TEXAS TECH UNIVERSITY
Multidisciplinary Research in Transportation

Pullout Resistance of Mechanically Stabilized Earth Reinforcement in Backfills Typically Used in Texas: Volume 2, Test Reports for MSE Reinforcements in Type B (Sandy) 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 2, presents pullout test reports from a total of 367 pullout tests completed on MSE reinforcements embedded in TxDOT Type B backfill, and accompanying strain gage test reports. Volume 1 summarizes the research findings, and Volume 3 presents test reports for reinforcements in Type A backfill.

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

Volume 2, Test Reports for MSE Reinforcements in Type B (Sandy) Backfill

By

Timothy D. Wood

Priyantha Jayawickrama

James G. Surles

William D. Lawson

Research Project Number 0-6493

Research Report Number 0-6493-1, Volume 2

Sponsored by the Texas Department of Transportation

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

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Lubbock, TX 79409-1023

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.

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Appendix K: MSE Reinforcement Pullout Test Strain Gage Reports: Welded Steel Grids in Type B Backfill

Appendix F

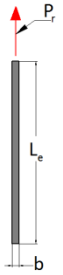
MSE Reinforcement Pullout Test Reports: Ribbed Strips in Type B Backfill

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/10/2010 10:24:00 AM
Test Identification:	TS09.13-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 B

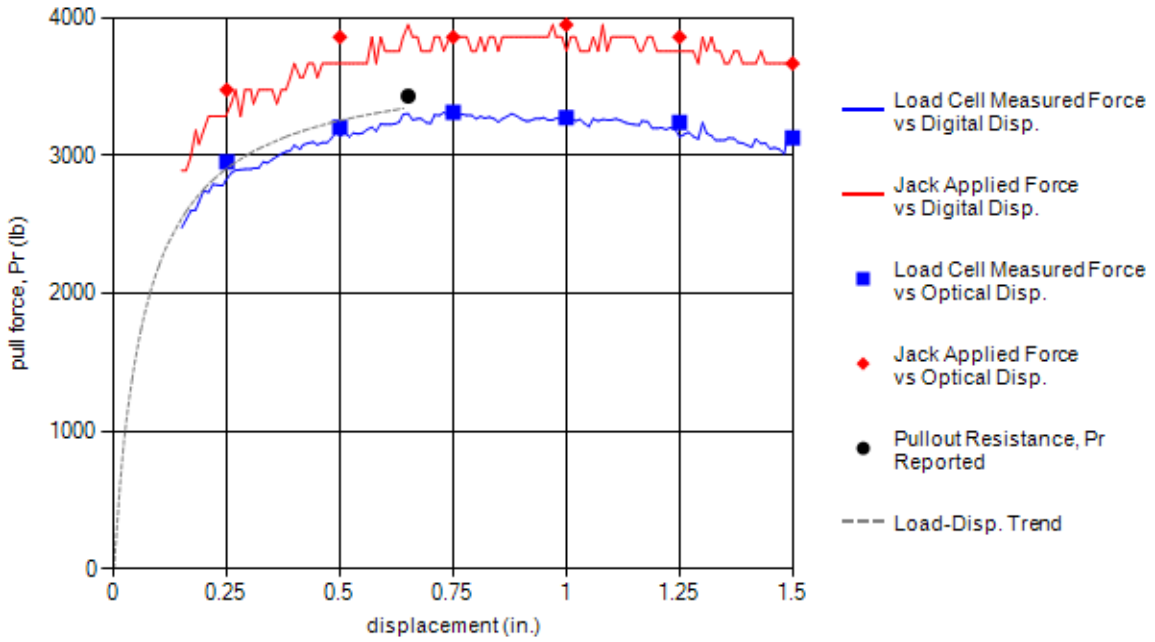
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	116.4	±2.8
Moisture Content, w (%):	6.8	±0.7%
Relative Compaction, C_R (%):	93.5	±2.3%

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	0.65	637	3429	5.1	**4.03**

Load-Displacement Curve

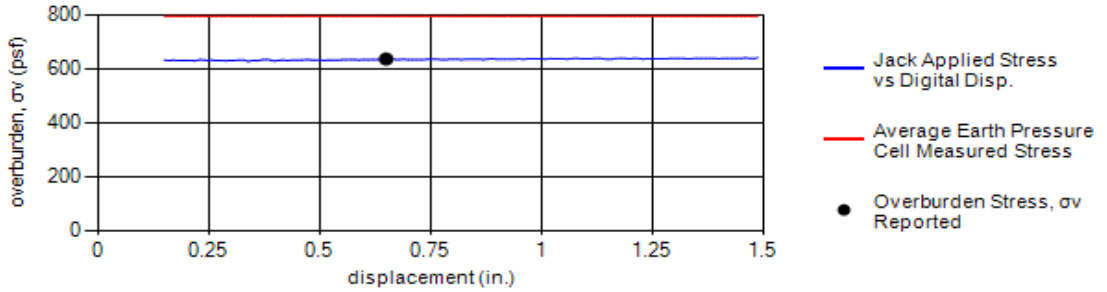


Comments

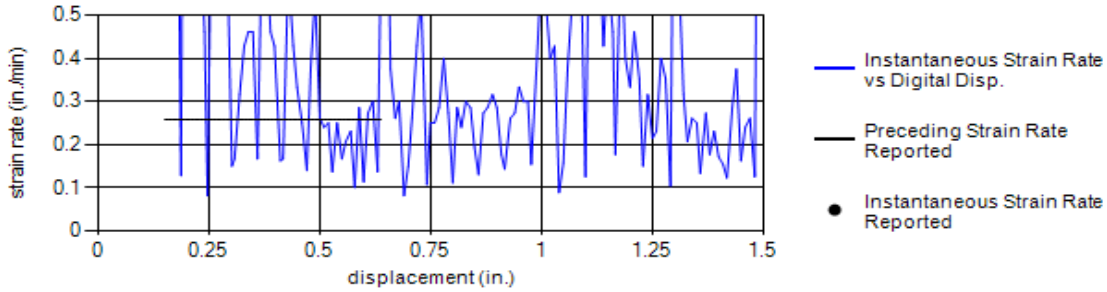
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
805	1044	375	980	776	796	2.85	635



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
1.00	0.26	0.21



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

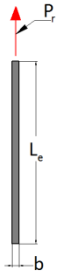
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/10/2010 10:34:00 AM
Test Identification:	TS09.14-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 B

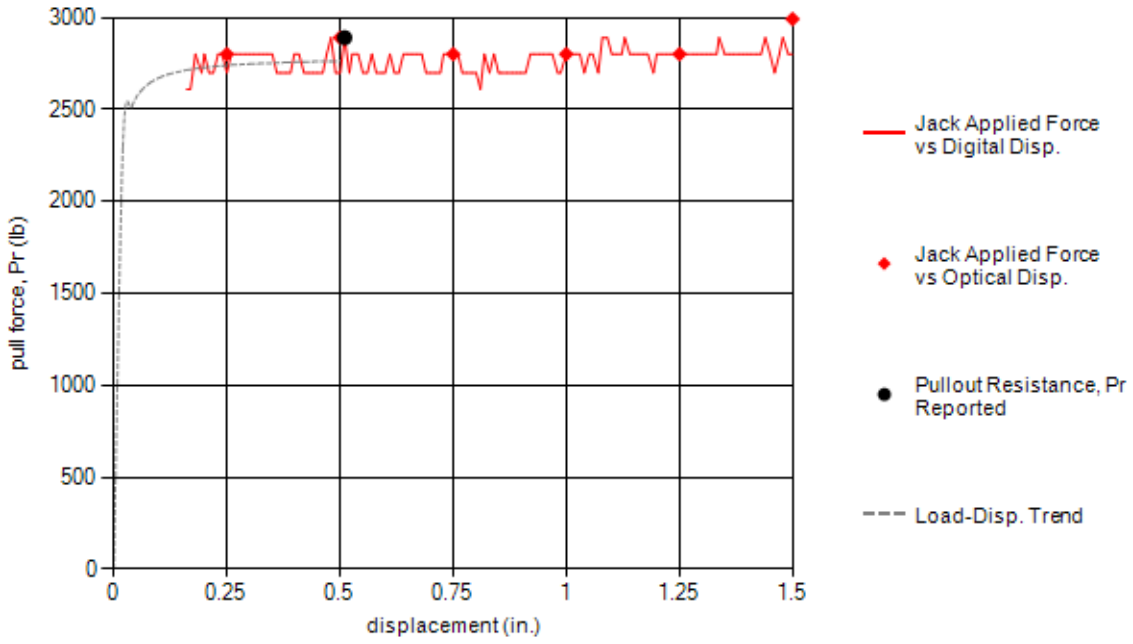
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	116.4	±2.8
Moisture Content, w (%):	6.8	±0.7%
Relative Compaction, C_R (%):	93.5	±2.3%

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	642	2890	5.2	**3.38**

Load-Displacement Curve



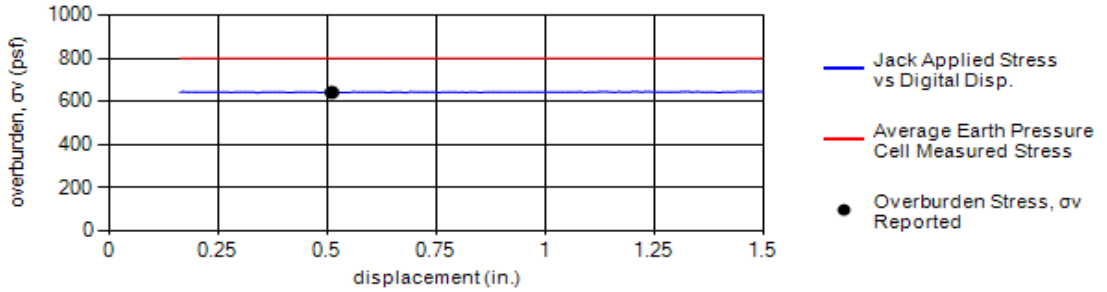
Comments

Load cell error; no load cell data.

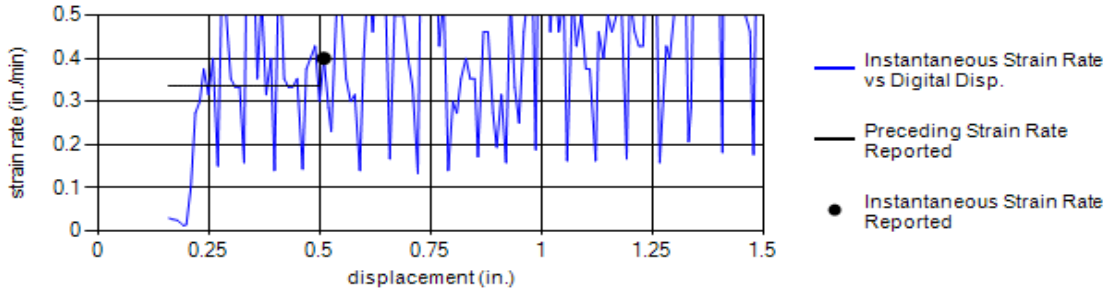
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
807	1043	384	982	784	800	2.84	642



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.40	0.34	0.58



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

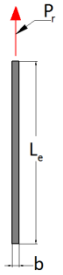
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/10/2010 10:55:00 AM
Test Identification:	TS09.15-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 B

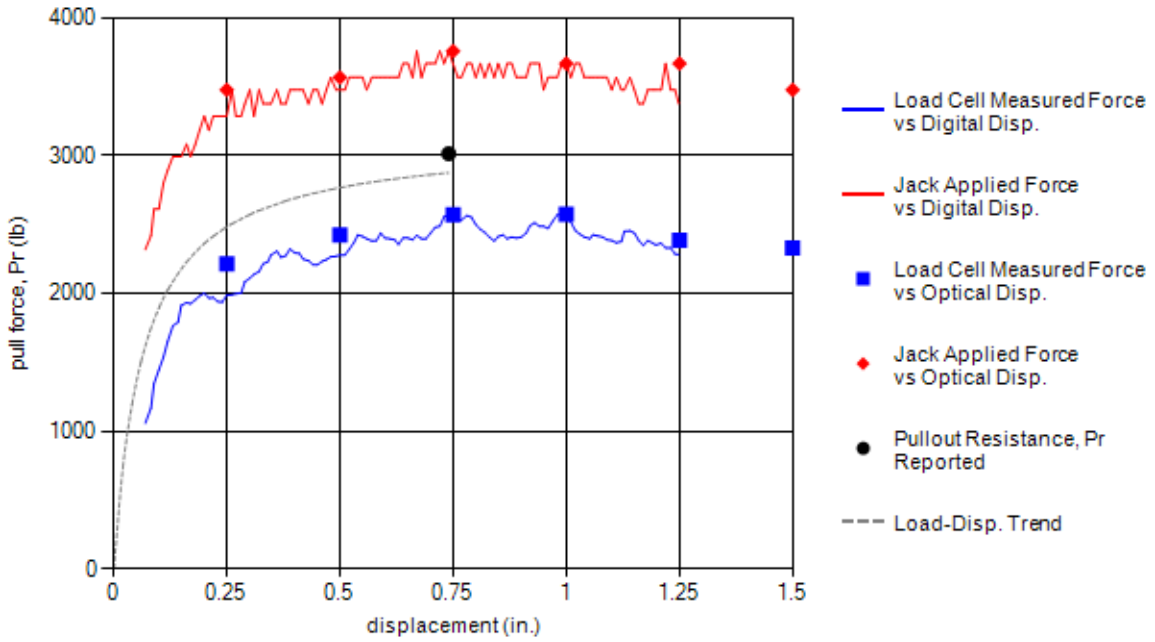
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	116.4	±2.8
Moisture Content, w (%):	6.8	±0.7%
Relative Compaction, C_R (%):	93.5	±2.3%

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	627	3012	5.0	**3.61**

Load-Displacement Curve

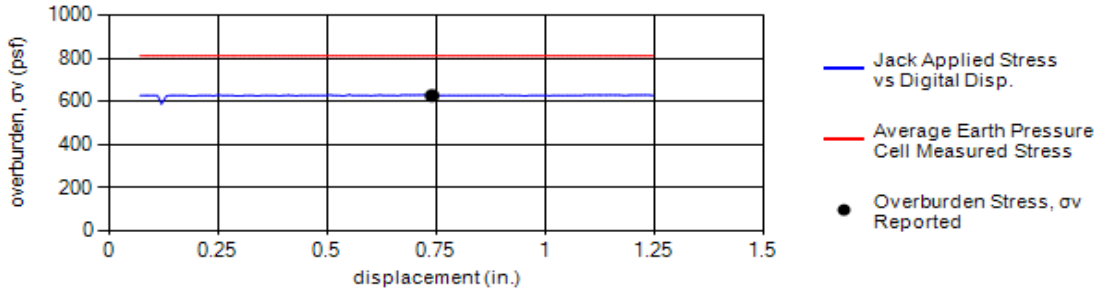


Comments

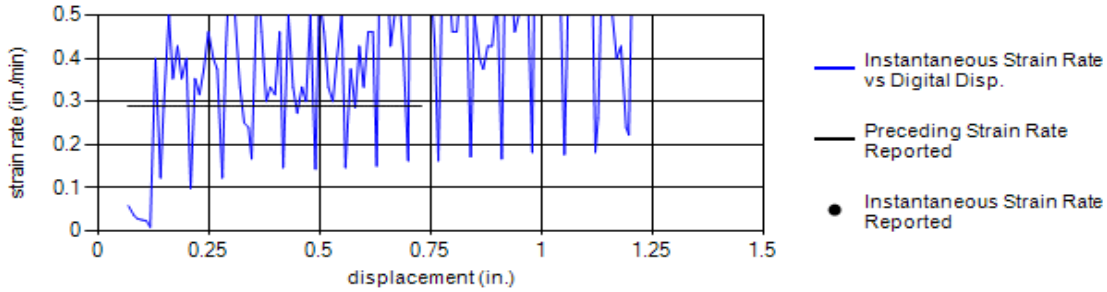
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
844	1110	485	915	700	811	3.14	626



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.60	0.29	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

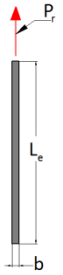
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/10/2010 11:15:00 AM
Test Identification:	TS09.16-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 B

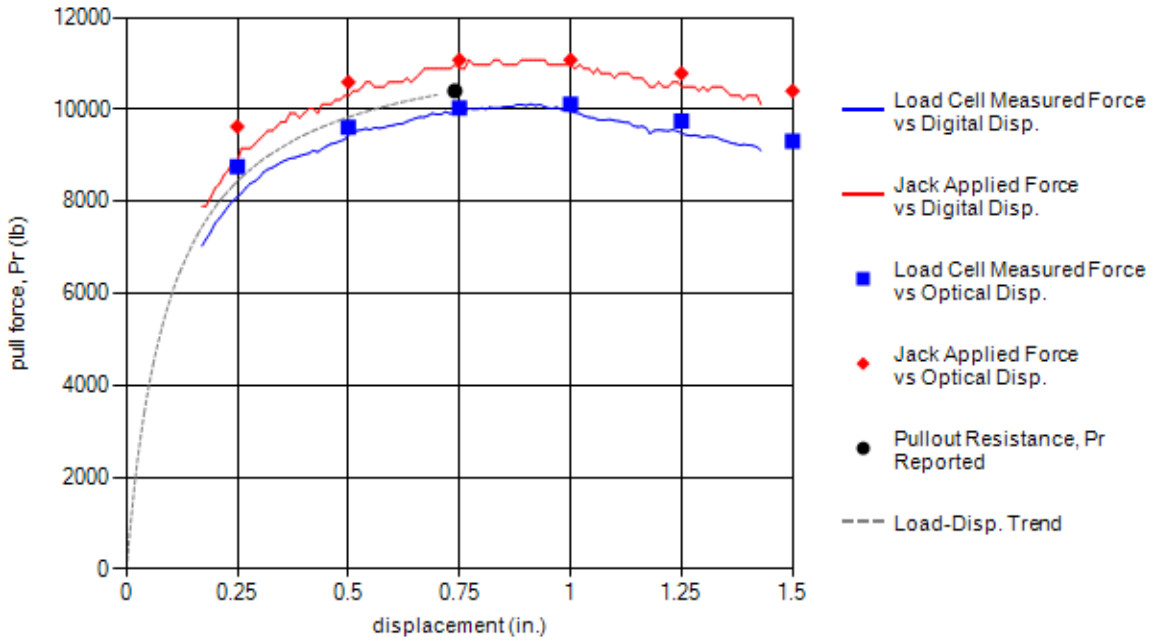
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	116.4	±2.8
Moisture Content, w (%):	6.8	±0.7%
Relative Compaction, C_R (%):	93.5	±2.3%

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	5064	10400	40.7	**1.03**

Load-Displacement Curve

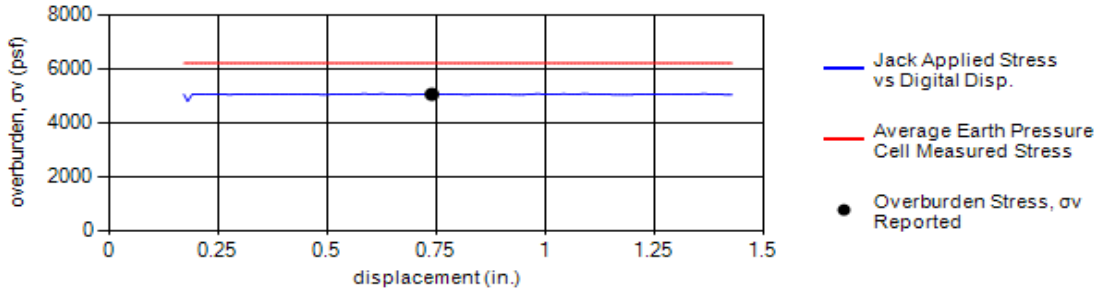


Comments

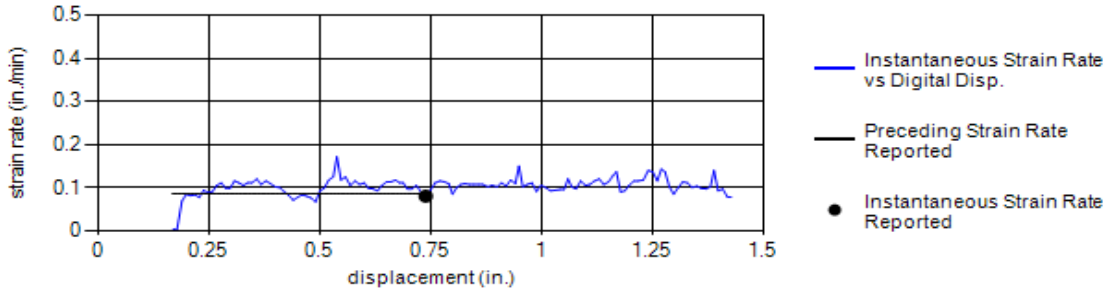
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
6389	6419	5683	6786	5826	6221	1.02	5064



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

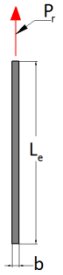
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/16/2010 11:42:00 AM
Test Identification:	TS10.13-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 B

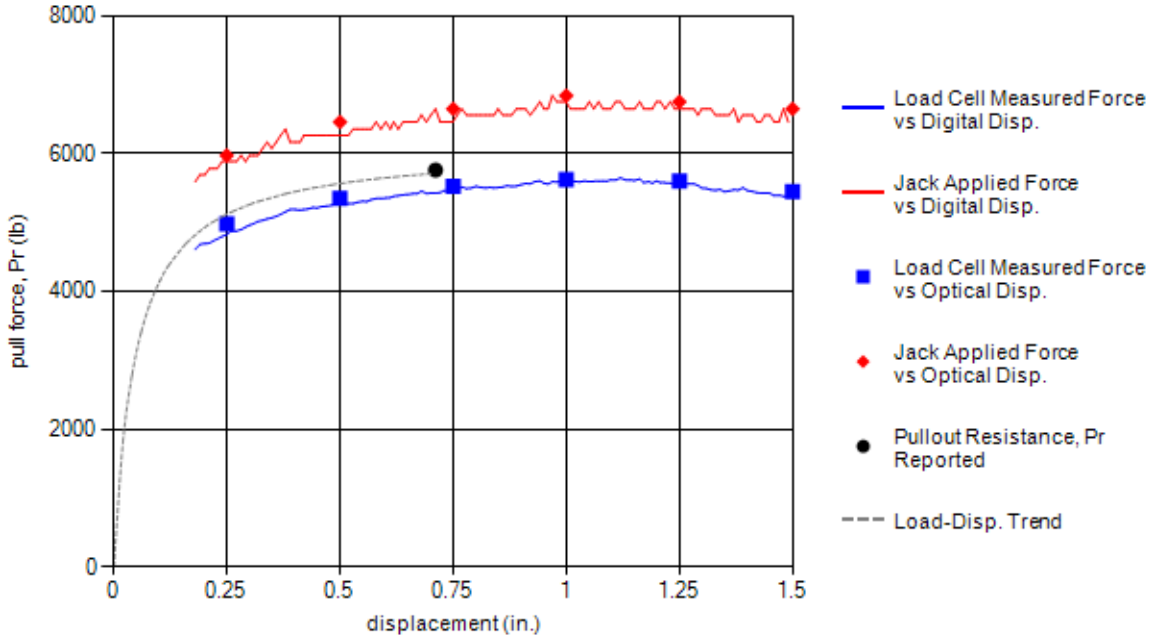
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	119.0	±0.8
Moisture Content, w (%):	7.6	±0.6%
Relative Compaction, C_R (%):	95.6	±0.7%

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	1517	5757	11.8	**2.85**

Load-Displacement Curve

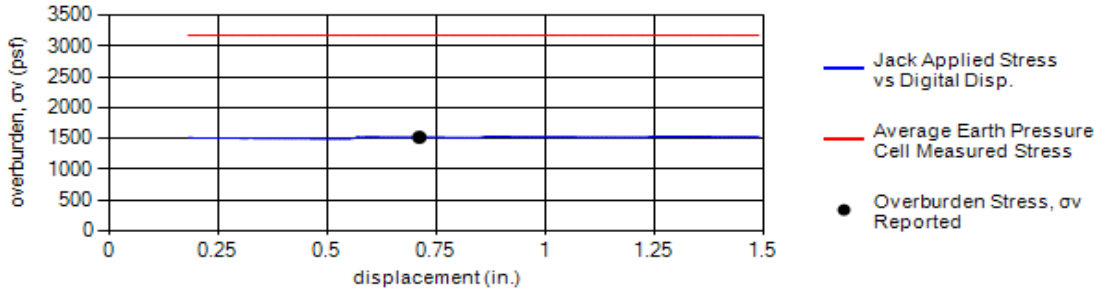


Comments

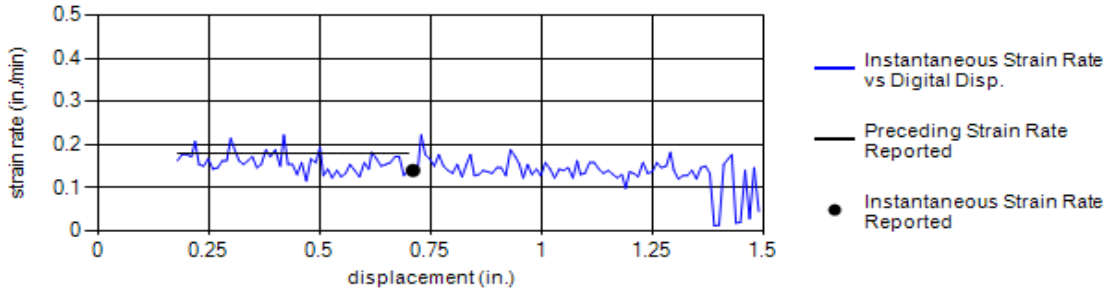
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3701	3192	2865	3116	2999	3174	1.07	1516



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

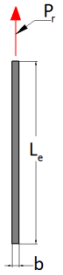
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/16/2010 11:58:00 AM
Test Identification:	TS10.14-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 B

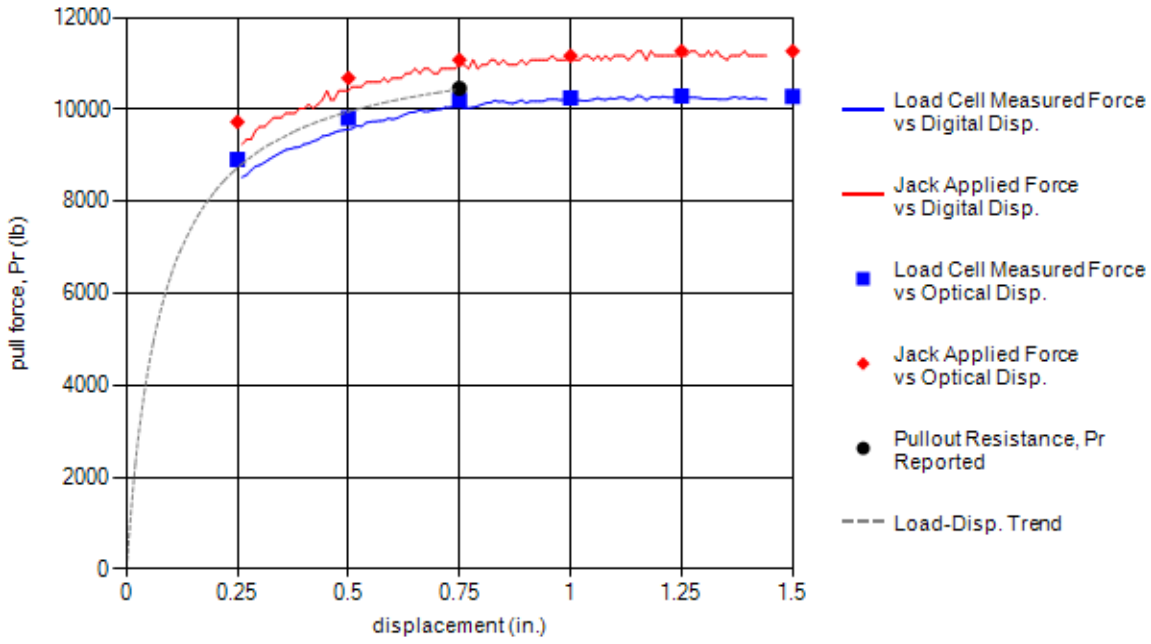
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	119.0	±0.8
Moisture Content, w (%):	7.6	±0.6%
Relative Compaction, C_R (%):	95.6	±0.7%

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	645	10457	5.0	**4.06**

Load-Displacement Curve

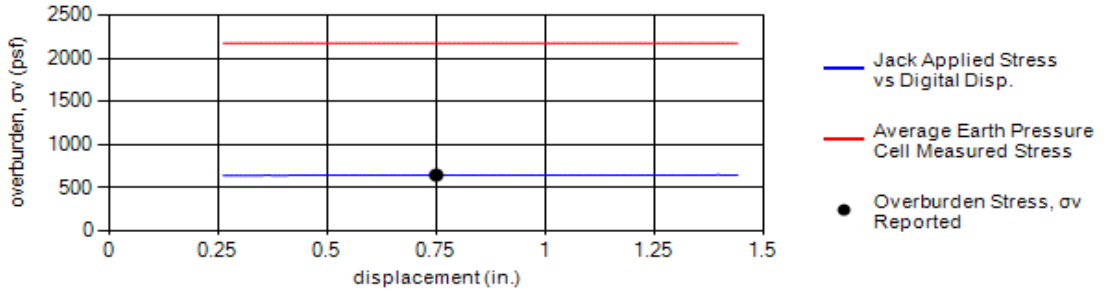


Comments

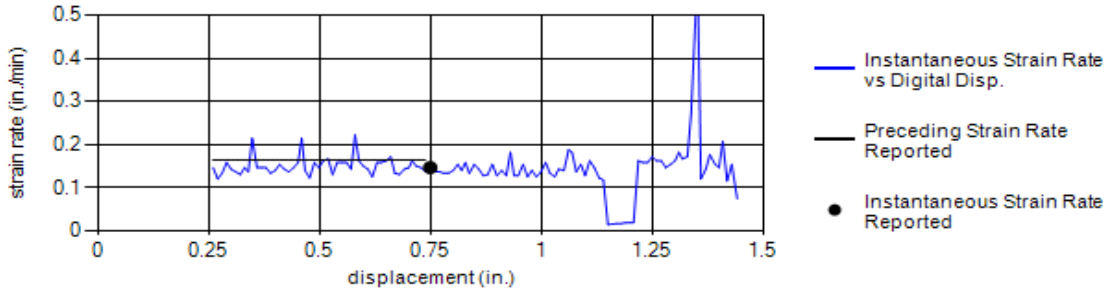
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2494	2339	1904	2036	2105	2176	2.37	644



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.15	0.16	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

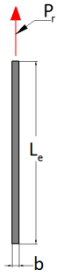
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/16/2010 11:04:00 AM
Test Identification:	TS10.15-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 B

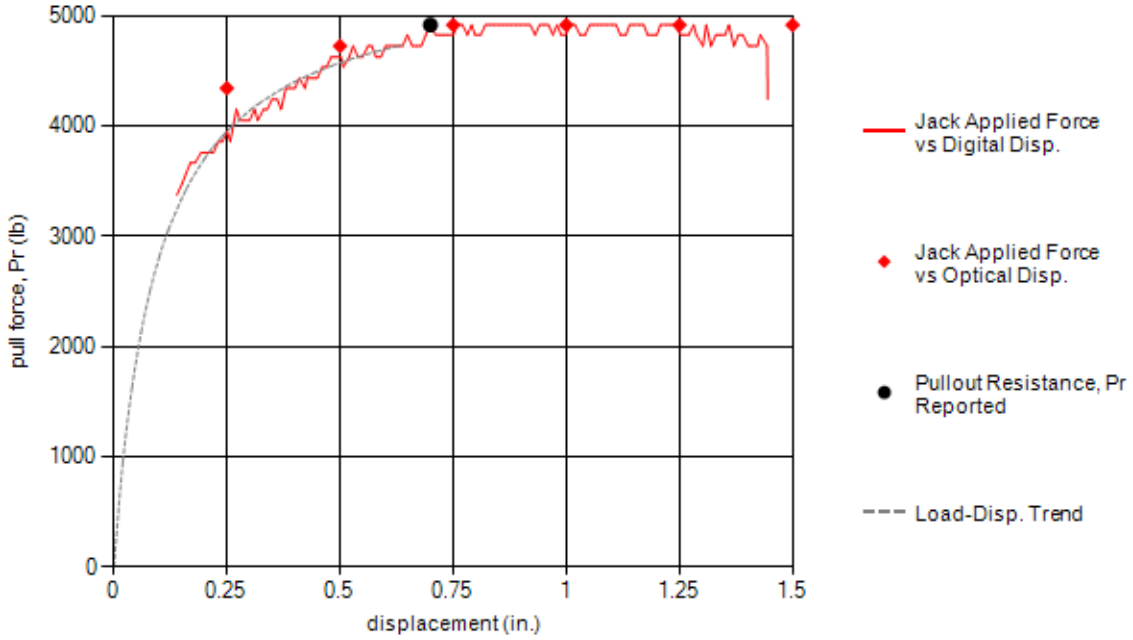
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	119.0	±0.8
Moisture Content, w (%):	7.6	±0.6%
Relative Compaction, C_R (%):	95.6	±0.7%

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	1526	4914	11.9	**2.42**

Load-Displacement Curve



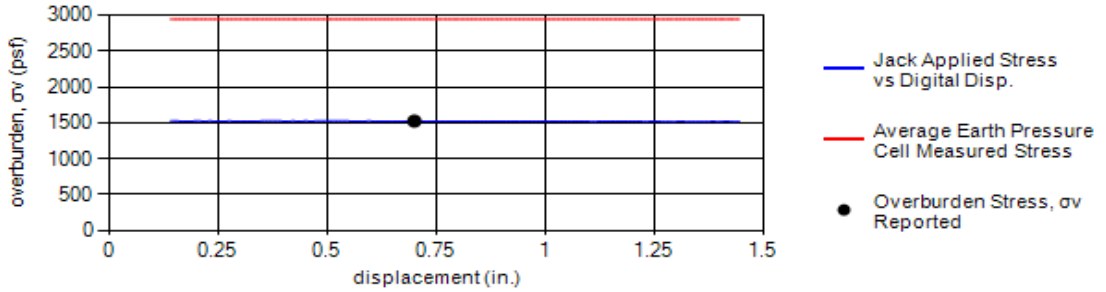
Comments

Load cell error; no load cell data.

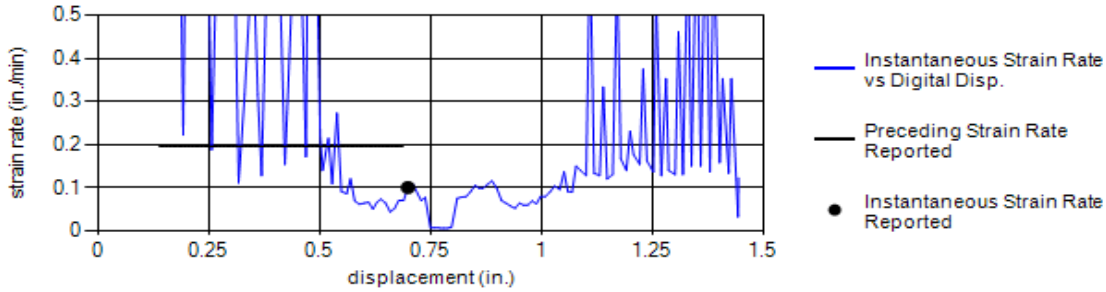
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3538	2873	2642	2910	2765	2946	1.17	1526



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.10	0.19	0.39



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

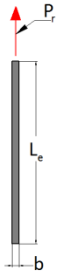
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/16/2010 11:21:00 AM
Test Identification:	TS10.16-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 B

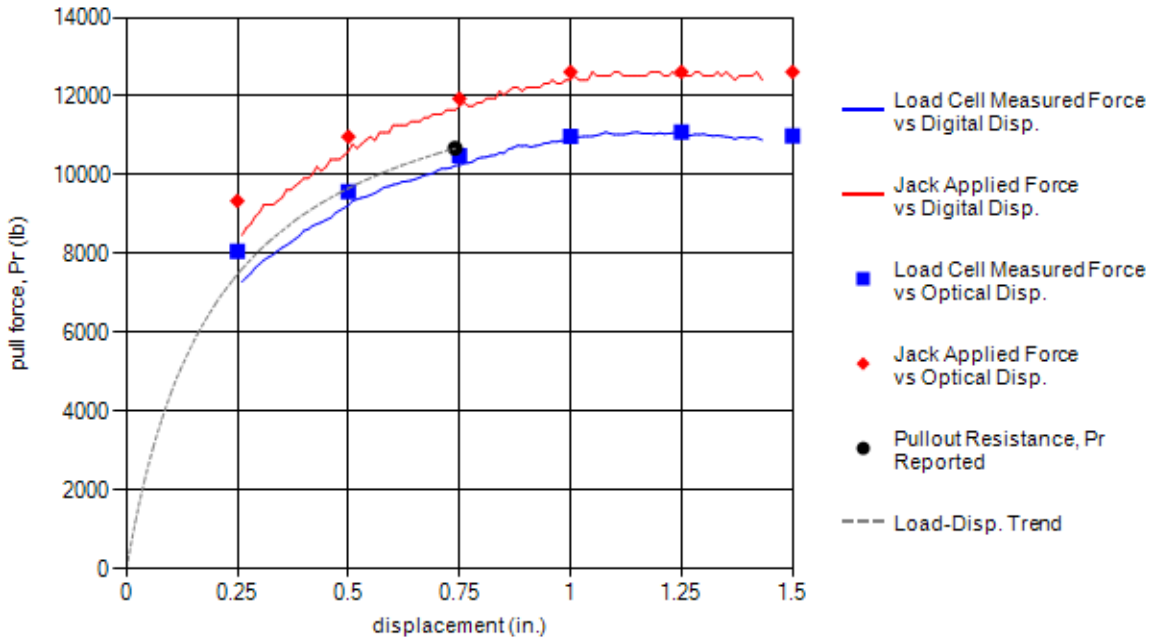
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	119.0	±0.8
Moisture Content, w (%):	7.6	±0.6%
Relative Compaction, C_R (%):	95.6	±0.7%

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	653	10679	5.1	**4.09**

Load-Displacement Curve

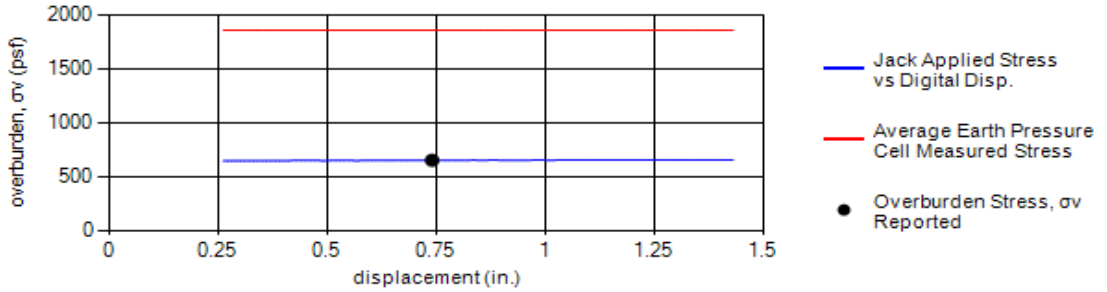


Comments

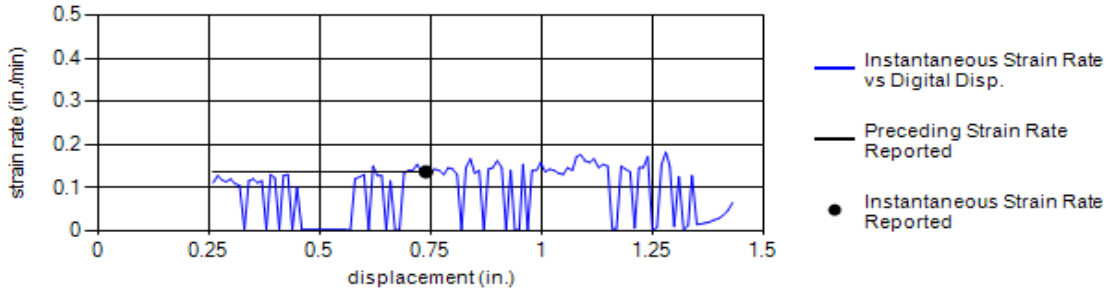
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2155	2097	1600	1733	1727	1863	2.73	653



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

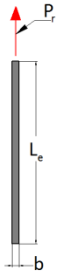
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/20/2010 12:22:00 PM
Test Identification:	TS11.13-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 B

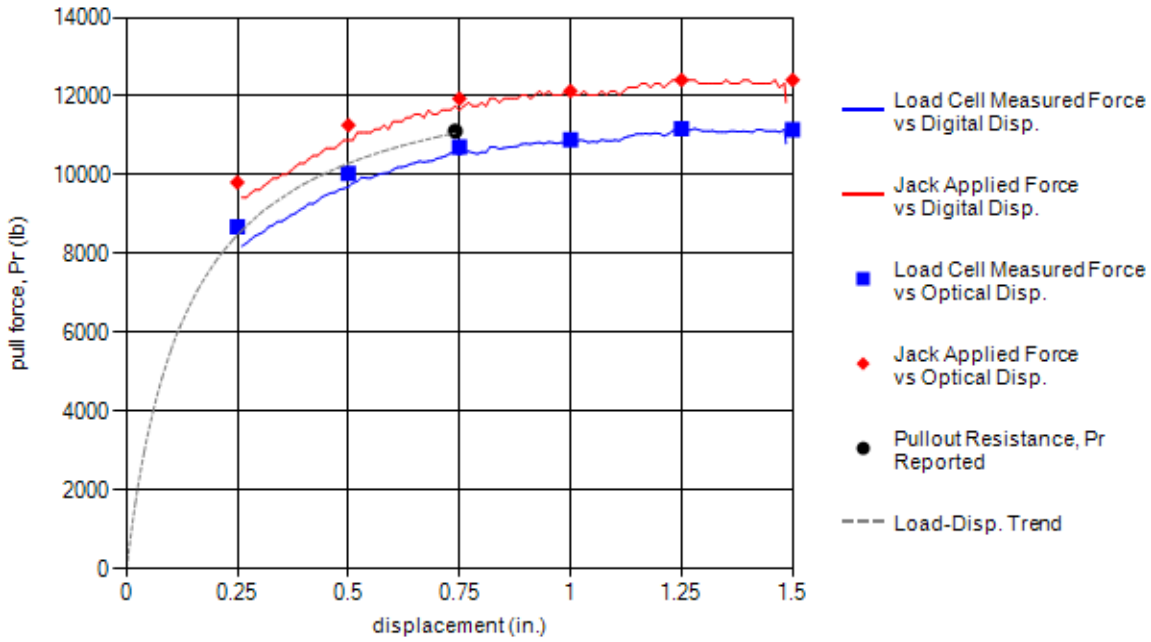
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	116.9	±1.5
Moisture Content, w (%):	6.6	±0.2%
Relative Compaction, C_R (%):	93.9	±1.2%

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	637	11117	5.1	**4.36**

Load-Displacement Curve

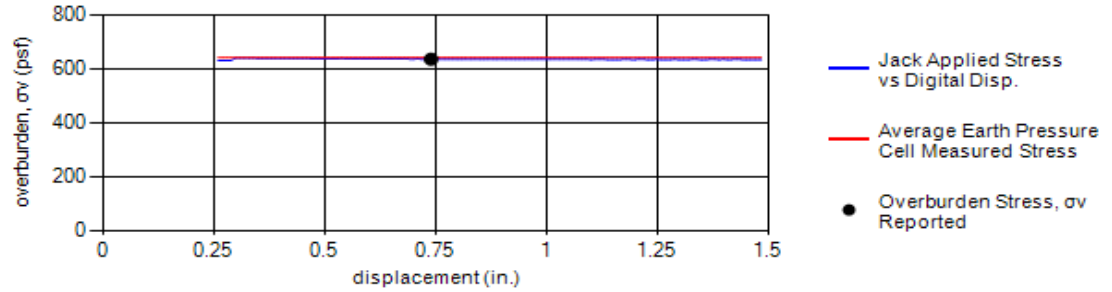


Comments

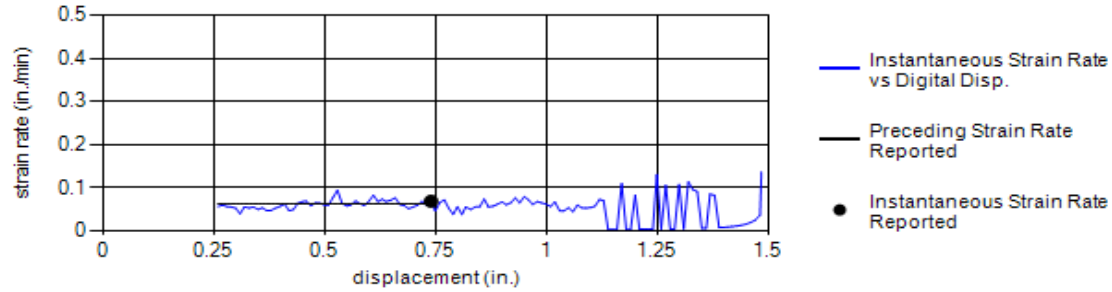
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
665	525	503	693	827	643	9.74	637



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

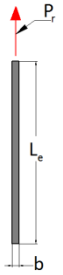
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	9/16/2010 3:44:00 PM
Test Identification:	TS13.13-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 B

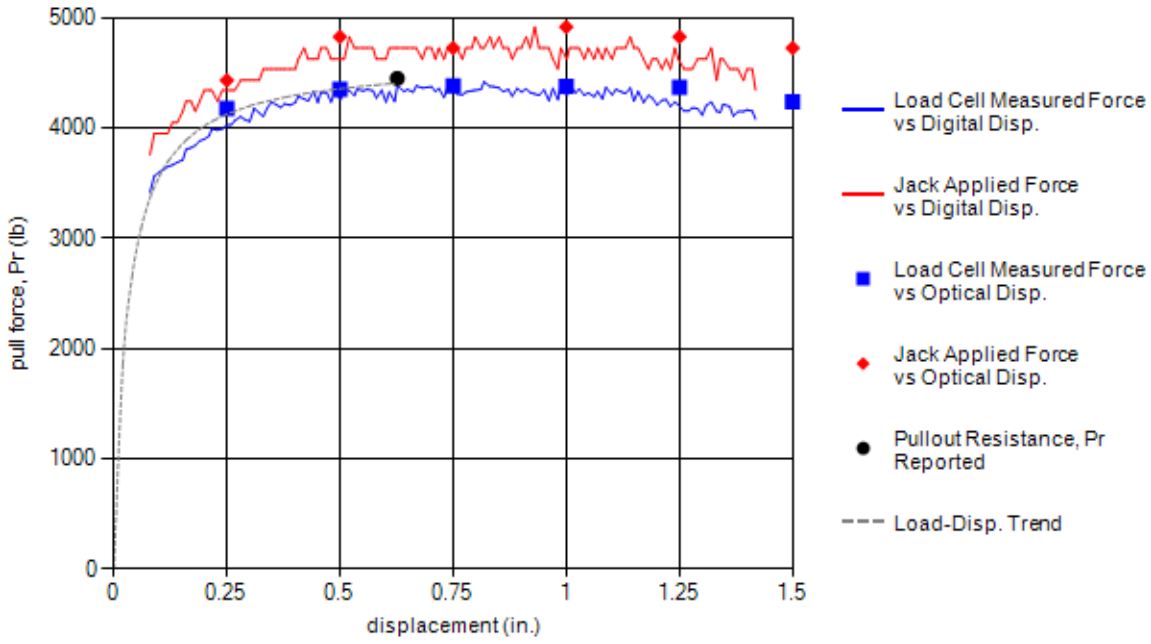
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	120.3	±2.1
Moisture Content, w (%):	4.9	±0.6%
Relative Compaction, C_R (%):	96.6	±1.6%

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	0.63	885	4447	7.0	**3.77**

Load-Displacement Curve

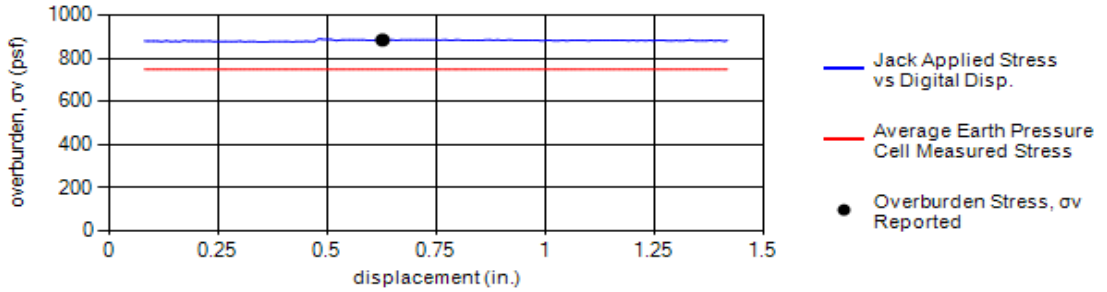


Comments

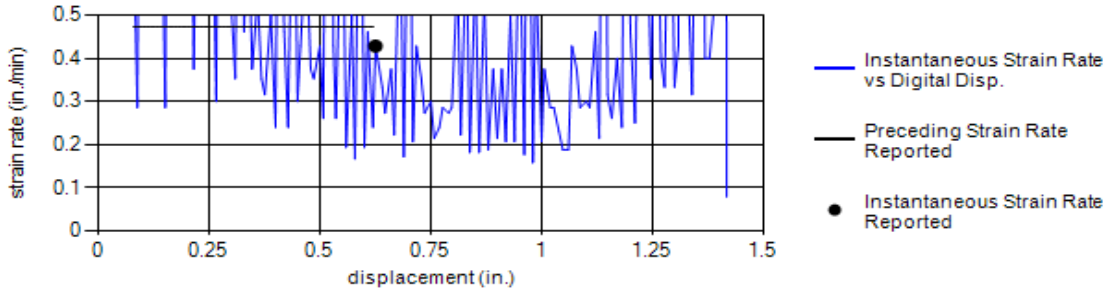
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1020	No Data	765	304	908	749	6.58	885



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.43	0.47	0.37



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

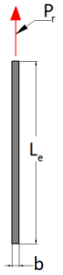
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	9/16/2010 3:52:00 PM
Test Identification:	TS13.14-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 B

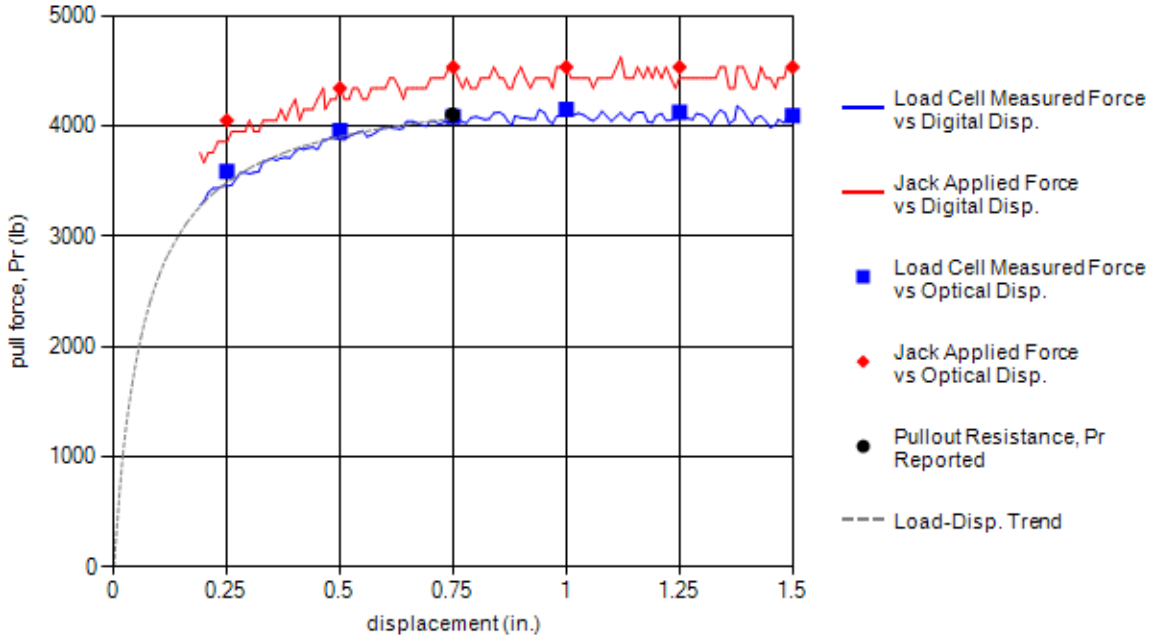
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	120.3	±2.1
Moisture Content, w (%):	4.9	±0.6%
Relative Compaction, C_R (%):	96.6	±1.6%

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	635	4098	5.0	**4.84**

Load-Displacement Curve

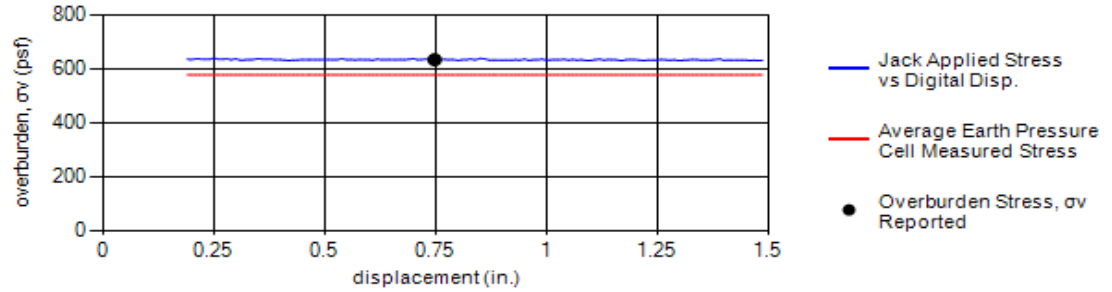


Comments

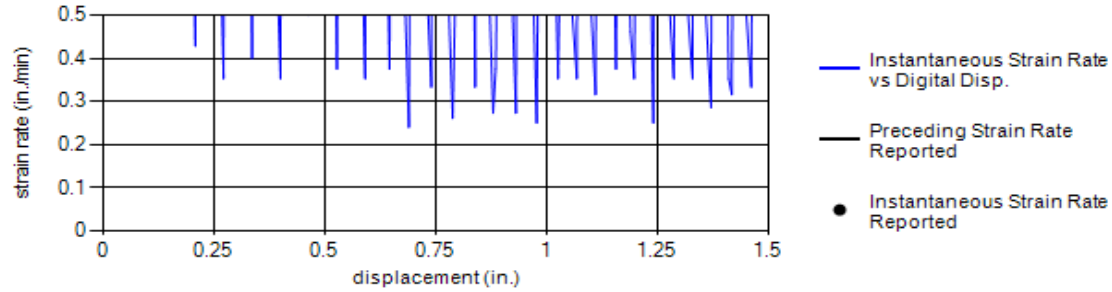
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
762	No Data	551	154	849	579	8.19	635



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
3.00	0.84	0.67



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

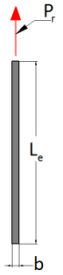
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	11/12/2010 12:13:00 PM
Test Identification:	TS17.13-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 B

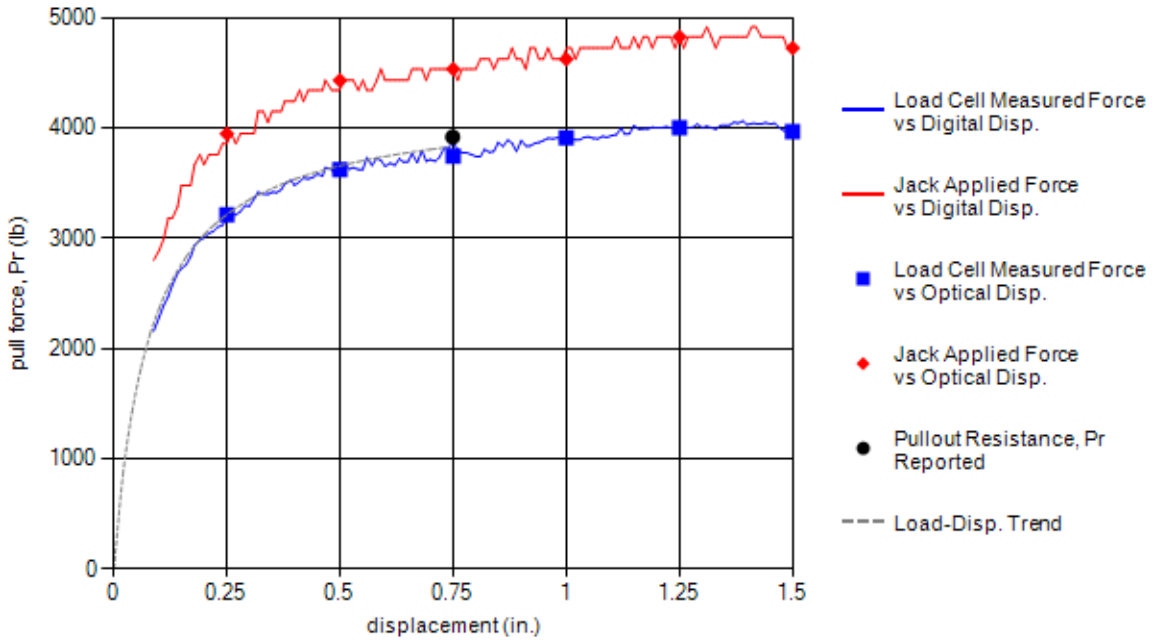
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	118.4	±2.0
Moisture Content, w (%):	5.9	±0.4%
Relative Compaction, C_R (%):	95.1	±1.6%

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	639	3917	5.1	**4.60**

Load-Displacement Curve

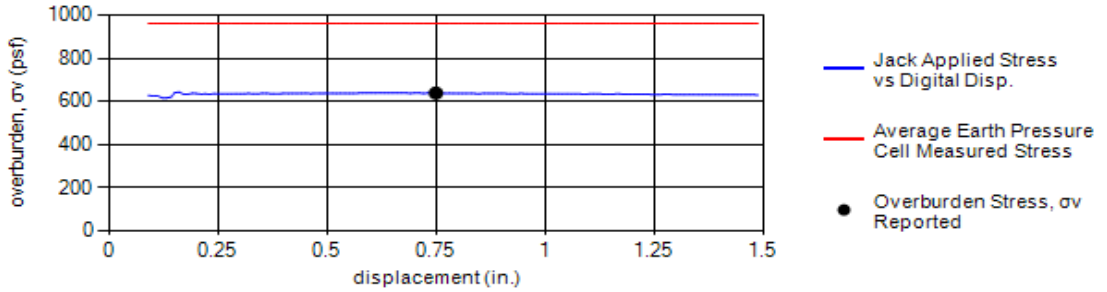


Comments

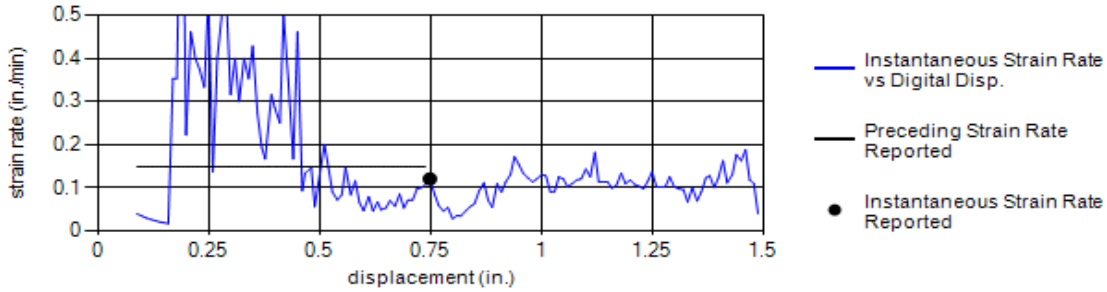
Personnel

Tested:	TW JL MB
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1061	No Data	722	937	1128	962	7.95	638



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.12	0.15	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

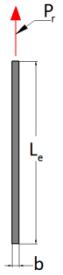
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	11/12/2010 12:32:00 PM
Test Identification:	TS17.14-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 B

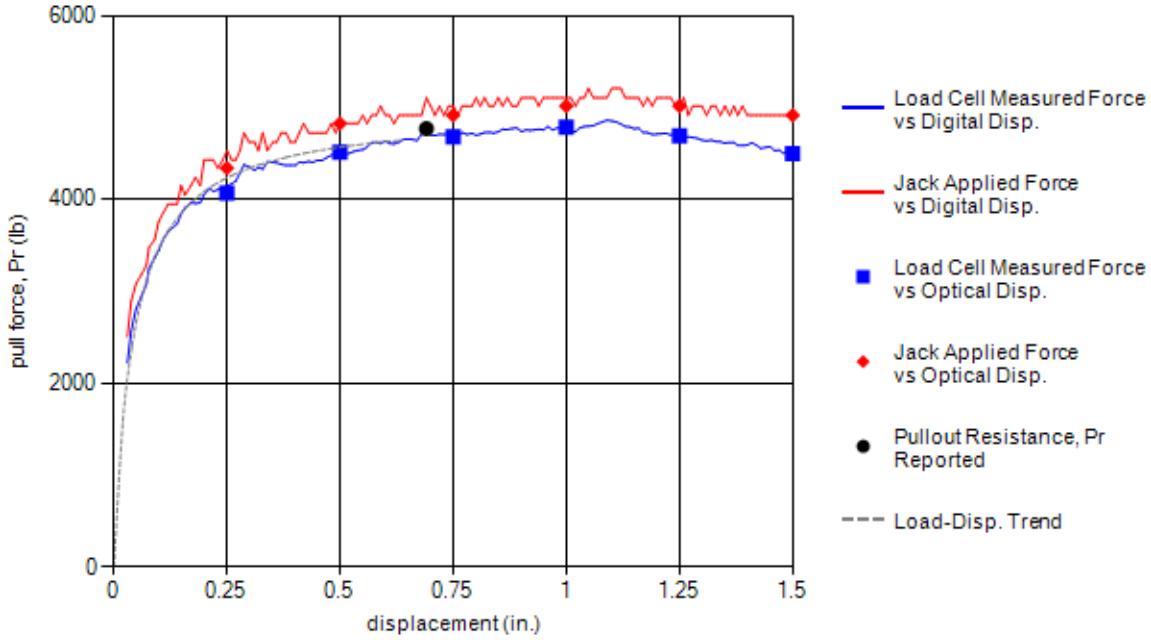
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	118.4	±2.0
Moisture Content, w (%):	5.9	±0.4%
Relative Compaction, C_R (%):	95.1	±1.6%

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	0.69	1500	4770	12.0	**2.38**

Load-Displacement Curve

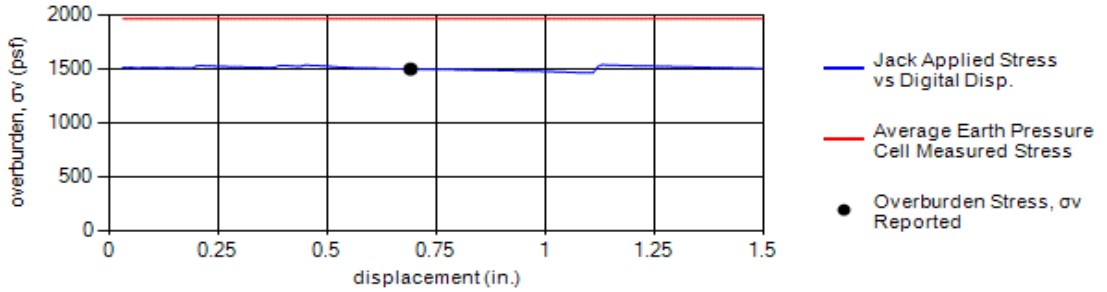


Comments

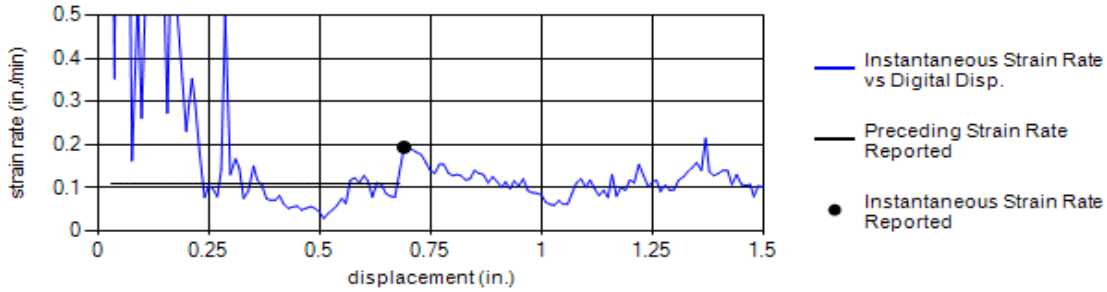
Personnel

Tested:	TW JL MB
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2250	No Data	1682	1843	2090	1966	3.38	1500



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

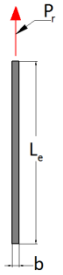
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	11/12/2010 1:59:00 PM
Test Identification:	TS17.15-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 B

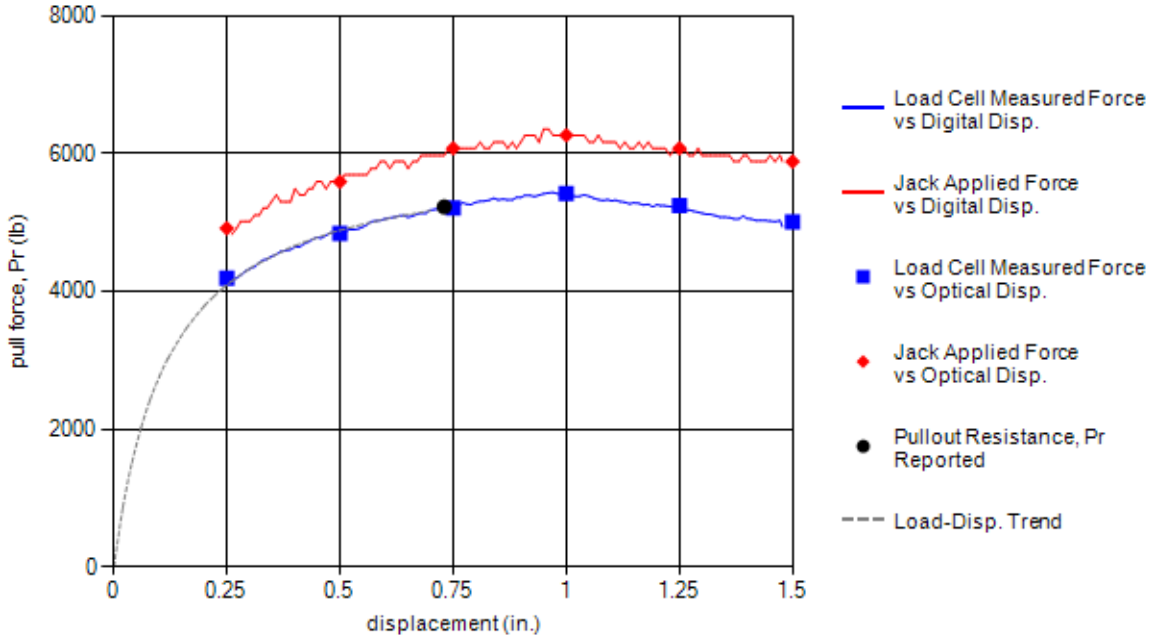
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	118.4	±2.0
Moisture Content, w (%):	5.9	±0.4%
Relative Compaction, C_R (%):	95.1	±1.6%

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	629	5225	5.0	**6.23**

Load-Displacement Curve

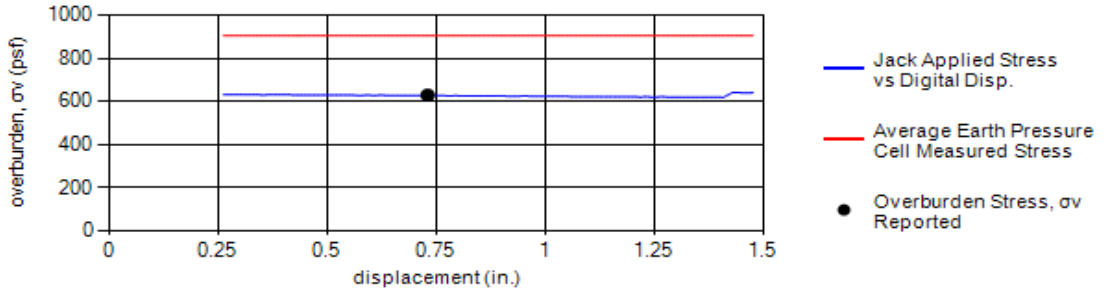


Comments

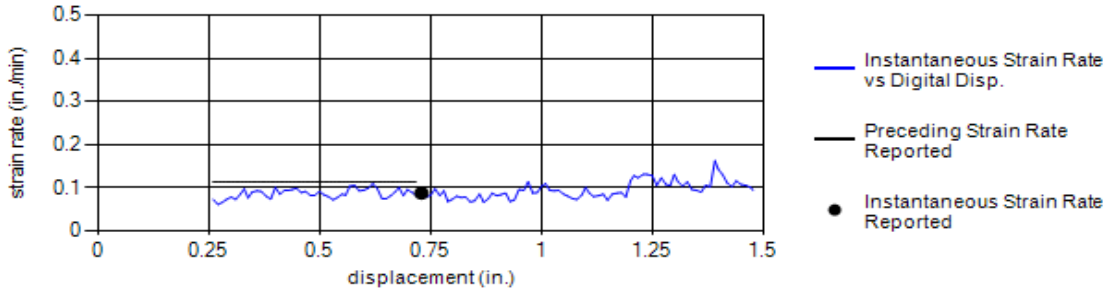
Personnel

Tested:	TW MB JL
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1051	No Data	709	938	928	906	8.29	628



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

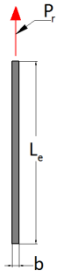
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	11/12/2010 2:17:00 PM
Test Identification:	TS17.16-S-L4-Z12-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 B

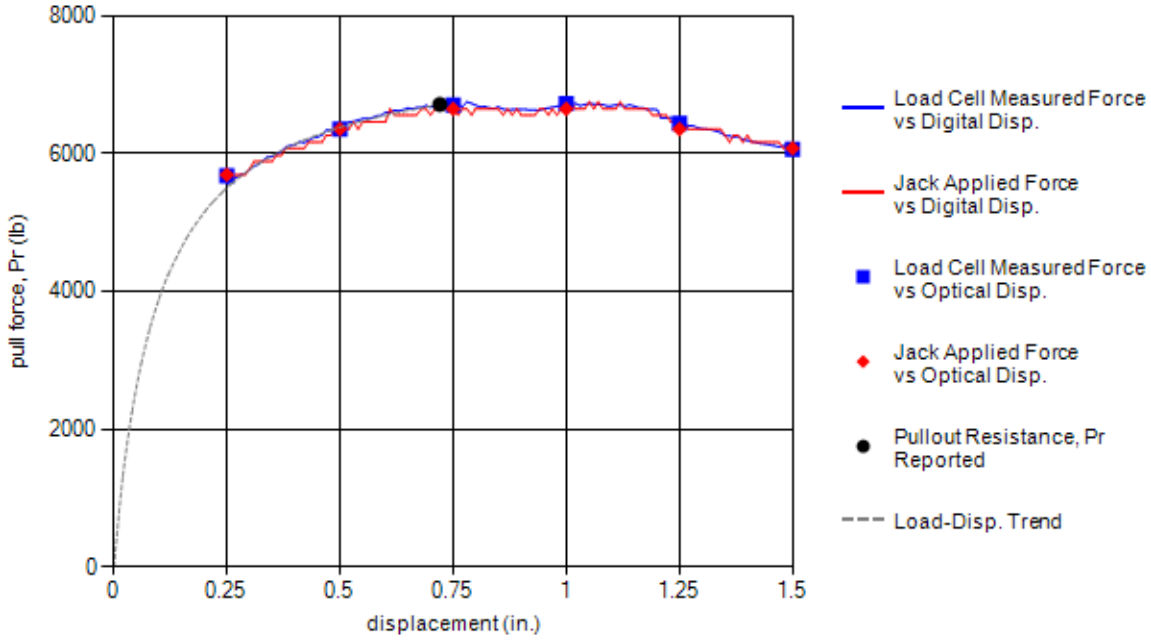
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	118.4	±2.0
Moisture Content, w (%):	5.9	±0.4%
Relative Compaction, C_R (%):	95.1	±1.6%

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	0.72	1510	6710	12.0	**3.33**

Load-Displacement Curve

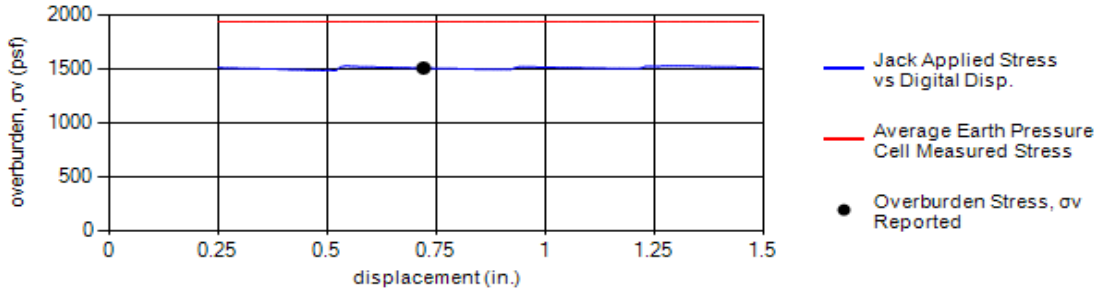


Comments

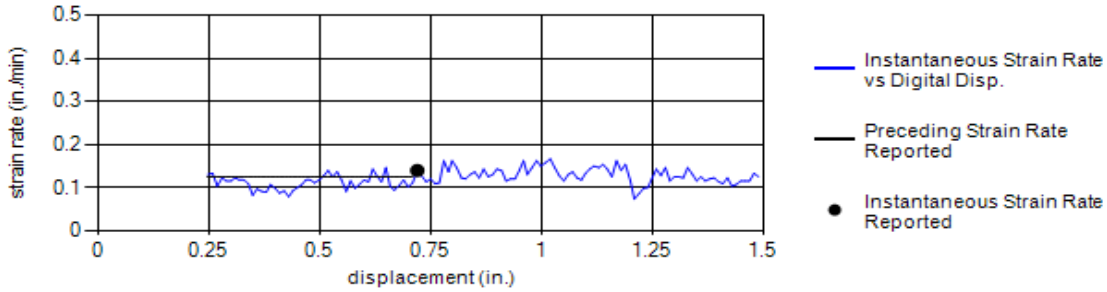
Personnel

Tested:	TW JL MB
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2271	No Data	1692	1915	1886	1941	3.49	1510



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.14	0.13	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

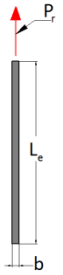
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	11/12/2010 12:59:00 PM
Test Identification:	TS17.17-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 B

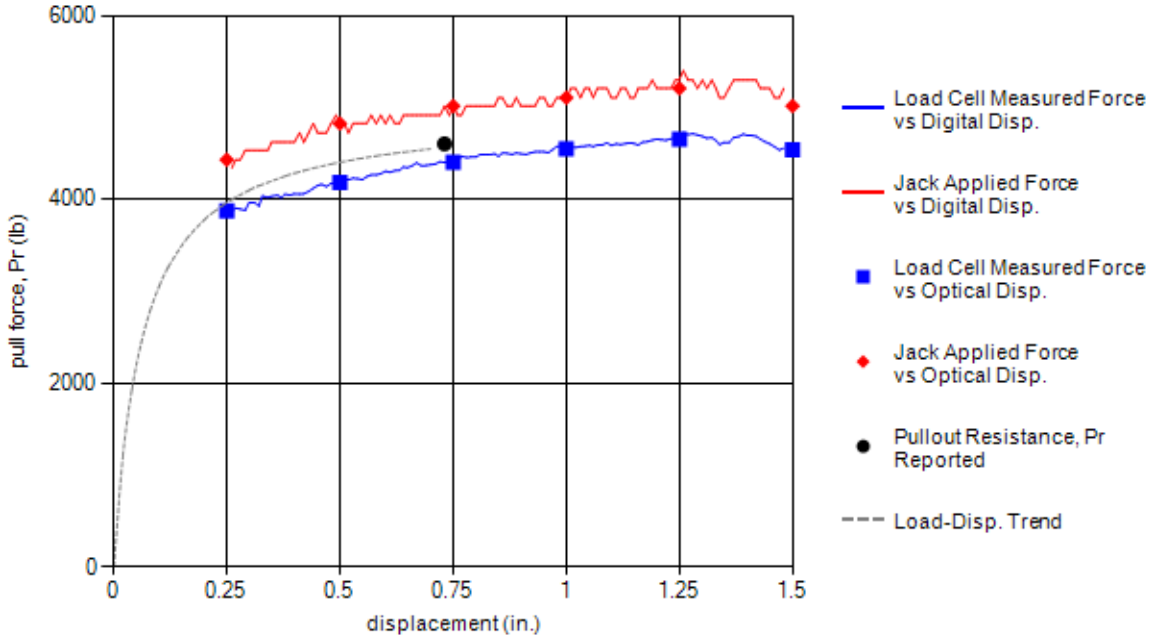
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	118.4	±2.0
Moisture Content, w (%):	5.9	±0.4%
Relative Compaction, C_R (%):	95.1	±1.6%

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	632	4603	5.0	**5.46**

Load-Displacement Curve

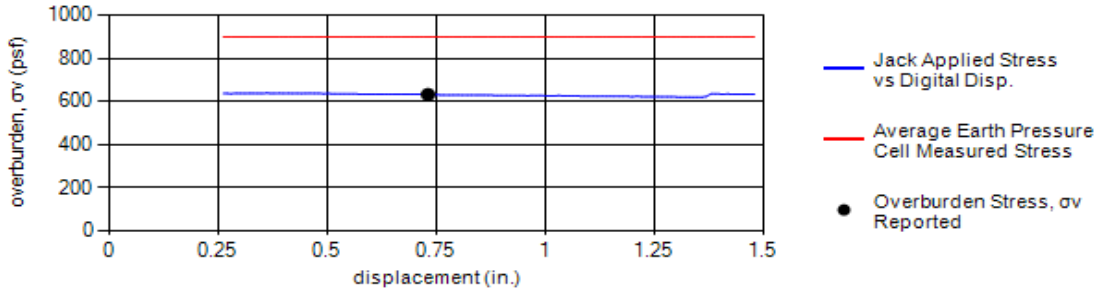


Comments

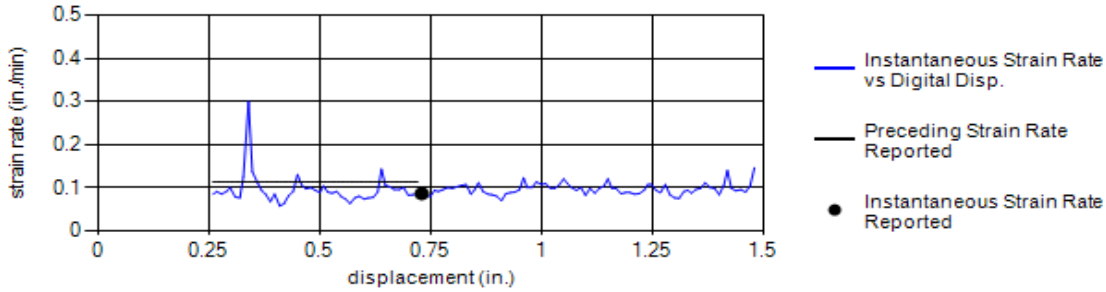
Personnel

Tested:	TW MB JL
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1059	No Data	757	862	920	900	8.42	632



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

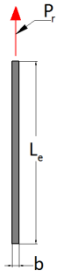
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	11/12/2010 1:27:00 PM
Test Identification:	TS17.18-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 B

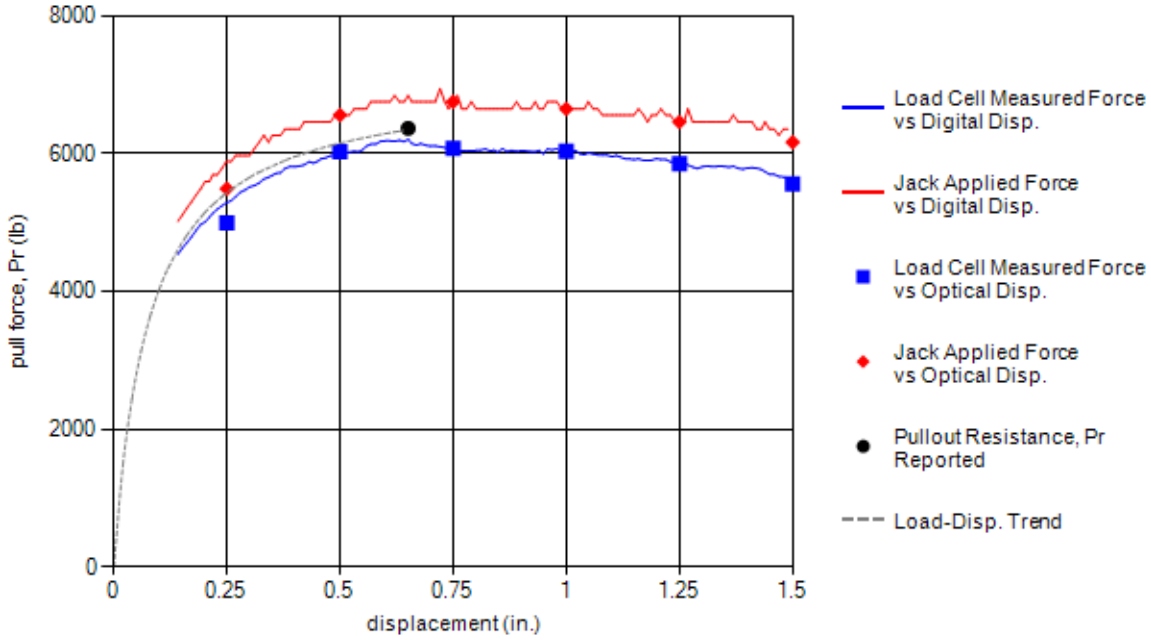
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	118.4	±2.0
Moisture Content, w (%):	5.9	±0.4%
Relative Compaction, C_R (%):	95.1	±1.6%

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	0.65	1517	6363	12.1	**3.15**

Load-Displacement Curve

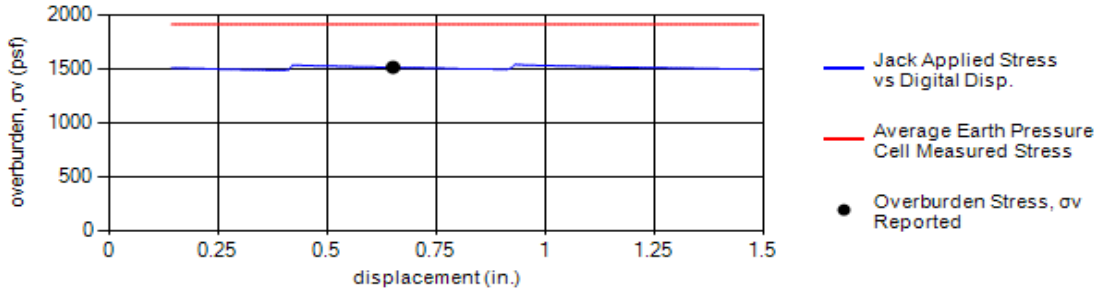


Comments

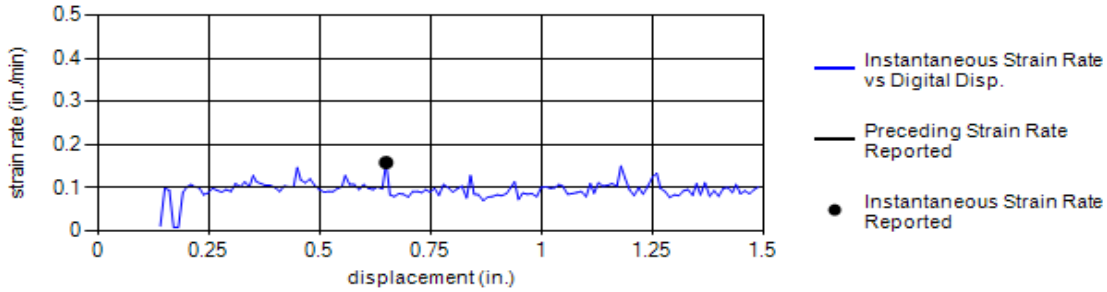
Personnel

Tested:	TW MB JL
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2267	No Data	1706	1847	1843	1916	3.60	1517



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

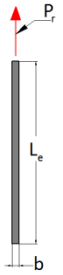
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	11/22/2010 4:20:00 PM
Test Identification:	TS18.13-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 B

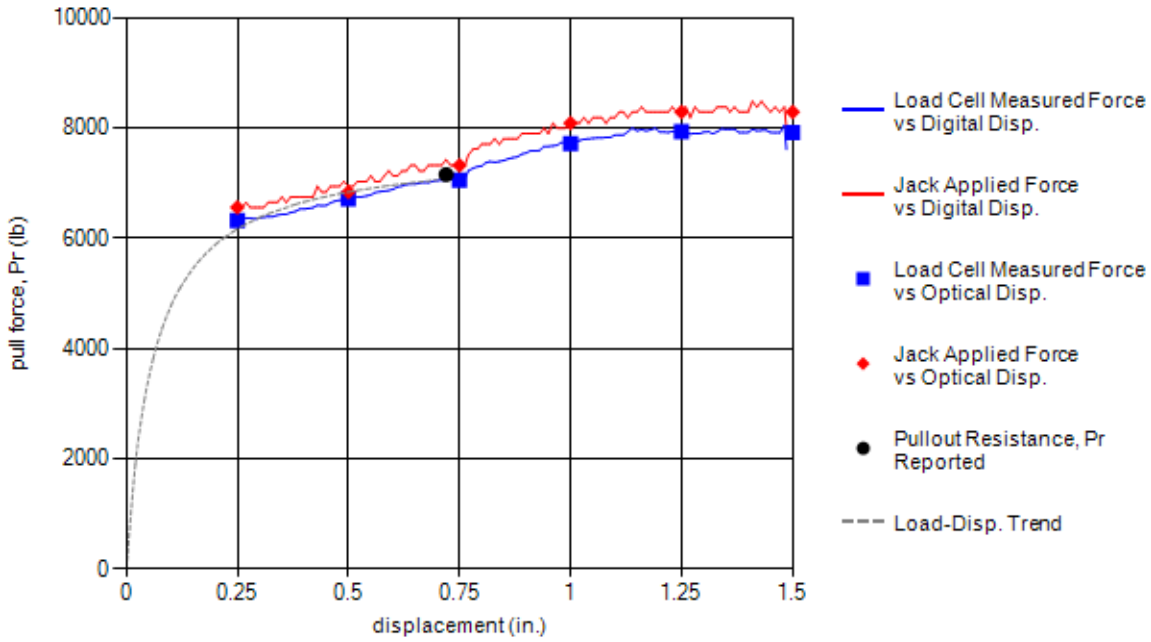
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	117.5	±1.0
Moisture Content, w (%):	6.7	±0.3%
Relative Compaction, C_R (%):	94.4	±0.8%

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	5089	7151	40.6	**0.70**

Load-Displacement Curve

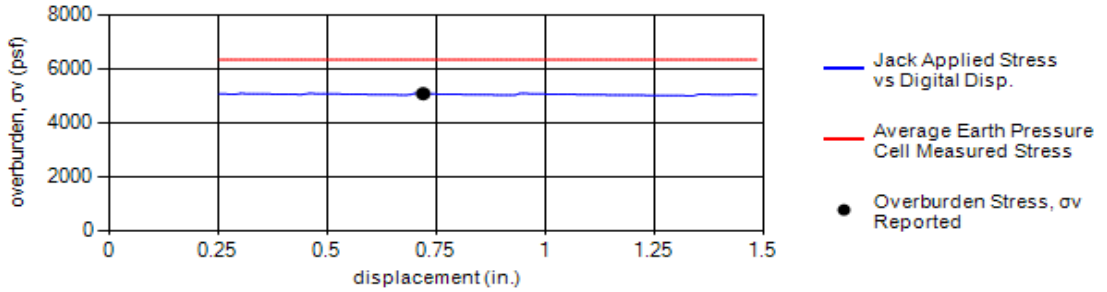


Comments

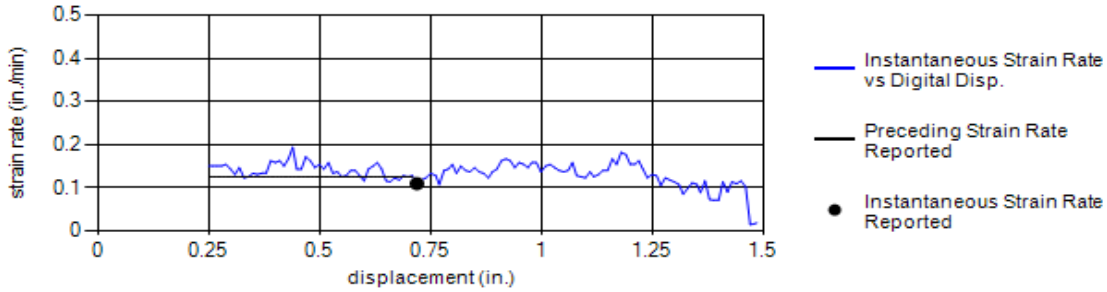
Personnel

Tested:	TW JL MB
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
7697	No Data	5096	6283	No Data	6358	1.03	5089



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

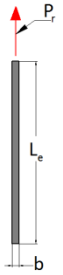
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	11/22/2010 4:58:00 PM
Test Identification:	TS18.14-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 B

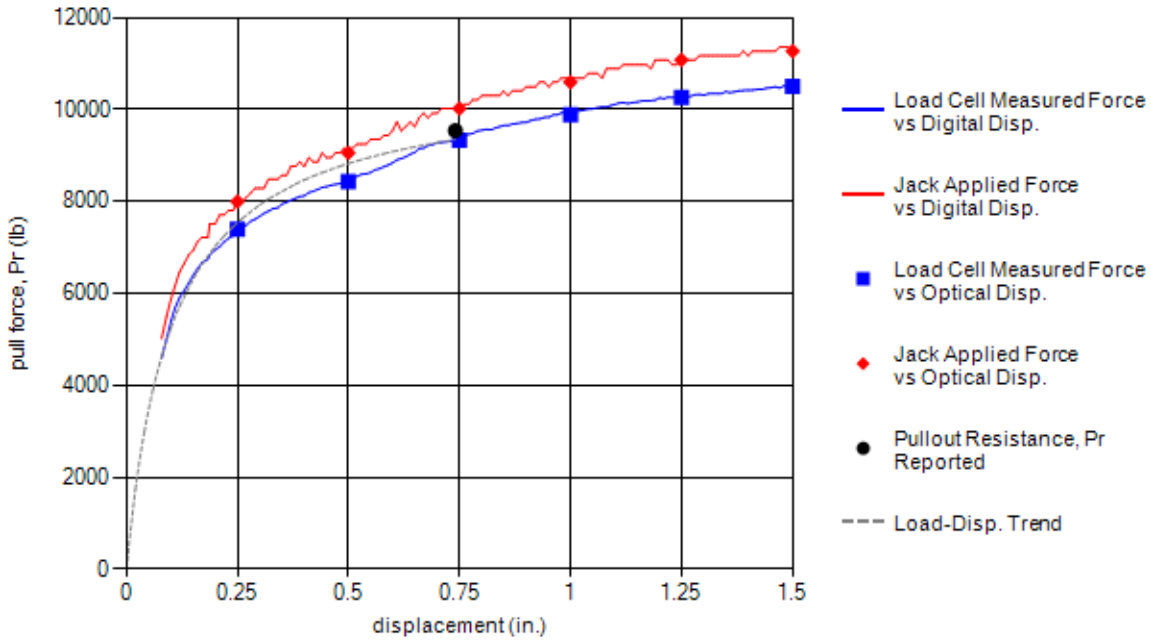
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	117.5	±1.0
Moisture Content, w (%):	6.7	±0.3%
Relative Compaction, C_R (%):	94.4	±0.8%

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	652	9537	5.2	**3.66**

Load-Displacement Curve

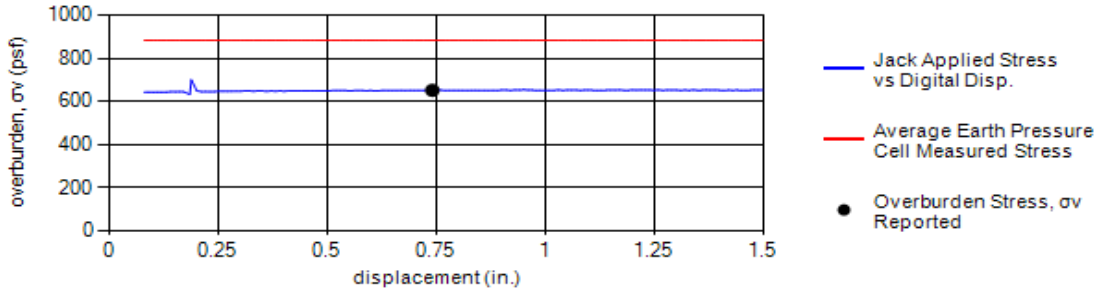


Comments

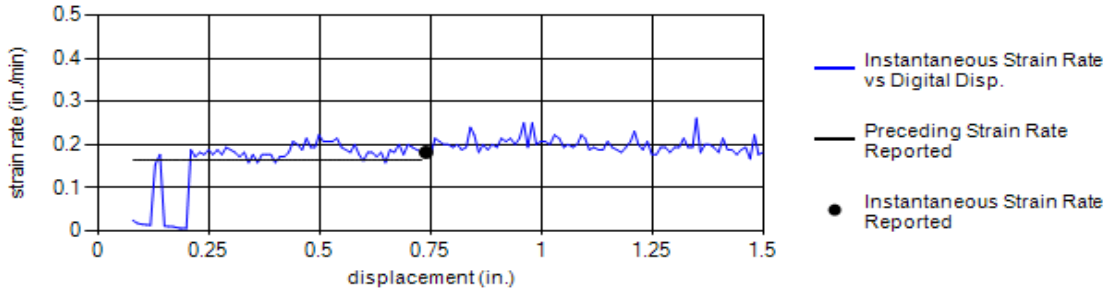
Personnel

Tested:	TW JL MB
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
993	No Data	674	982	No Data	883	7.81	651



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.18	0.17	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

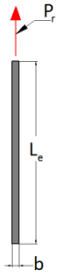
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	11/22/2010 4:43:00 PM
Test Identification:	TS18.15-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 B

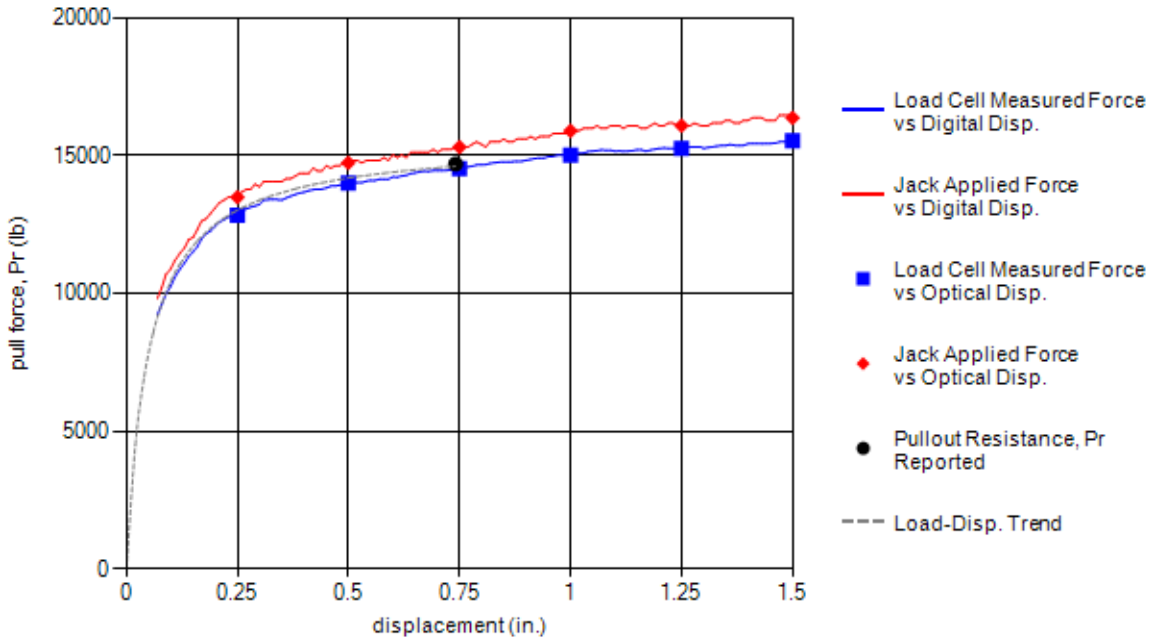
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	117.5	±1.0
Moisture Content, w (%):	6.7	±0.3%
Relative Compaction, C_R (%):	94.4	±0.8%

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	1539	14685	12.3	**2.39**

Load-Displacement Curve

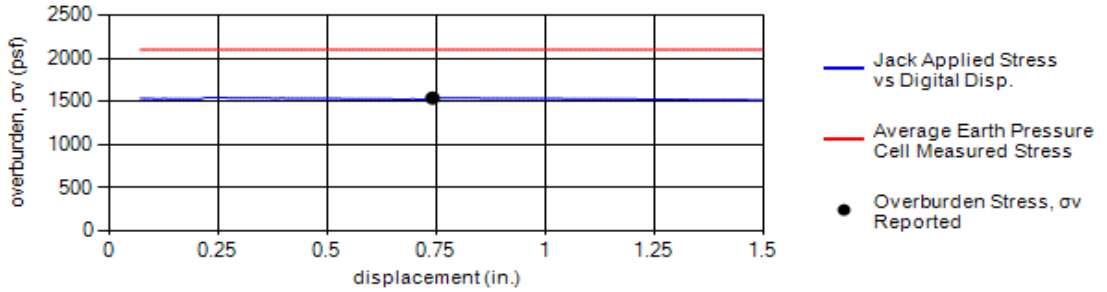


Comments

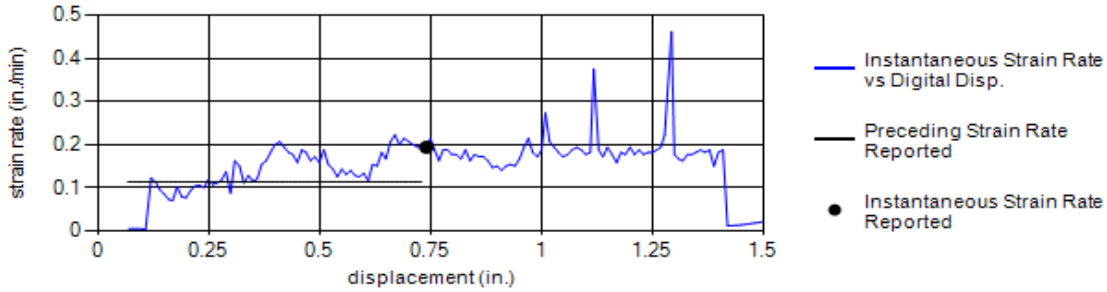
Personnel

Tested:	TW JL MB
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2337	No Data	1635	2328	No Data	2100	3.31	1539



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

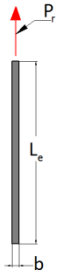
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	11/24/2010 10:16:00 AM
Test Identification:	TS18.16-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 B

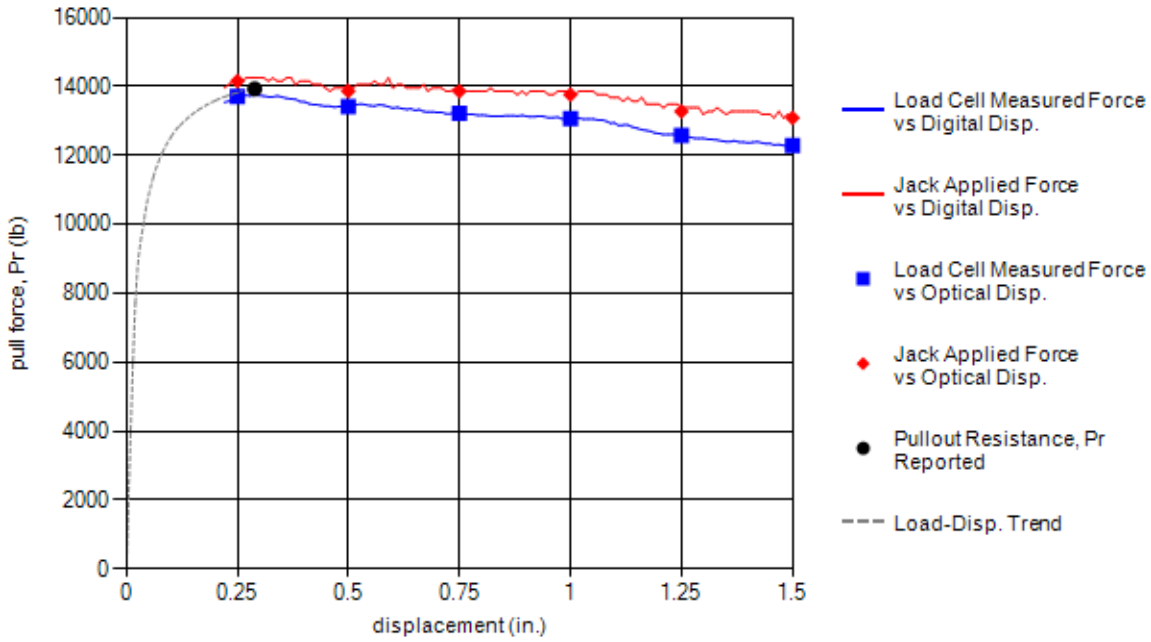
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	117.5	±1.0
Moisture Content, w (%):	6.7	±0.3%
Relative Compaction, C_R (%):	94.4	±0.8%

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	0.29	5112	13928	40.8	**1.36**

Load-Displacement Curve

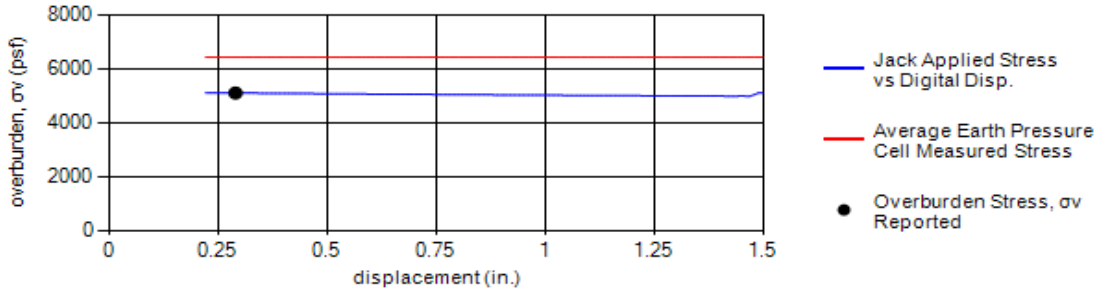


Comments

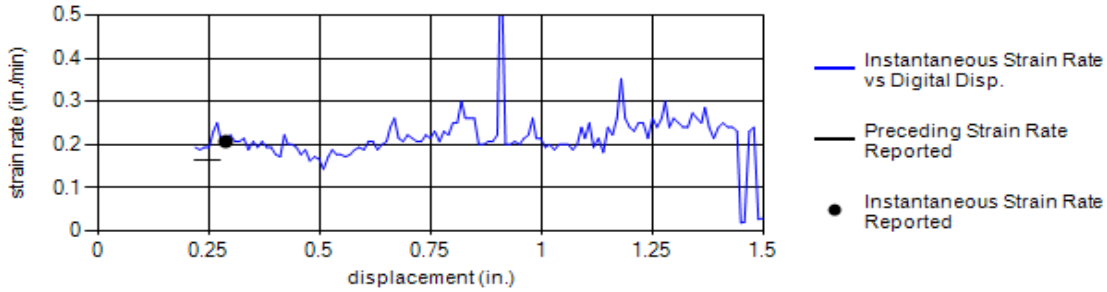
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
7762	No Data	5420	6516	6110	6452	1.02	5112



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.21	0.16	0.18



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

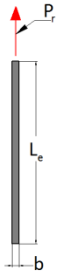
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	11/24/2010 10:57:00 AM
Test Identification:	TS18.17-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 B

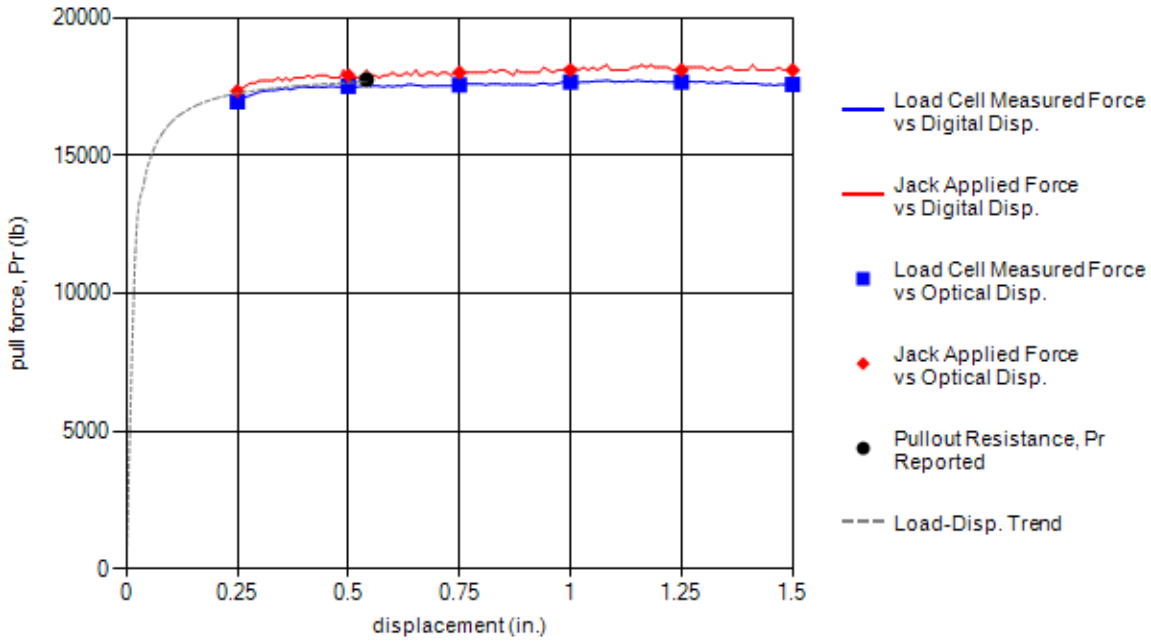
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	117.5	±1.0
Moisture Content, w (%):	6.7	±0.3%
Relative Compaction, C_R (%):	94.4	±0.8%

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	0.54	626	17741	5.0	**7.08**

Load-Displacement Curve

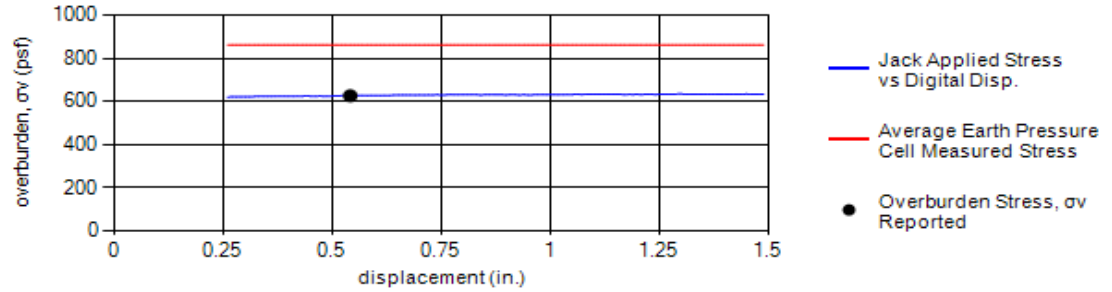


Comments

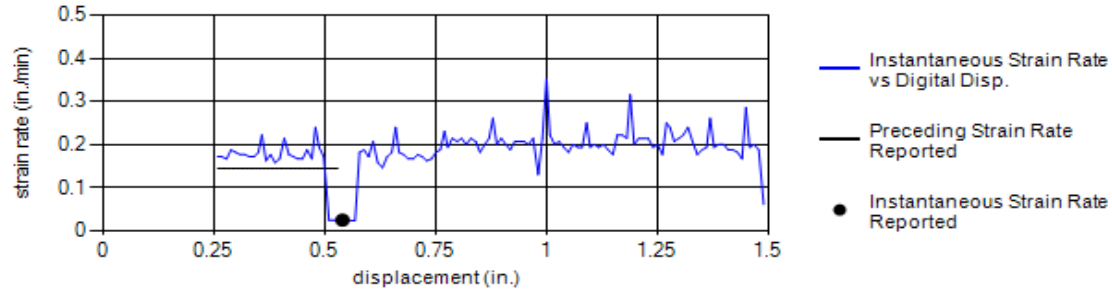
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
965	No Data	686	924	918	863	9.62	626



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.02	0.15	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

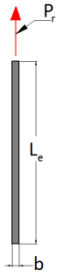
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	11/24/2010 10:43:00 AM
Test Identification:	TS18.18-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 B

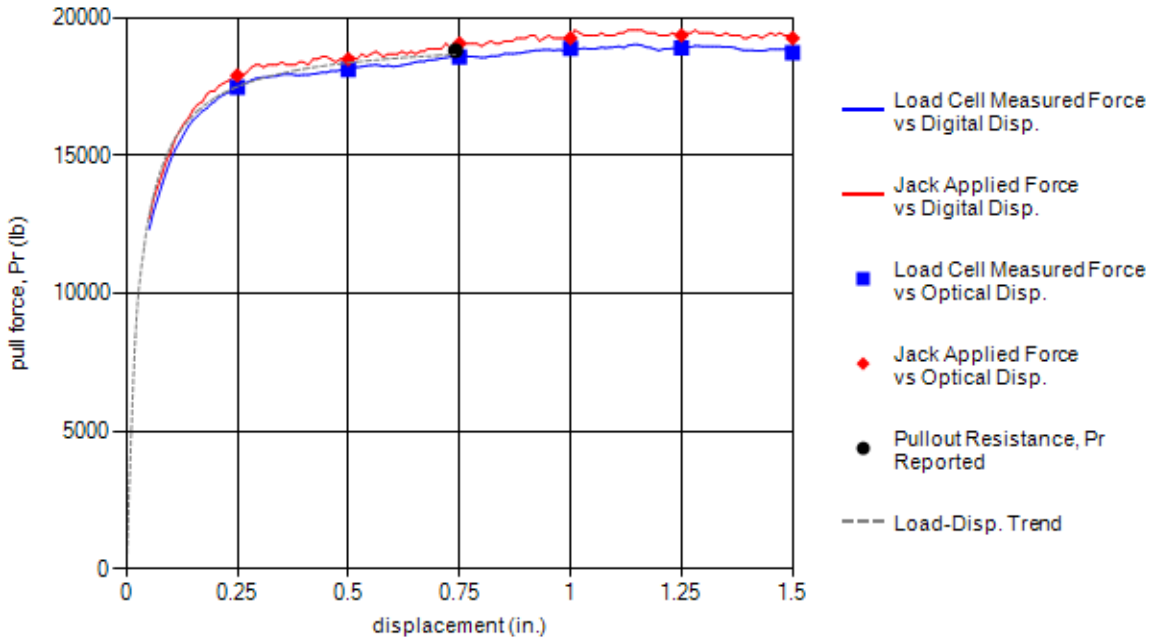
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	117.5	±1.0
Moisture Content, w (%):	6.7	±0.3%
Relative Compaction, C_R (%):	94.4	±0.8%

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	1544	18795	12.3	**3.04**

Load-Displacement Curve

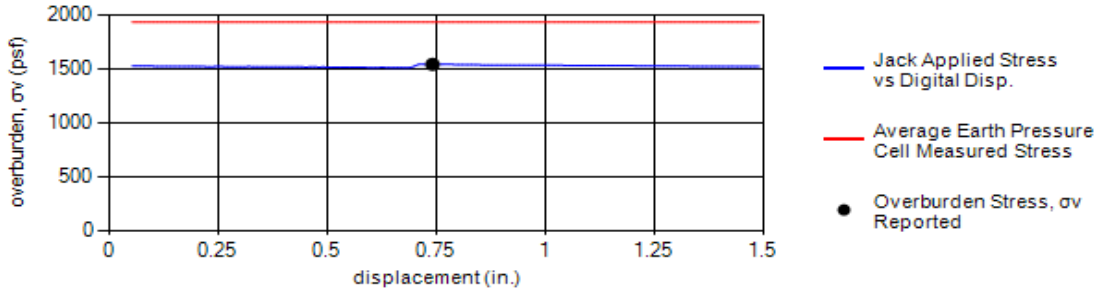


Comments

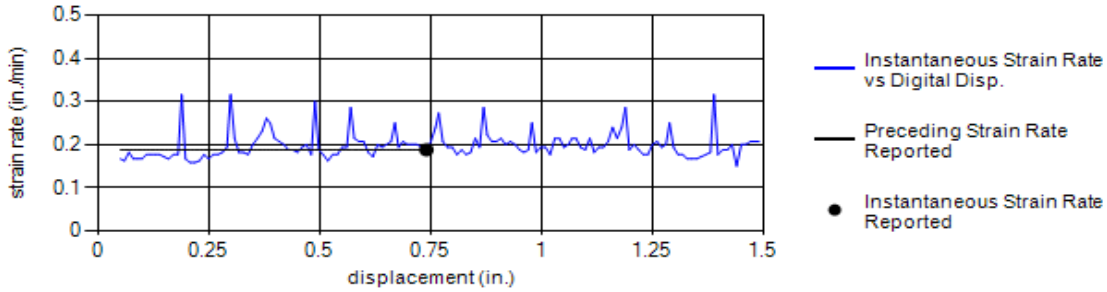
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2227	No Data	1404	2036	2083	1937	3.39	1544



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

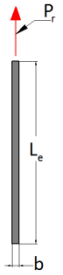
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	11/24/2010 9:55:00 AM
Test Identification:	TS18.19-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 B

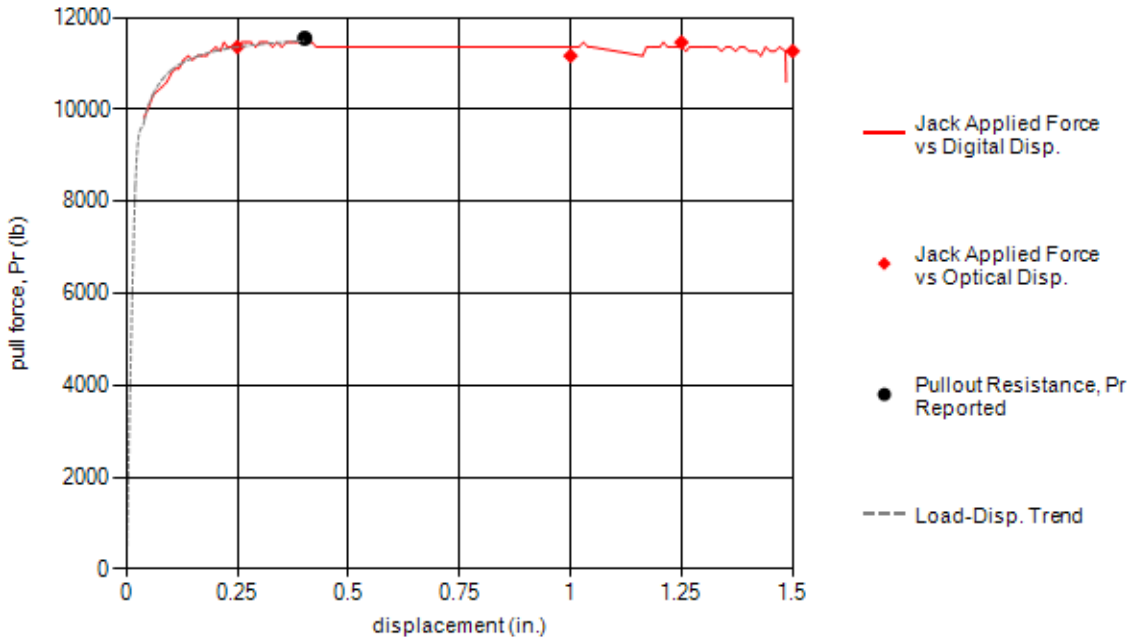
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	117.5	±1.0
Moisture Content, w (%):	6.7	±0.3%
Relative Compaction, C_R (%):	94.4	±0.8%

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	0.40	5043	11546	40.2	**1.14**

Load-Displacement Curve



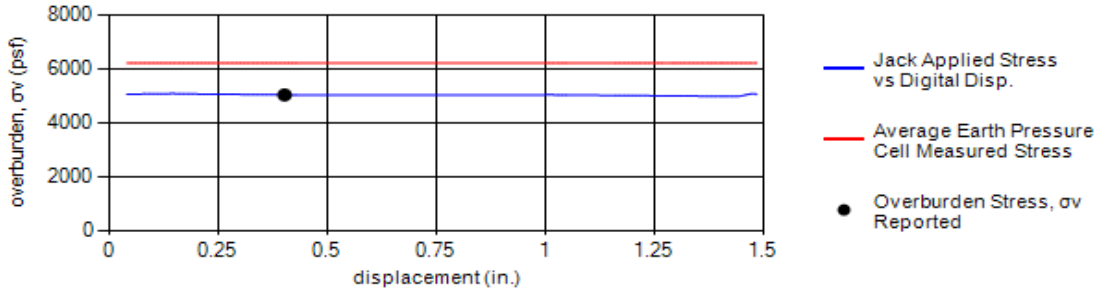
Comments

Load cell error; no load cell data.

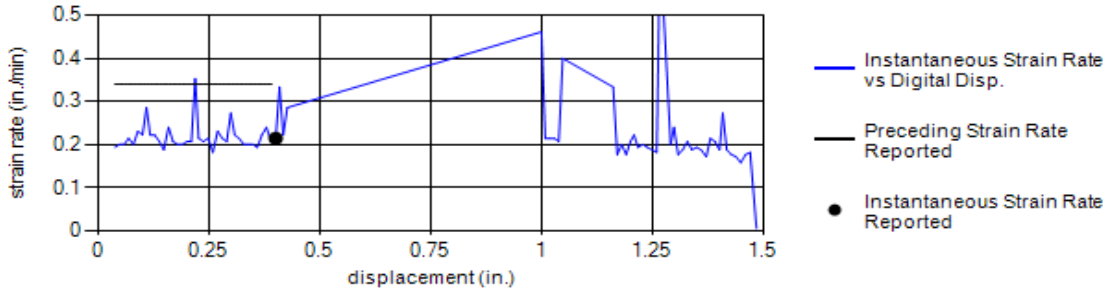
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
7465	No Data	5326	6245	5868	6226	1.06	5043



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.21	0.34	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

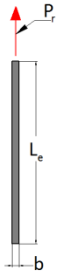
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	11/24/2010 9:19:00 AM
Test Identification:	TS18.20-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 B

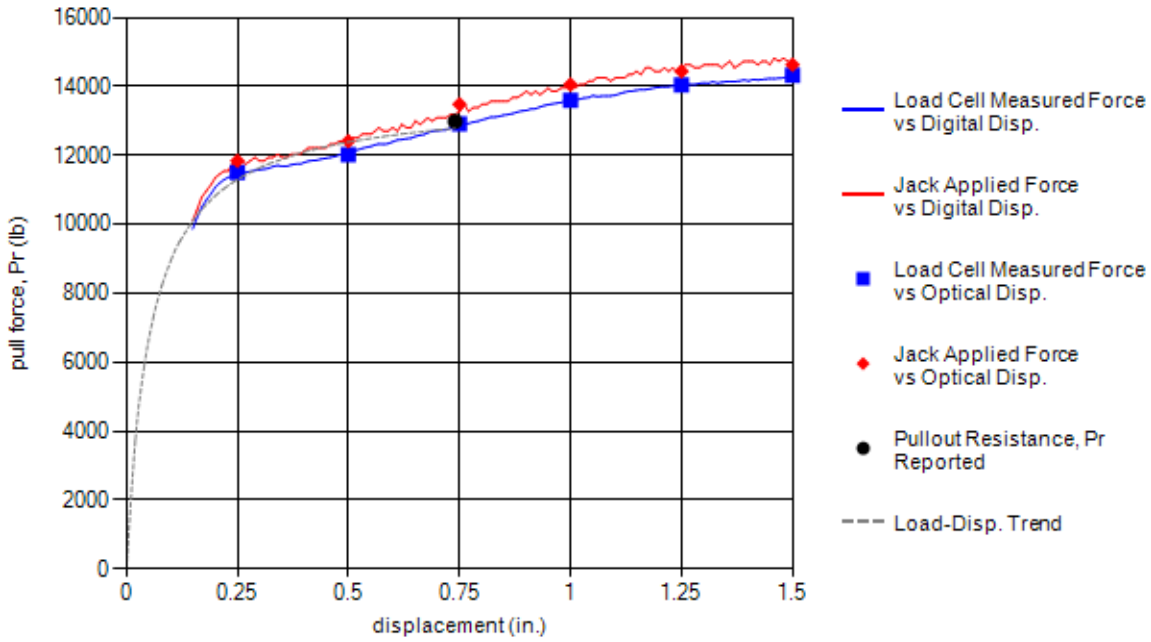
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	117.5	±1.0
Moisture Content, w (%):	6.7	±0.3%
Relative Compaction, C_R (%):	94.4	±0.8%

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	636	12985	5.1	**5.10**

Load-Displacement Curve

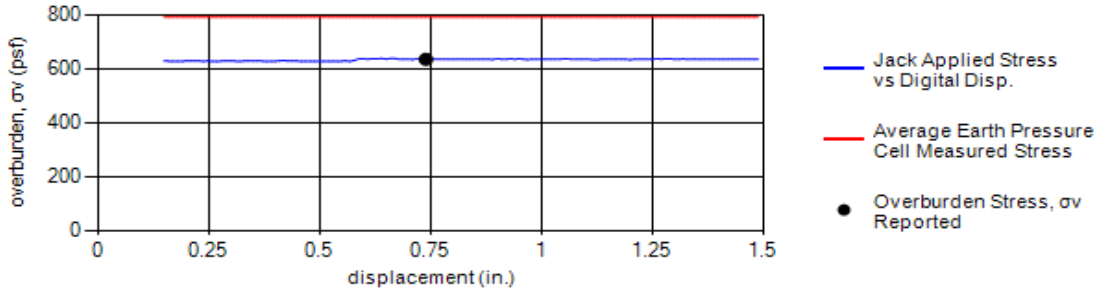


Comments

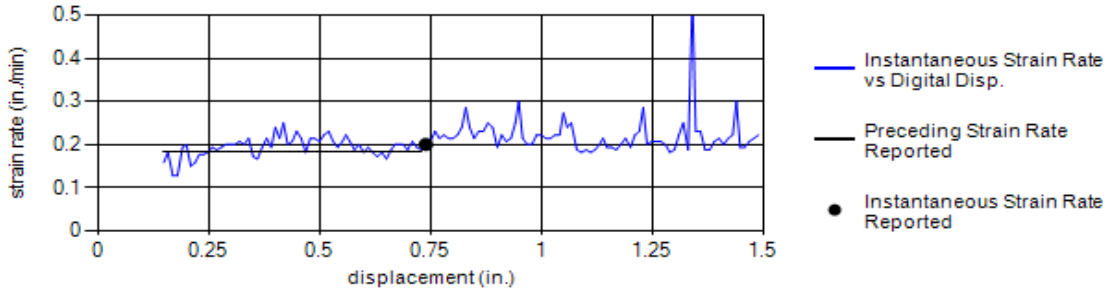
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
912	No Data	598	829	831	793	8.39	636



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

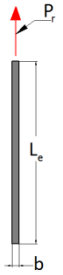
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	11/24/2010 9:33:00 AM
Test Identification:	TS18.21-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 B

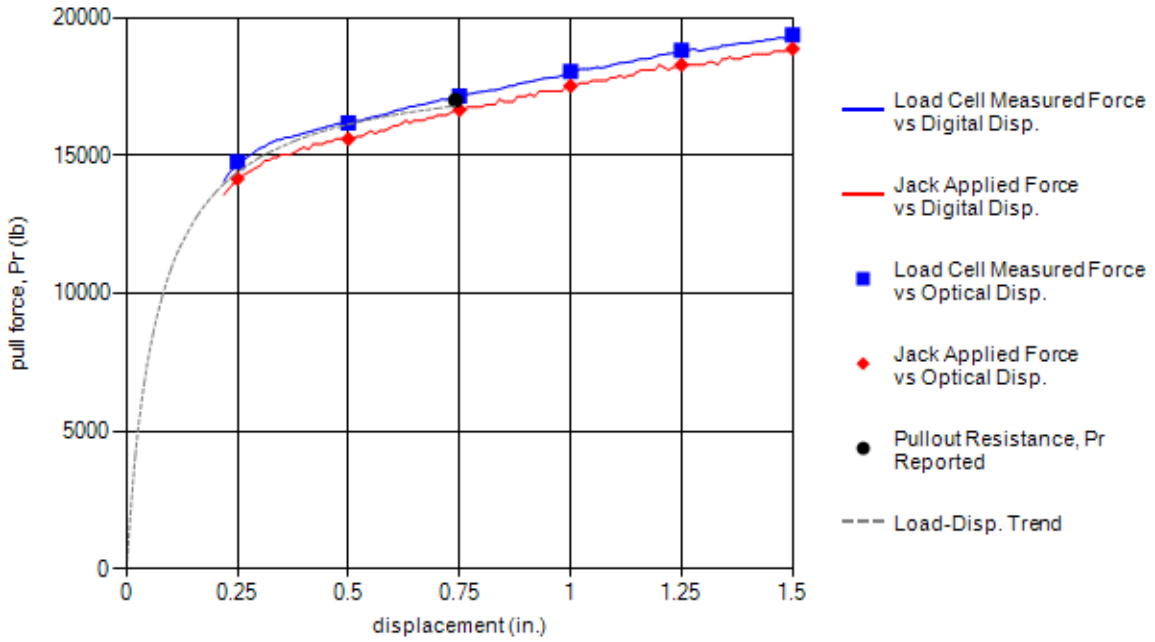
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	117.5	±1.0
Moisture Content, w (%):	6.7	±0.3%
Relative Compaction, C_R (%):	94.4	±0.8%

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	1523	16996	12.1	**2.79**

Load-Displacement Curve

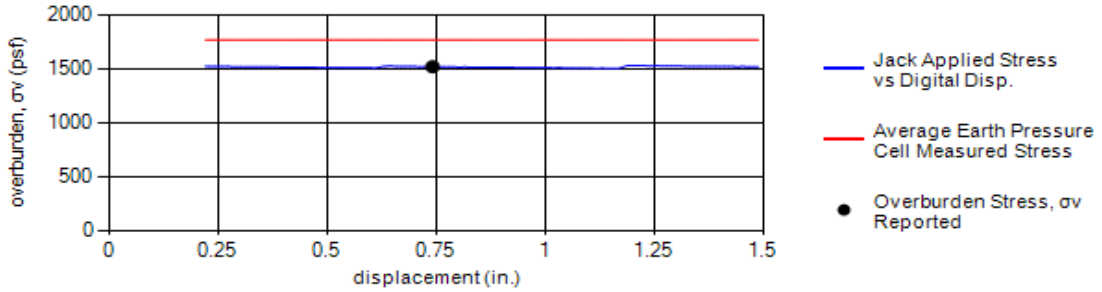


Comments

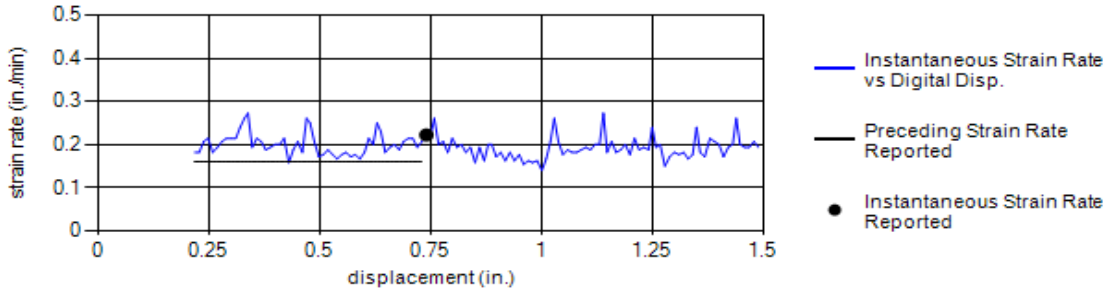
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2095	No Data	1483	1791	1695	1771	3.51	1523



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.22	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

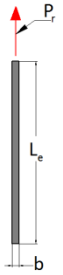
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	12/21/2010 4:06:00 PM
Test Identification:	TS19.13-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 B

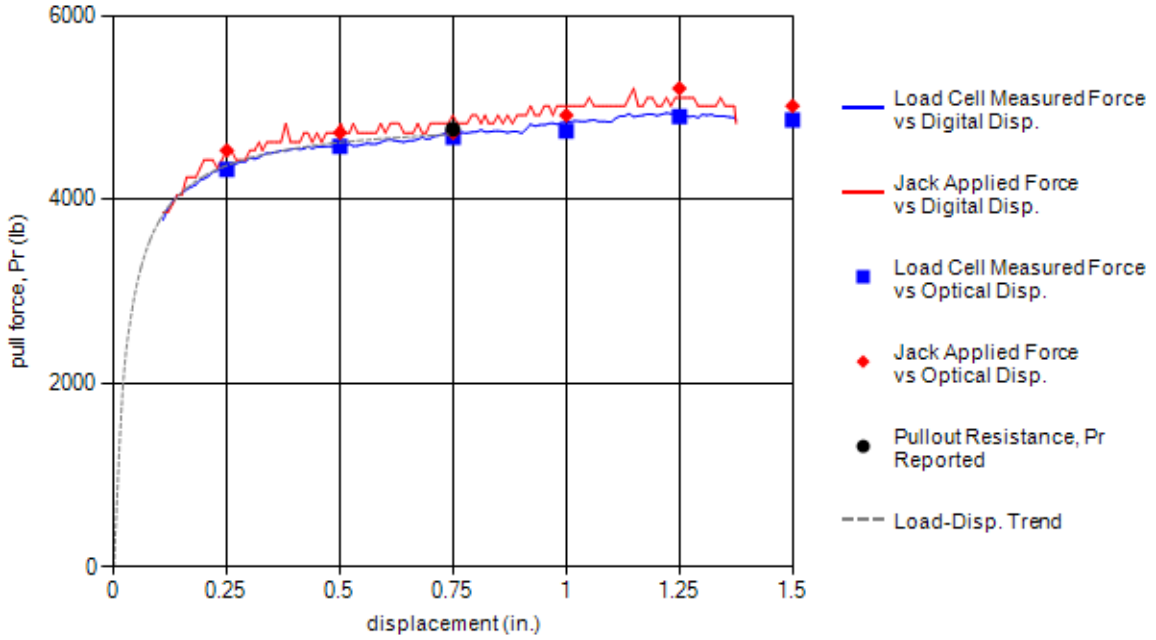
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	117.5	±1.0
Moisture Content, w (%):	6.7	±0.3%
Relative Compaction, C_R (%):	94.4	±0.8%

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	2502	4762	20.0	**1.43**

Load-Displacement Curve

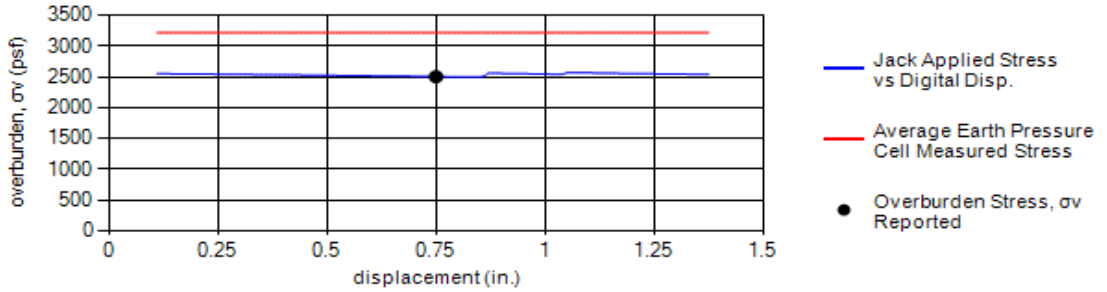


Comments

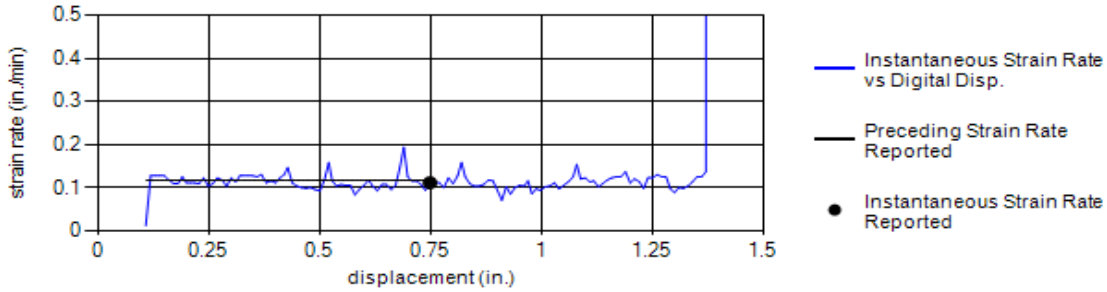
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3863	No Data	2679	3109	No Data	3217	2.06	2502



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

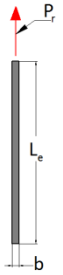
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	12/21/2010 3:44:00 PM
Test Identification:	TS19.14-S-L8-Z40-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 B

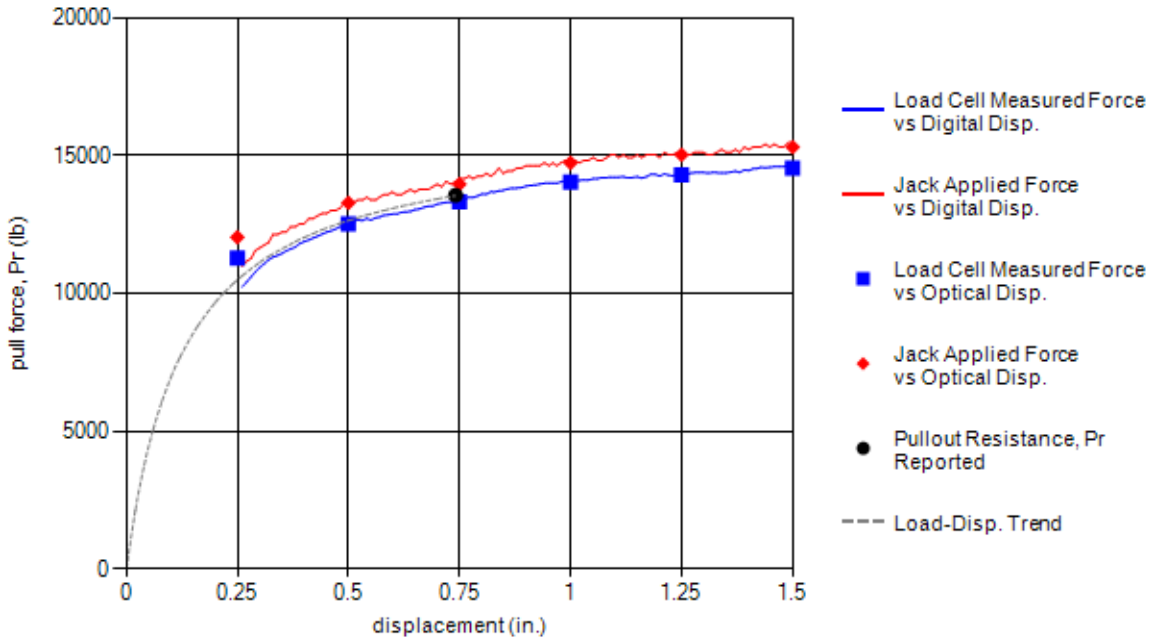
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	117.5	±1.0
Moisture Content, w (%):	6.7	±0.3%
Relative Compaction, C_R (%):	94.4	±0.8%

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	5016	13551	40.0	**1.01**

Load-Displacement Curve

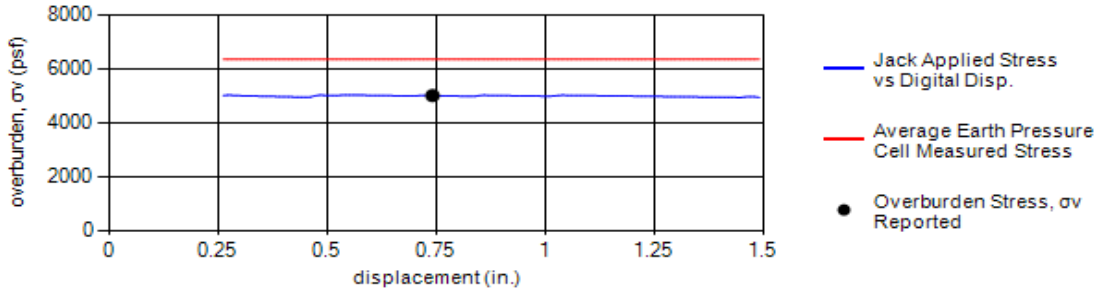


Comments

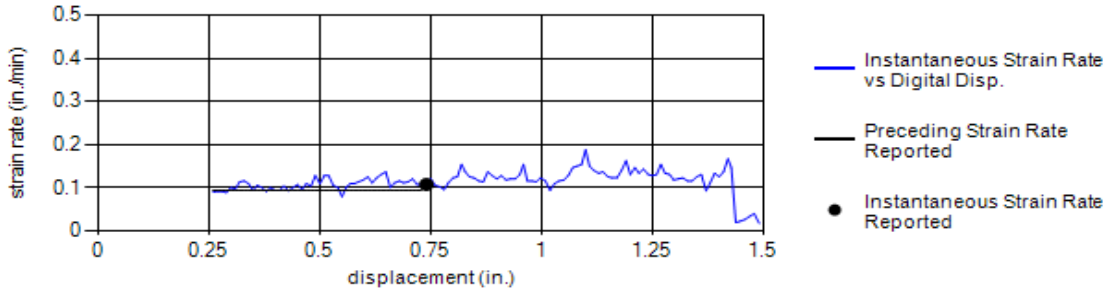
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
7359	No Data	5620	6098	No Data	6359	1.04	5016



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

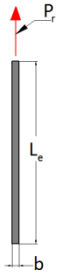
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	12/21/2010 3:11:00 PM
Test Identification:	TS19.15-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 B

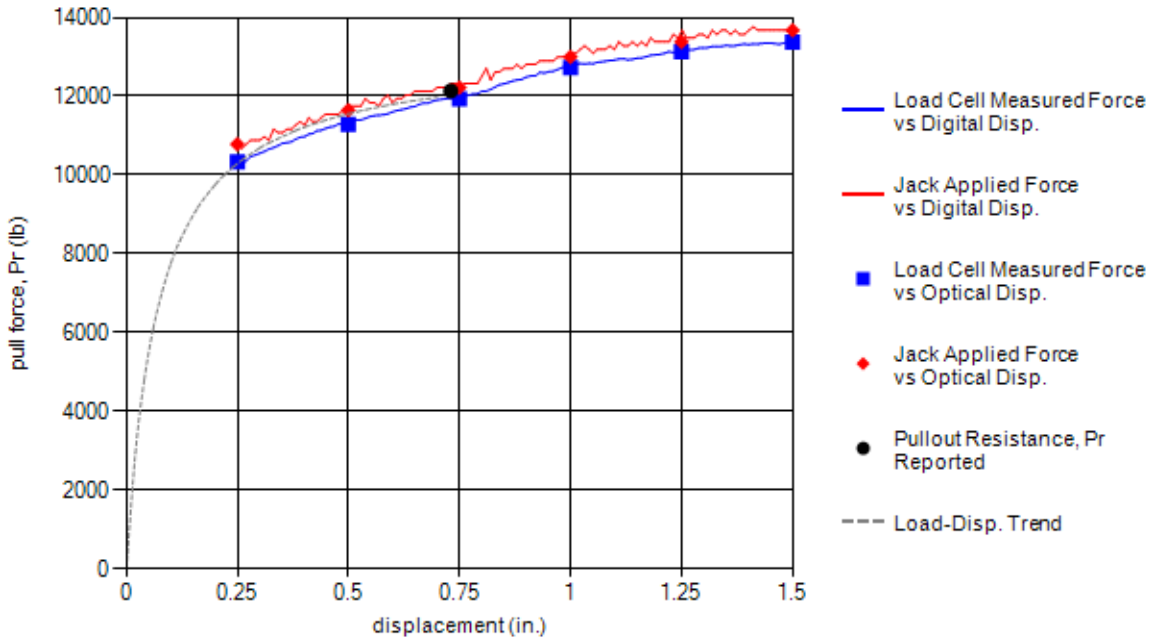
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	117.5	±1.0
Moisture Content, w (%):	6.7	±0.3%
Relative Compaction, C_R (%):	94.4	±0.8%

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	2530	12136	20.2	**1.20**

Load-Displacement Curve

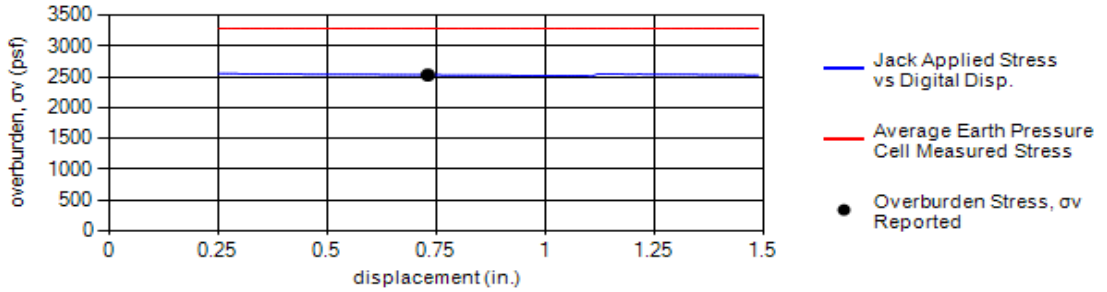


Comments

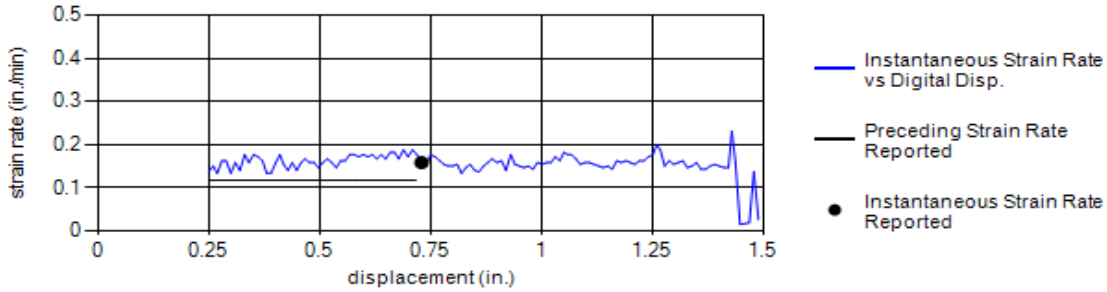
Personnel

Tested:	TW SH YW
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3724	No Data	2974	3157	No Data	3285	1.21	2530



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

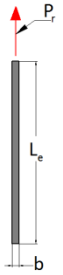
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	12/22/2010 12:41:00 PM
Test Identification:	TS19.16-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 B

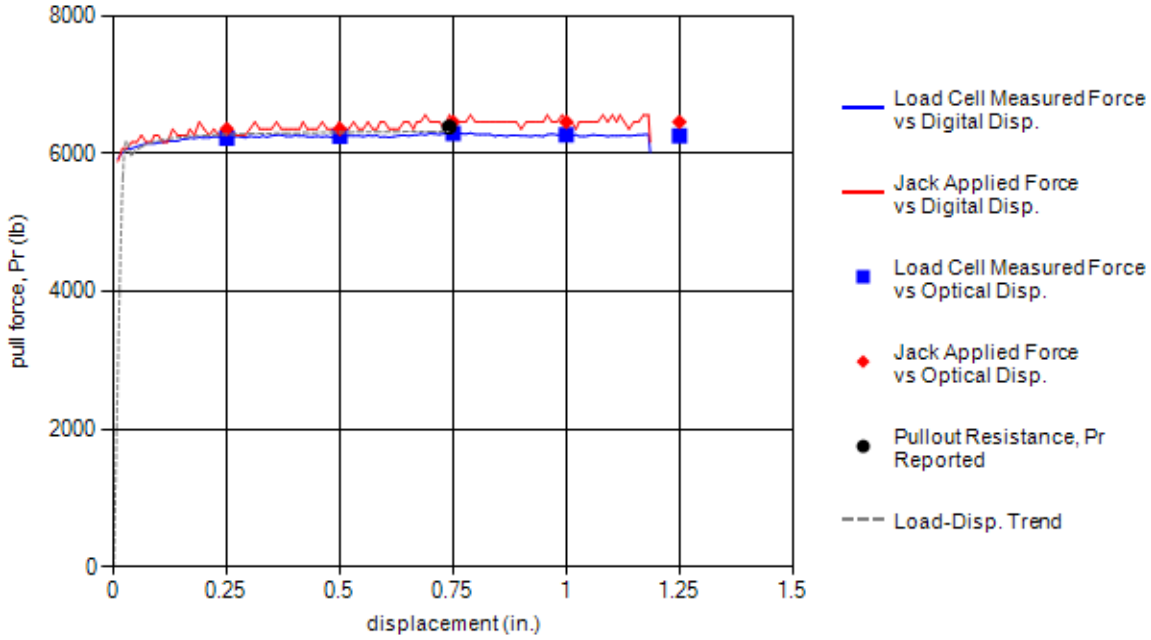
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	117.5	±1.0
Moisture Content, w (%):	6.7	±0.3%
Relative Compaction, C_R (%):	94.4	±0.8%

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	2545	6382	20.3	**1.88**

Load-Displacement Curve

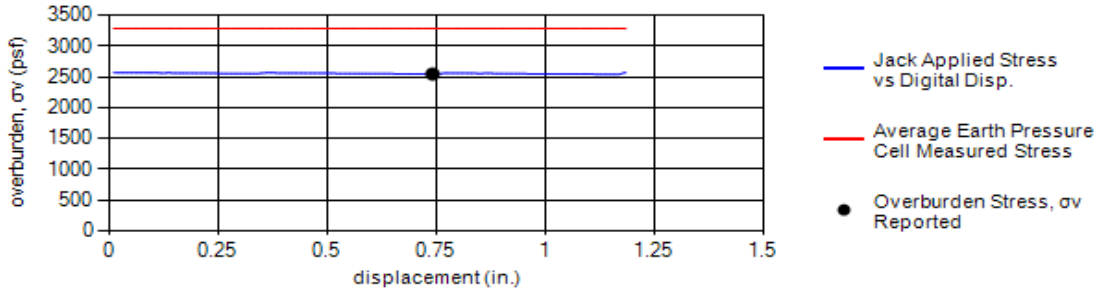


Comments

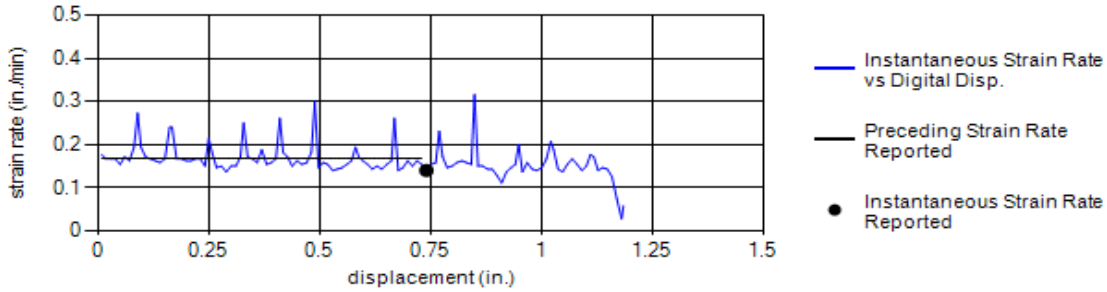
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3941	No Data	2869	3409	2924	3286	2.02	2545



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

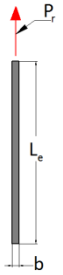
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	12/22/2010 12:02:00 PM
Test Identification:	TS19.17-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 B

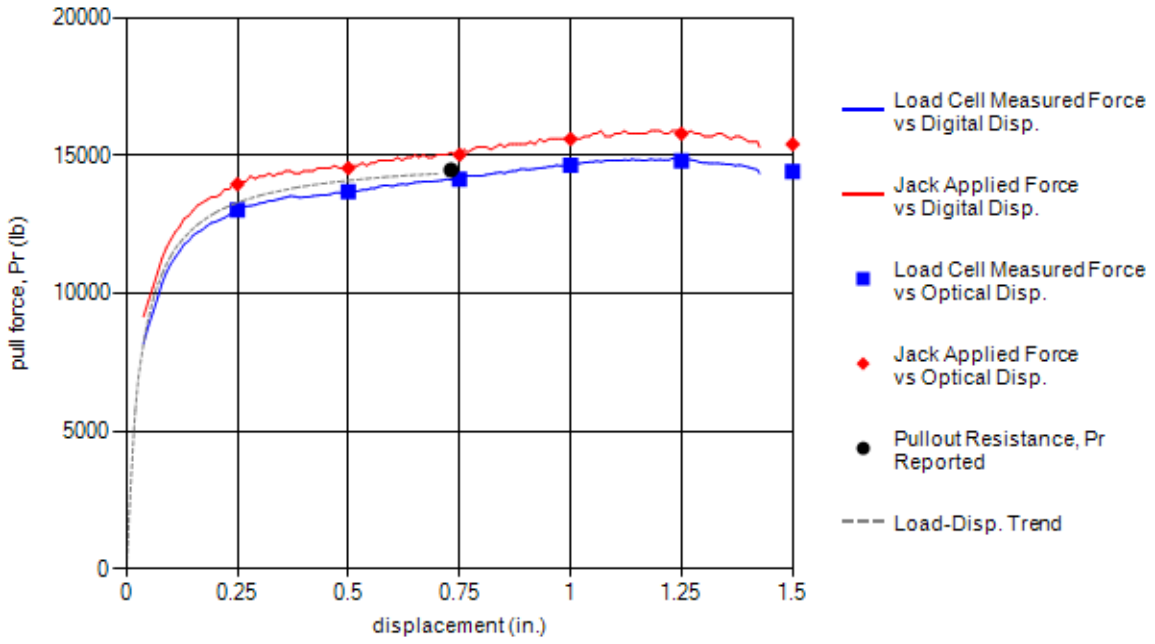
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	117.5	±1.0
Moisture Content, w (%):	6.7	±0.3%
Relative Compaction, C_R (%):	94.4	±0.8%

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	5083	14469	40.5	**1.07**

Load-Displacement Curve

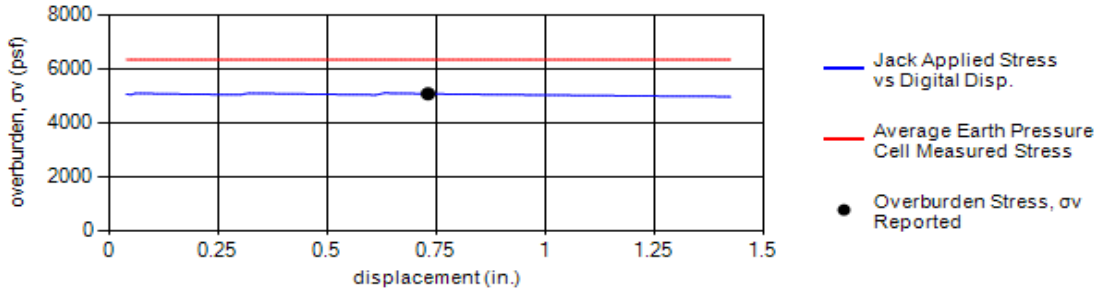


Comments

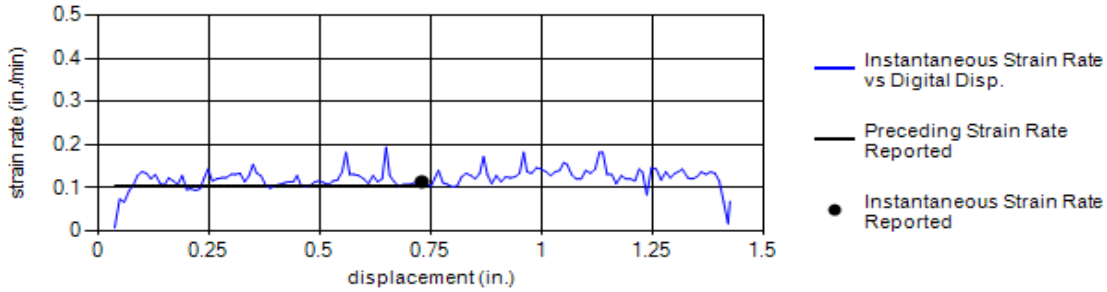
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
7504	No Data	6030	6528	5360	6355	1.01	5083



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

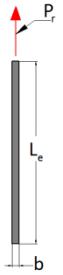
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	12/22/2010 12:22:00 PM
Test Identification:	TS19.18-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 B

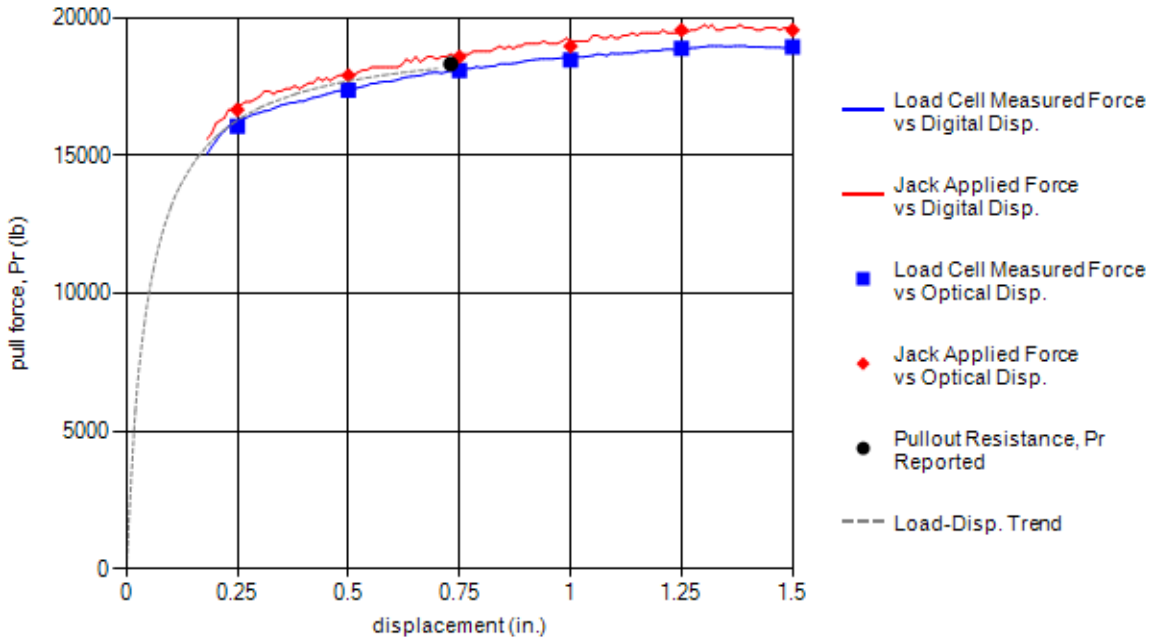
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	117.5	±1.0
Moisture Content, w (%):	6.7	±0.3%
Relative Compaction, C_R (%):	94.4	±0.8%

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	2545	18313	20.3	**1.80**

Load-Displacement Curve

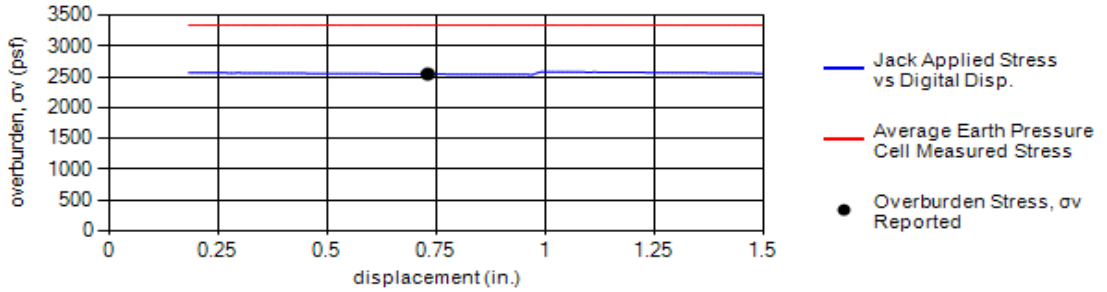


Comments

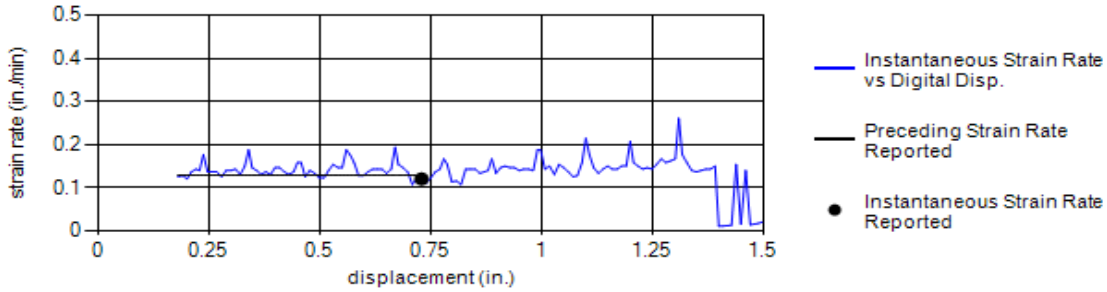
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3948	No Data	2868	3351	3189	3339	2.02	2545



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

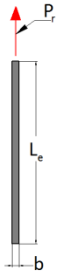
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	12/21/2010 4:28:00 PM
Test Identification:	TS19.19-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 B

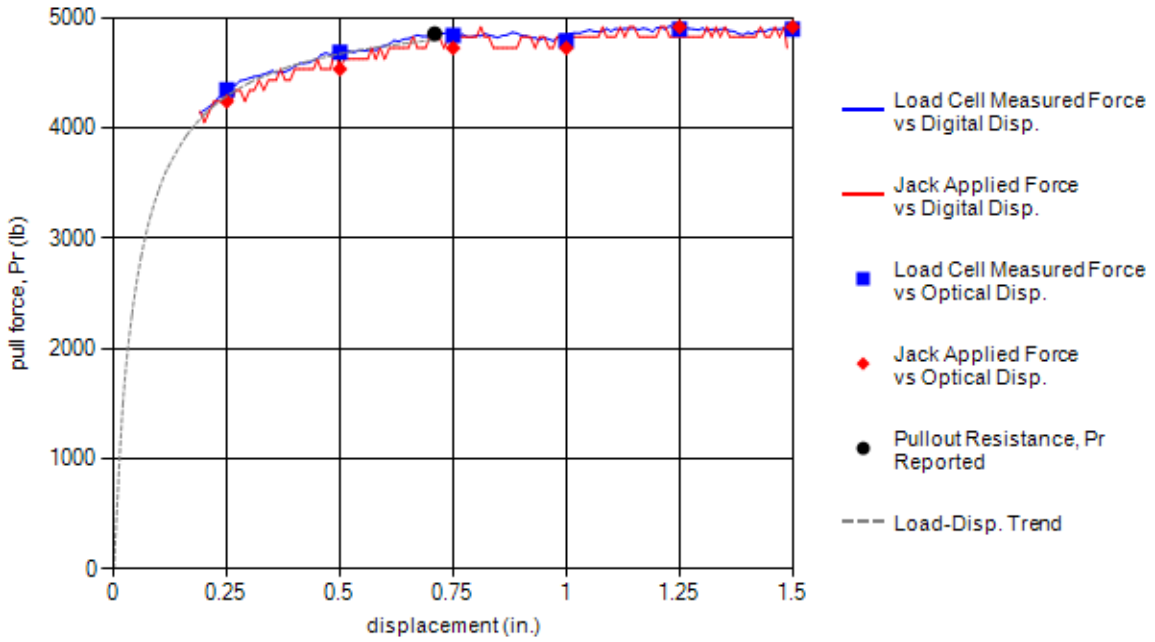
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	117.5	±1.0
Moisture Content, w (%):	6.7	±0.3%
Relative Compaction, C_R (%):	94.4	±0.8%

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	2534	4852	20.2	**1.44**

Load-Displacement Curve

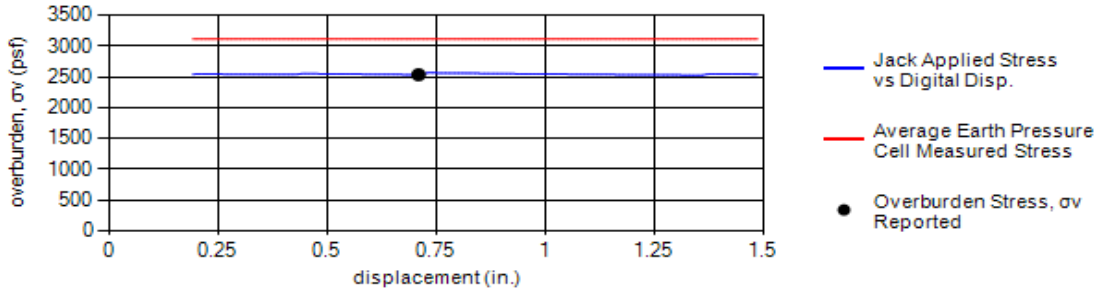


Comments

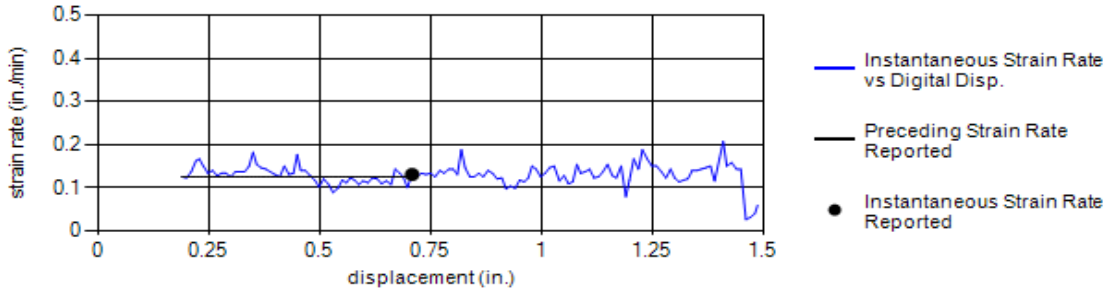
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3751	No Data	2616	3210	2870	3112	2.08	2534



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

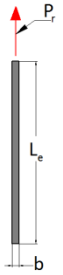
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	12/22/2010 11:41:00 AM
Test Identification:	TS19.20-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 B

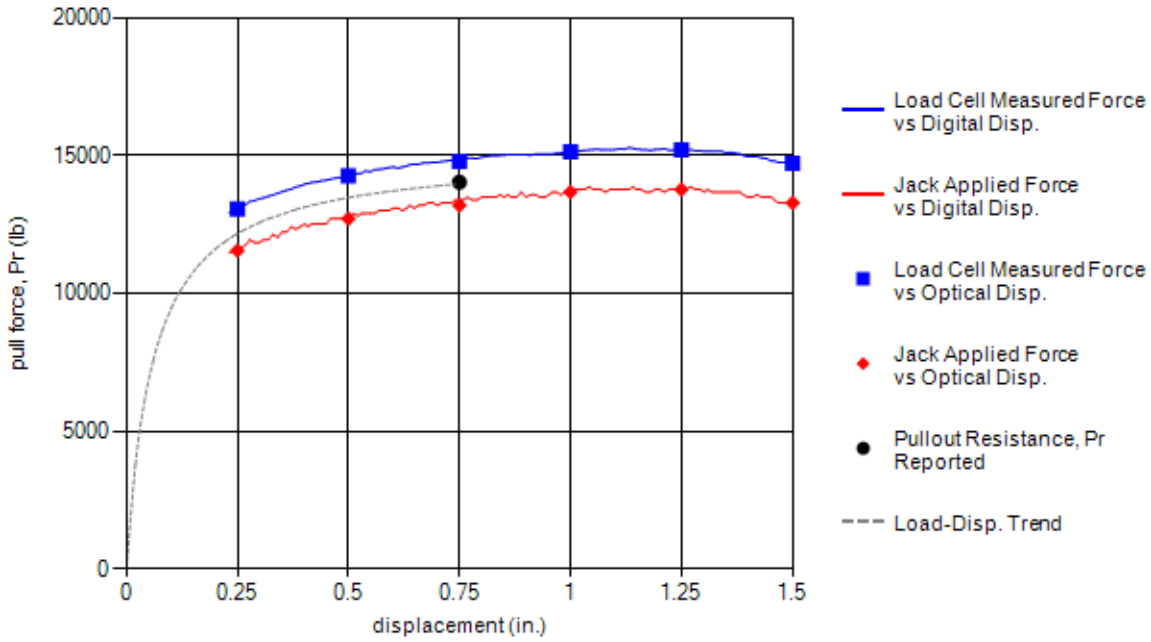
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	117.5	±1.0
Moisture Content, w (%):	6.7	±0.3%
Relative Compaction, C_R (%):	94.4	±0.8%

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	5046	14029	40.2	**1.04**

Load-Displacement Curve

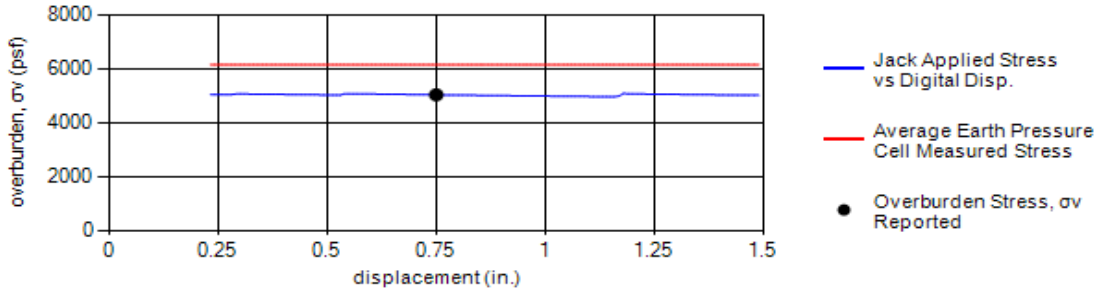


Comments

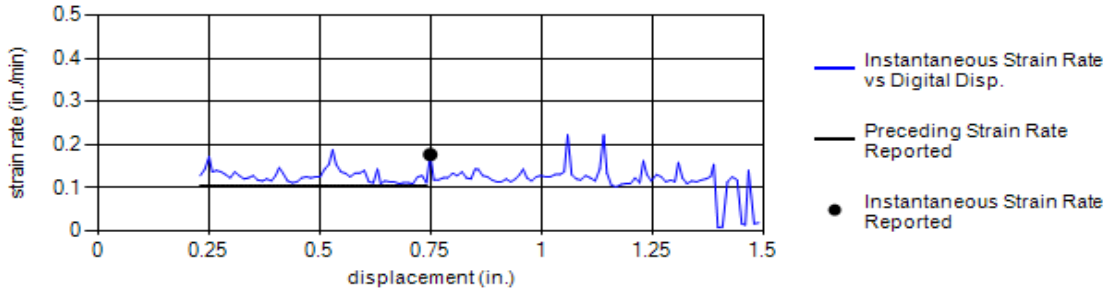
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
7285	No Data	5843	6347	5201	6169	1.04	5046



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

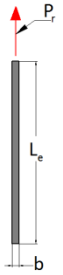
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	12/21/2010 4:49:00 PM
Test Identification:	TS19.21-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 B

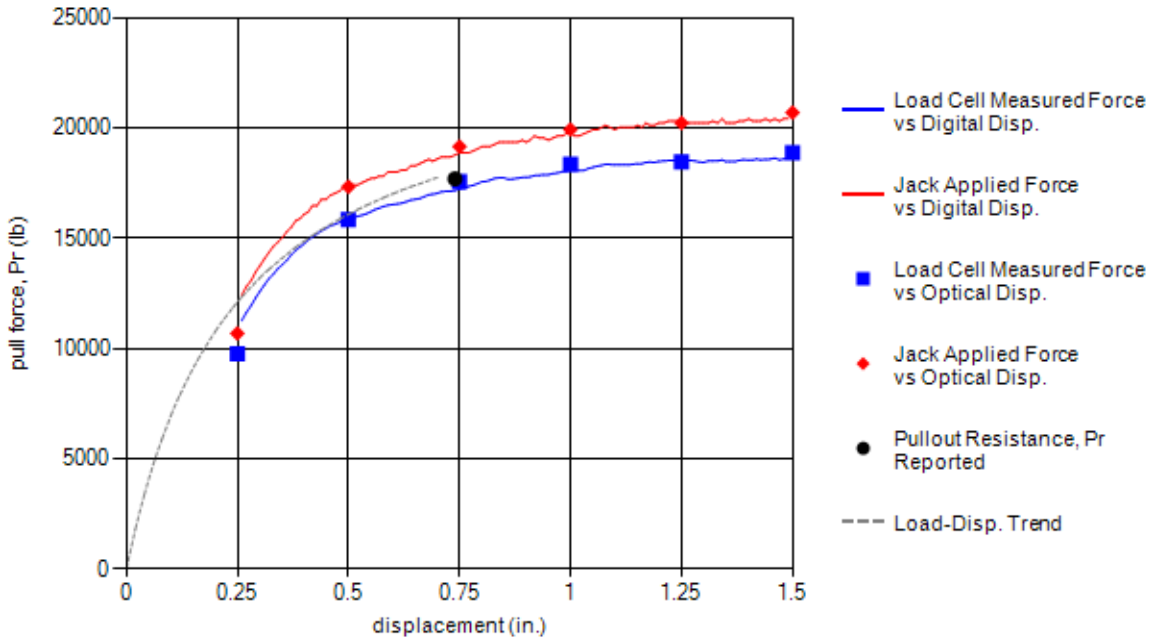
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	117.5	±1.0
Moisture Content, w (%):	6.7	±0.3%
Relative Compaction, C_R (%):	94.4	±0.8%

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	2557	17685	20.4	**1.73**

Load-Displacement Curve

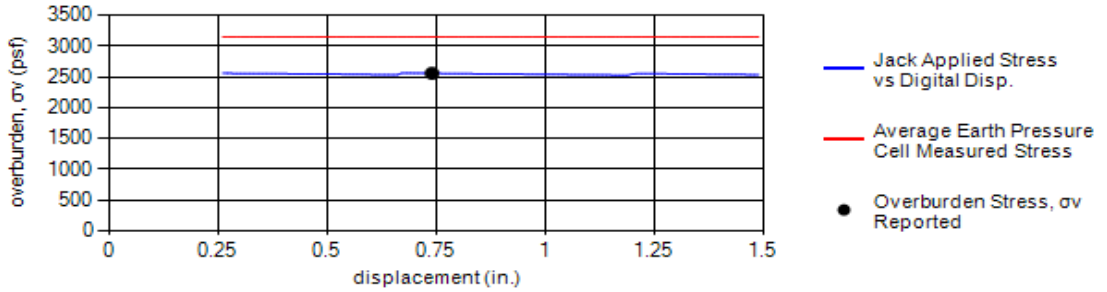


Comments

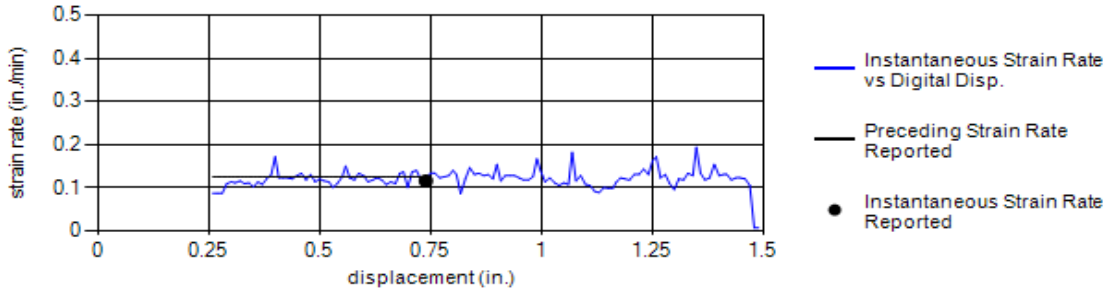
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3716	No Data	2585	3328	2885	3147	2.06	2557



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

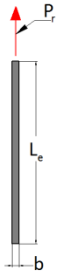
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/7/2011 10:42:00 AM
Test Identification:	TS20.13-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 B

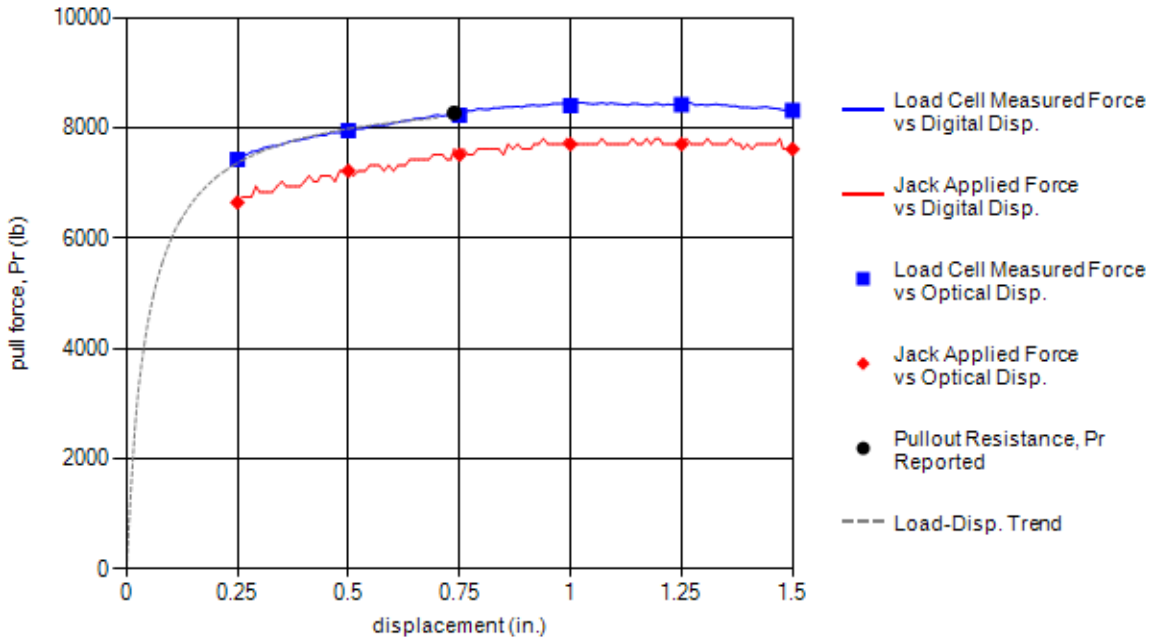
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	116.1	±0.8
Moisture Content, w (%):	8.9	±0.3%
Relative Compaction, C_R (%):	93.3	±0.6%

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	632	8266	5.0	**4.90**

Load-Displacement Curve

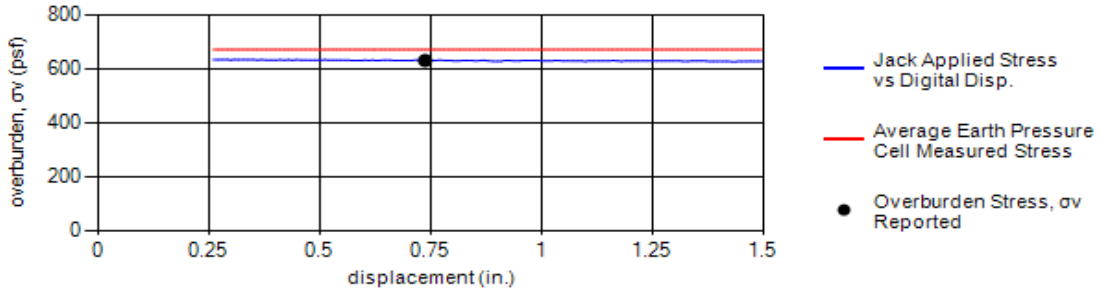


Comments

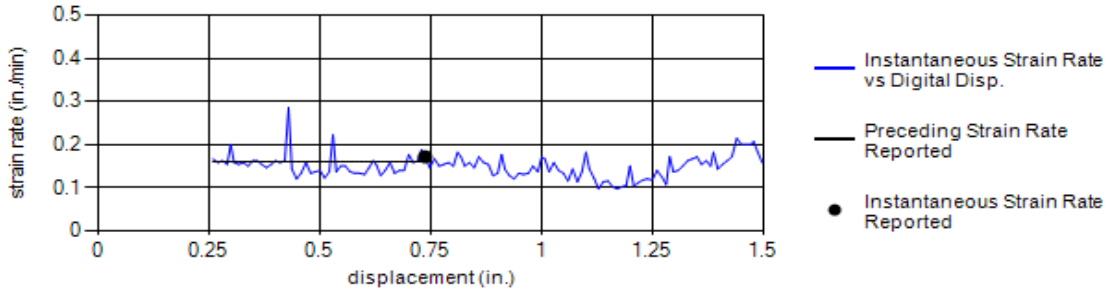
Personnel

Tested:	AS YW DH
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
745	No Data	568	706	No Data	673	2.60	632



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

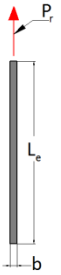
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/7/2011 10:54:00 AM
Test Identification:	TS20.14-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 B

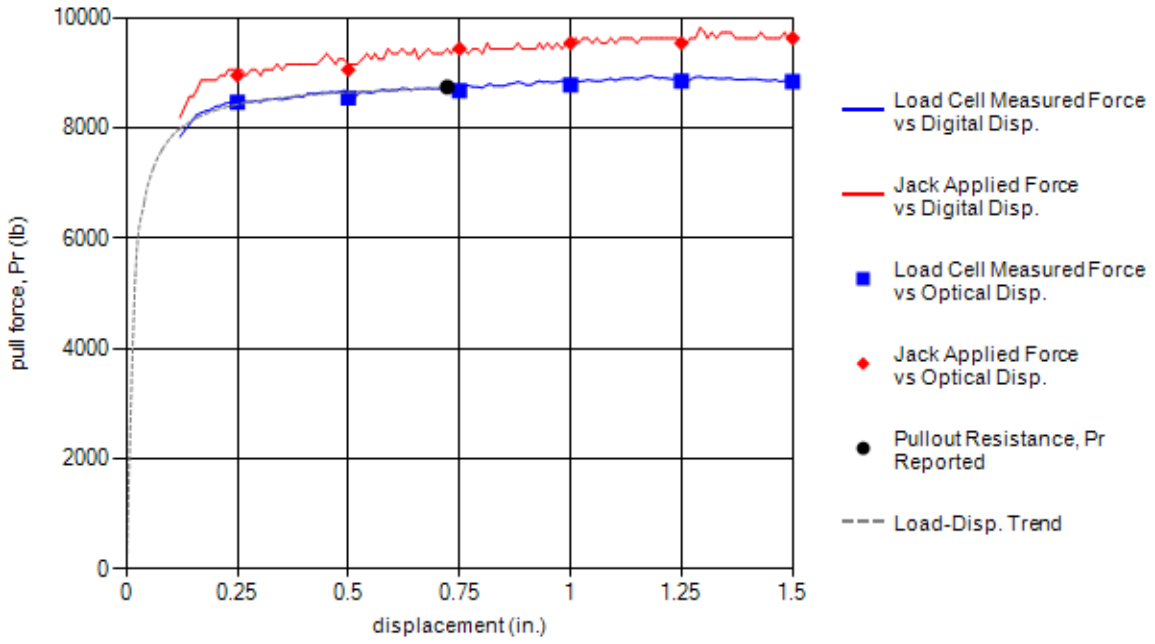
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	116.1	±0.8
Moisture Content, w (%):	8.9	±0.3%
Relative Compaction, C_R (%):	93.3	±0.6%

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	0.72	1520	8738	12.0	**2.16**

Load-Displacement Curve

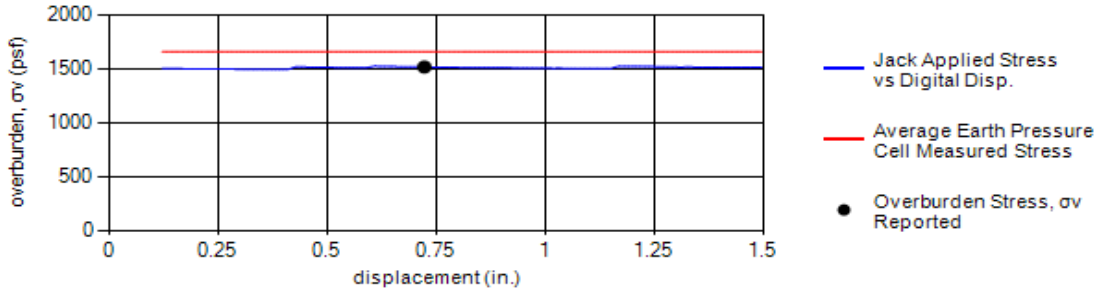


Comments

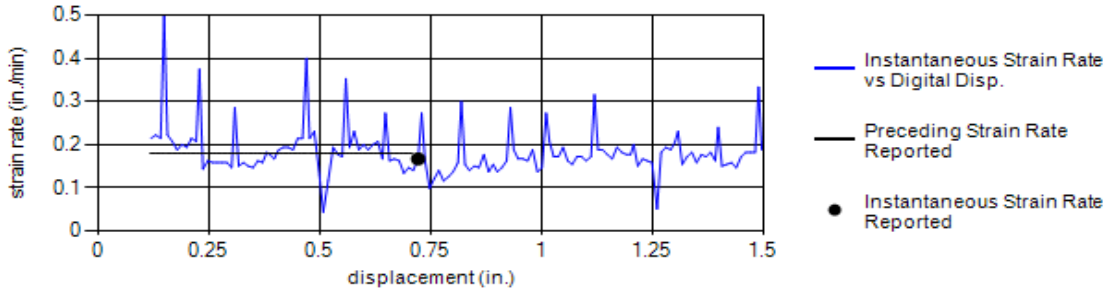
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1748	No Data	1676	1563	No Data	1662	1.06	1519



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.17	0.18	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

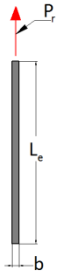
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/7/2011 11:20:00 AM
Test Identification:	TS20.15-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 B

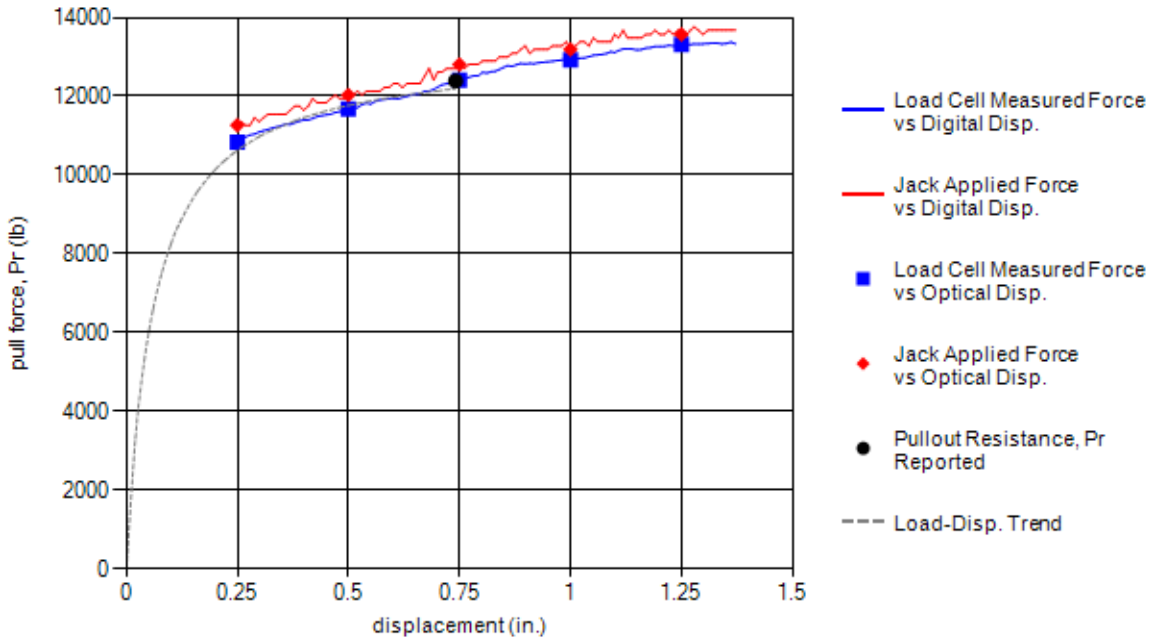
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	116.1	±0.8
Moisture Content, w (%):	8.9	±0.3%
Relative Compaction, C_R (%):	93.3	±0.6%

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	2649	12390	21.0	**1.75**

Load-Displacement Curve

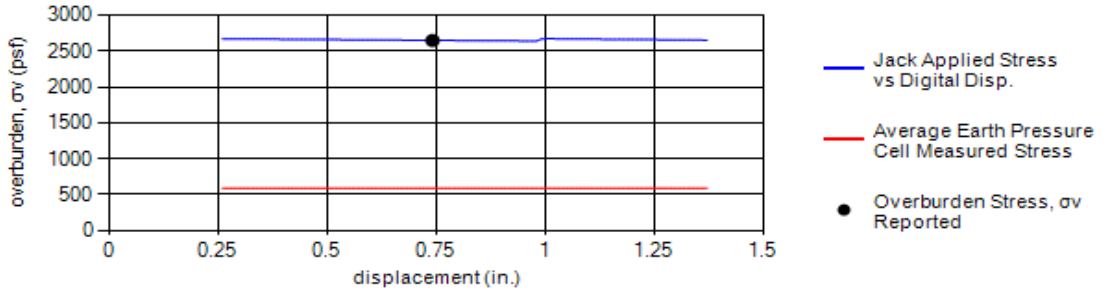


Comments

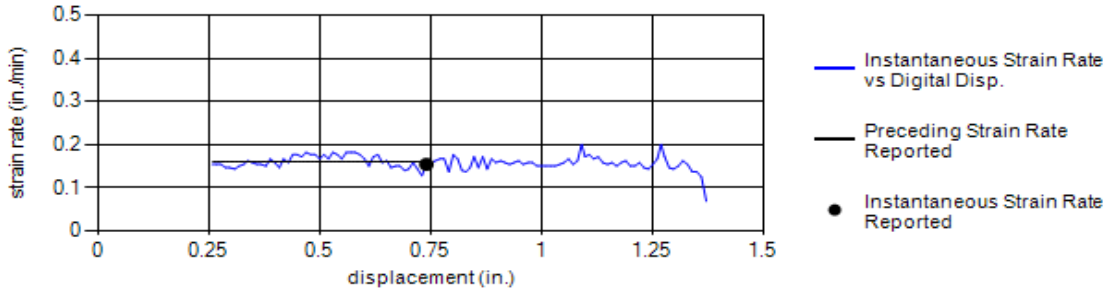
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
665	No Data	512	597	No Data	591	3.14	2651



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.15	0.16	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

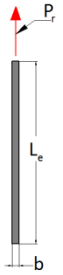
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/7/2011 11:09:00 AM
Test Identification:	TS20.16-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 B

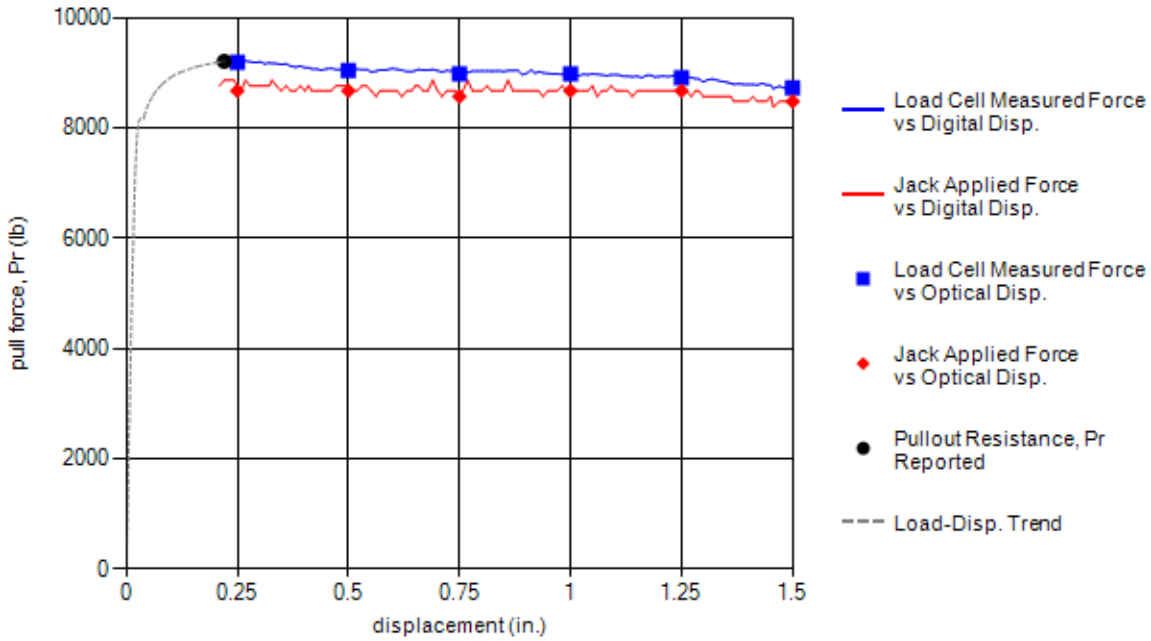
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	116.1	±0.8
Moisture Content, w (%):	8.9	±0.3%
Relative Compaction, C_R (%):	93.3	±0.6%

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	0.22	1542	9204	12.2	**2.24**

Load-Displacement Curve

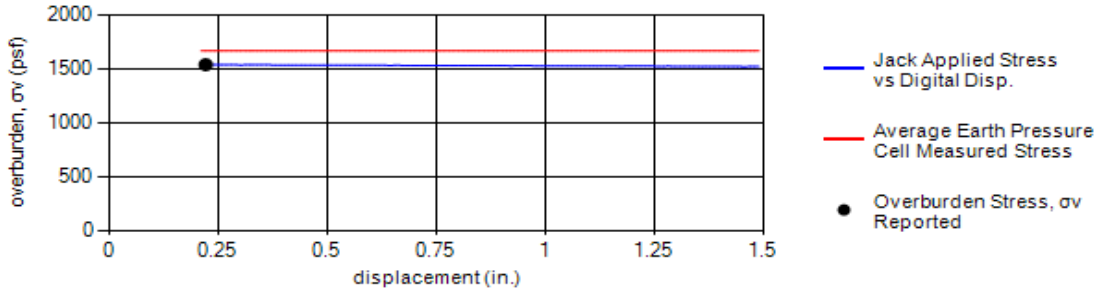


Comments

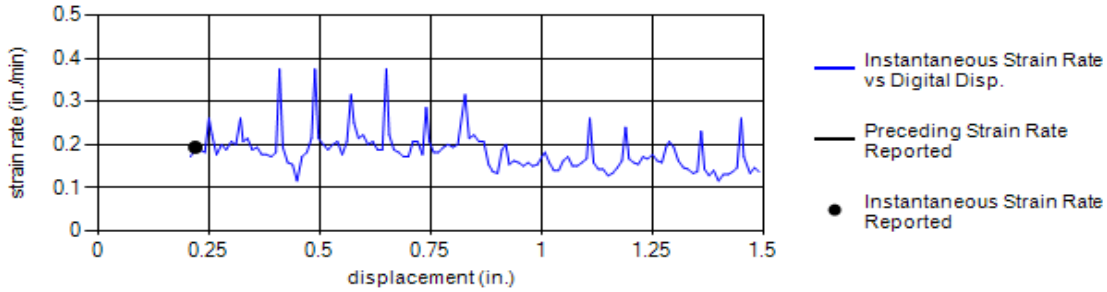
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1788	No Data	1643	1574	No Data	1668	1.11	1541



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

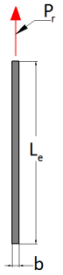
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/7/2011 10:26:00 AM
Test Identification:	TS20.17-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 B

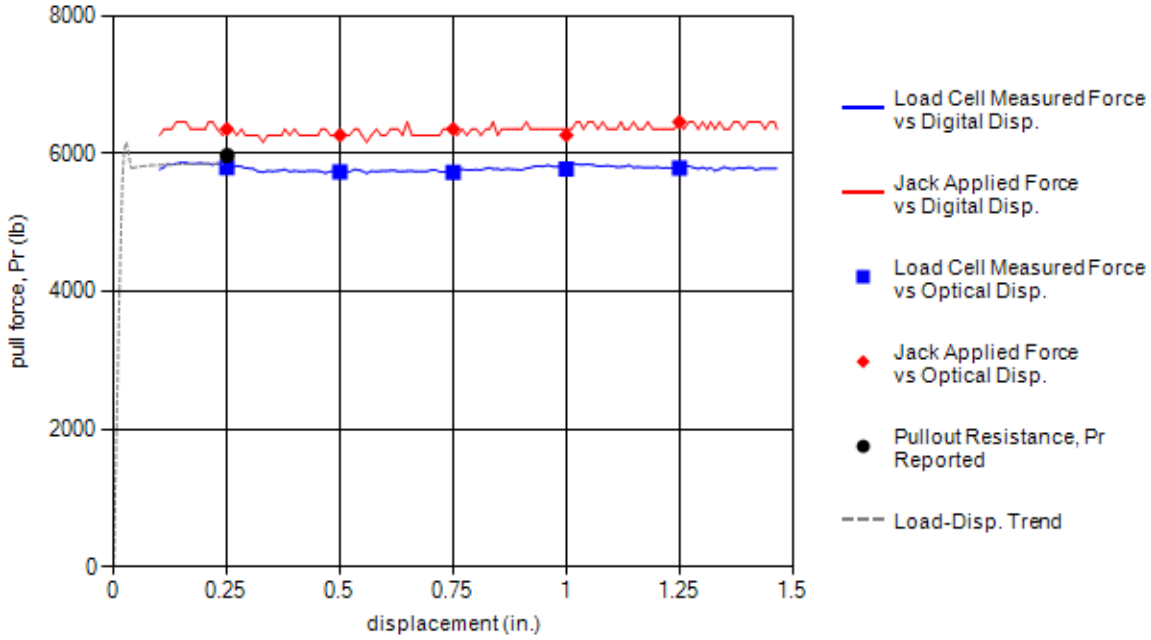
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	116.1	±0.8
Moisture Content, w (%):	8.9	±0.3%
Relative Compaction, C_R (%):	93.3	±0.6%

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	0.25	637	5968	5.0	**3.51**

Load-Displacement Curve

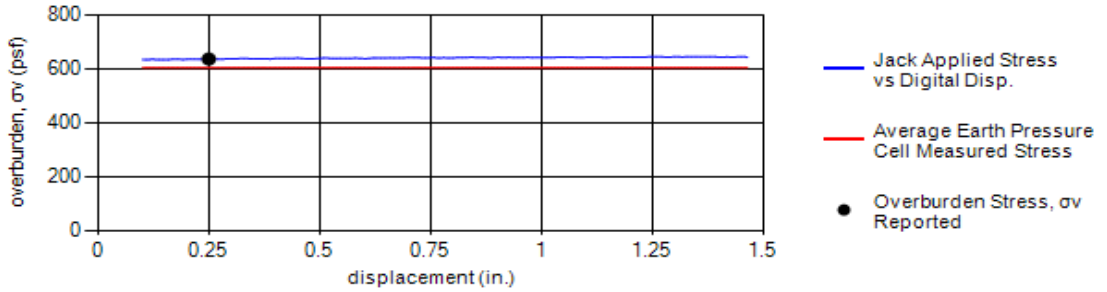


Comments

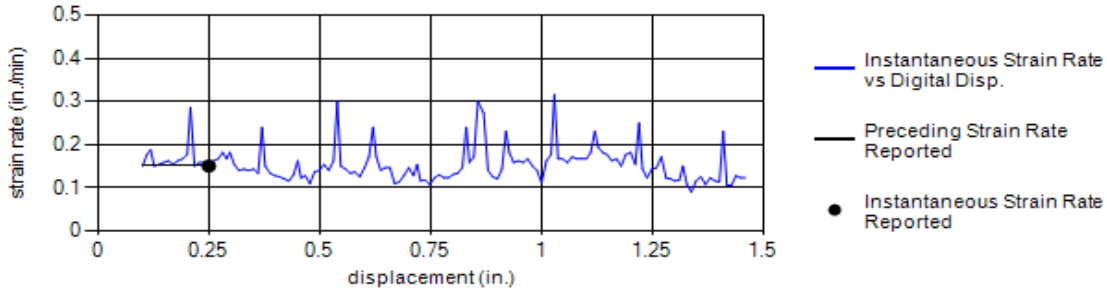
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
700	No Data	464	652	No Data	605	3.30	637



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

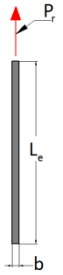
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/7/2011 10:06:00 AM
Test Identification:	TS20.18-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 B

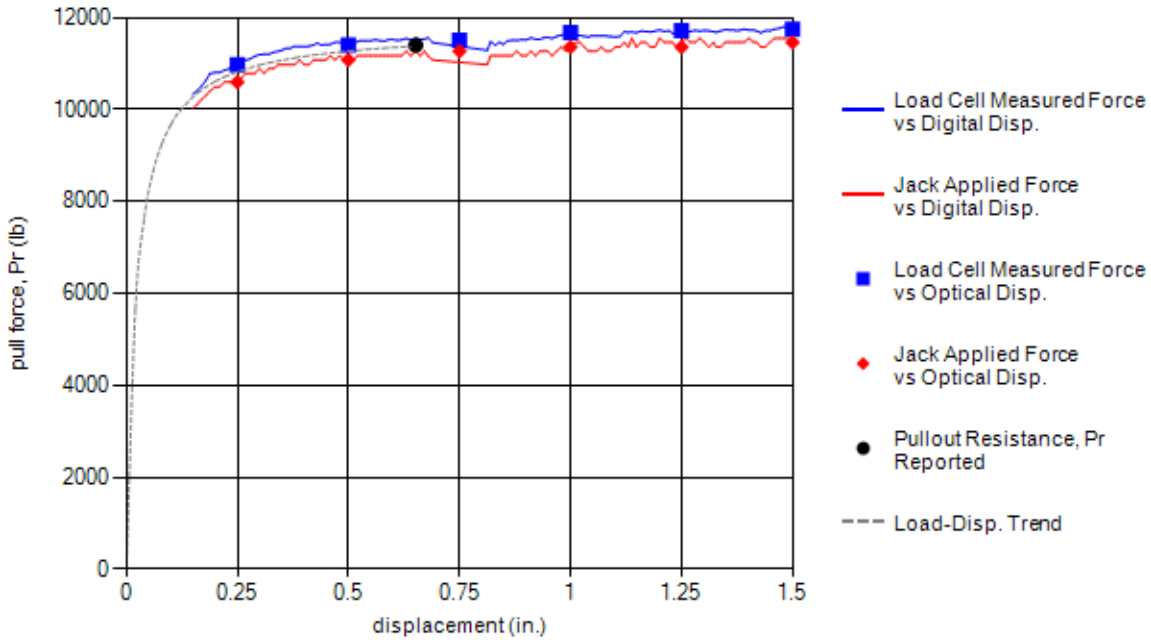
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	116.1	±0.8
Moisture Content, w (%):	8.9	±0.3%
Relative Compaction, C_R (%):	93.3	±0.6%

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	0.65	1546	11396	12.2	**2.76**

Load-Displacement Curve

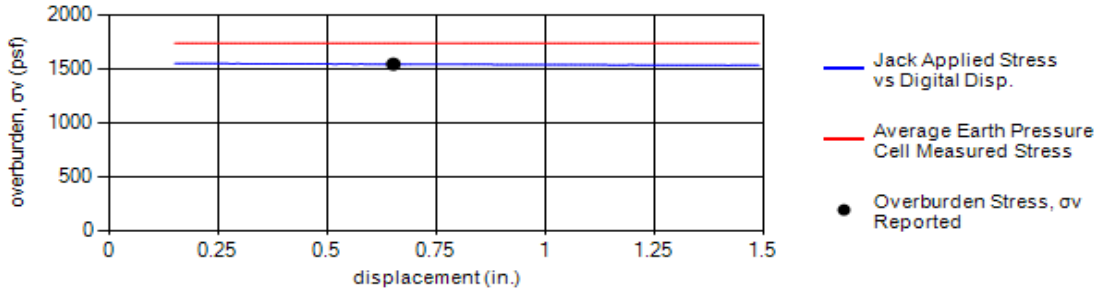


Comments

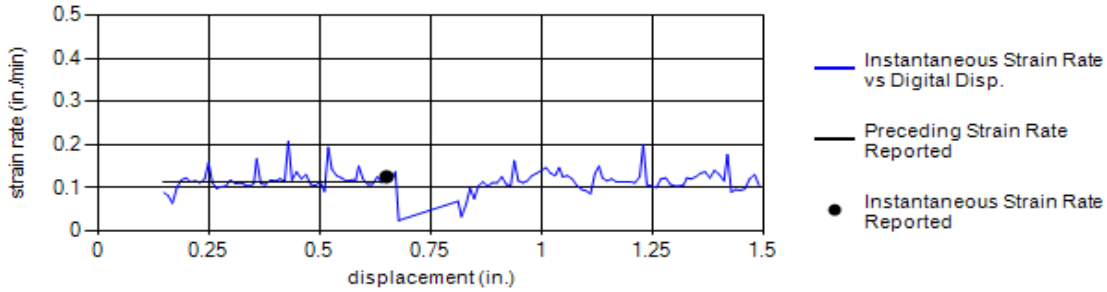
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1864	No Data	1702	1658	No Data	1741	1.15	1546



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

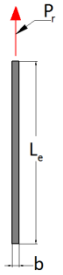
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/20/2011 3:33:00 PM
Test Identification:	TS21.13-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 B

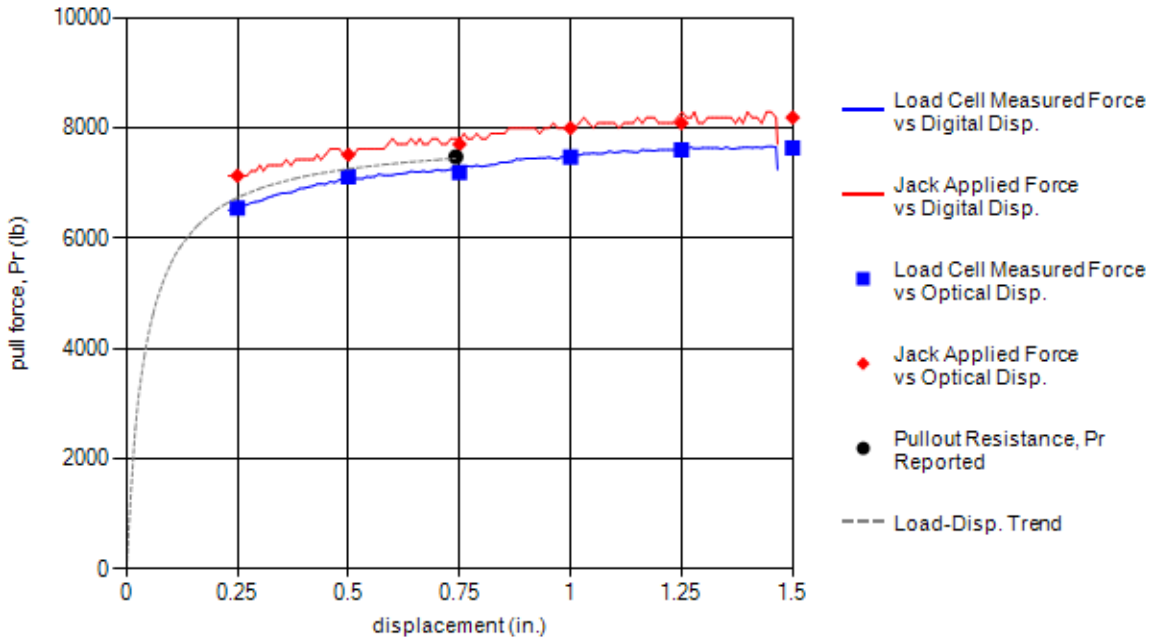
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	119.1	±2.0
Moisture Content, w (%):	8.0	±0.4%
Relative Compaction, C_R (%):	95.6	±1.6%

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	5060	7473	39.3	**1.11**

Load-Displacement Curve

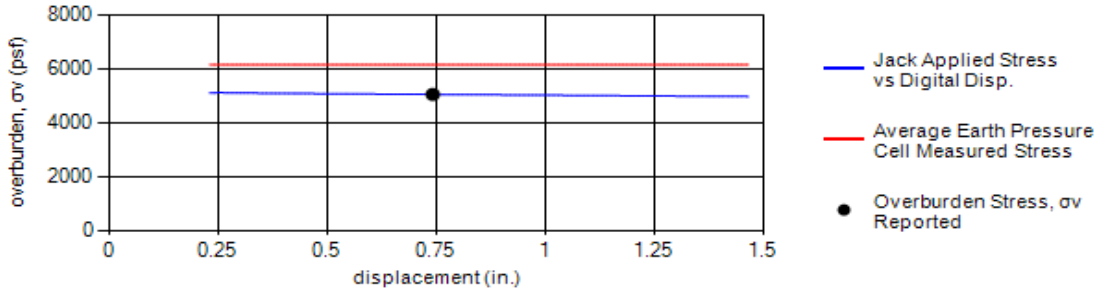


Comments

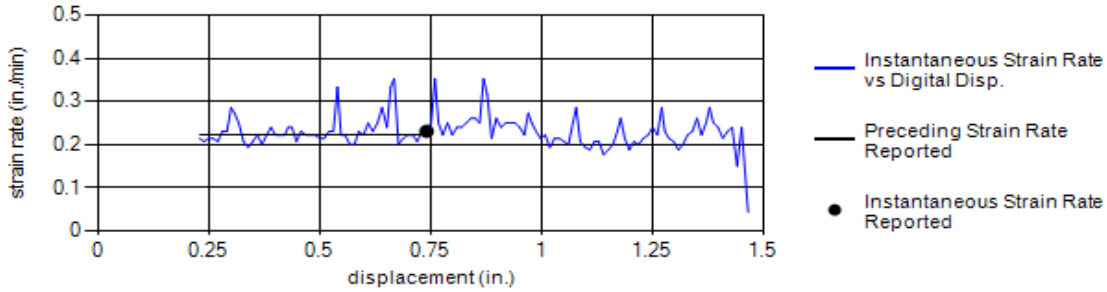
Personnel

Tested:	AS YW DH
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
5874	No Data	6293	6338	No Data	6168	1.05	5059



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.23	0.22	0.21



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

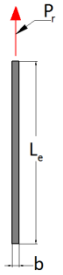
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/20/2011 3:45:00 PM
Test Identification:	TS21.14-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 B

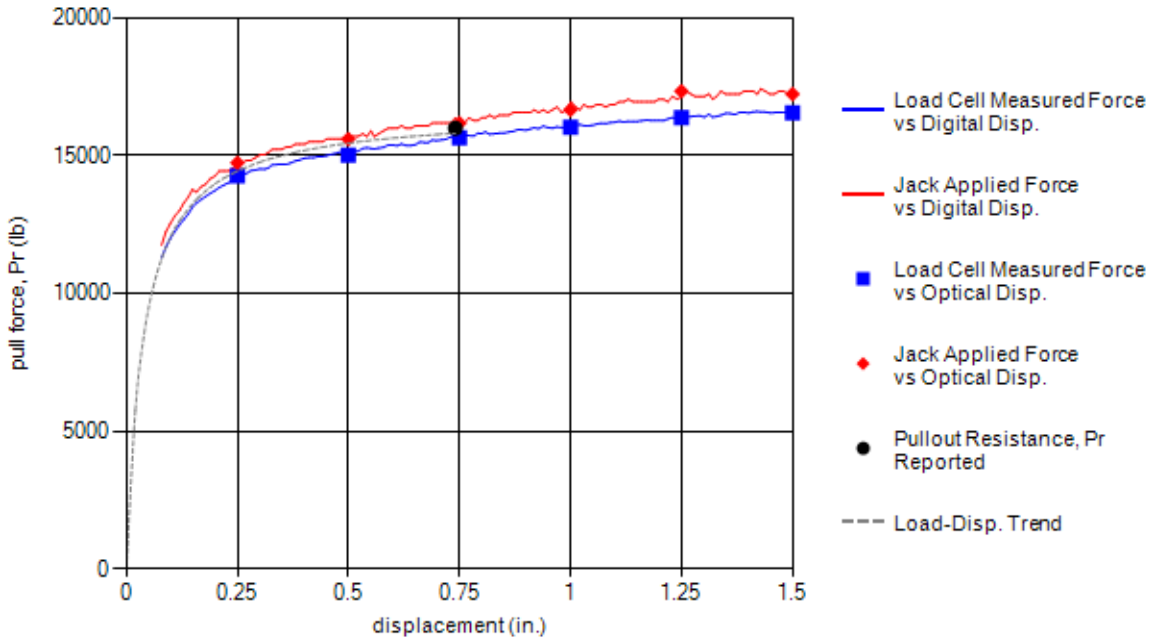
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	119.1	±2.0
Moisture Content, w (%):	8.0	±0.4%
Relative Compaction, C_R (%):	95.6	±1.6%

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	2550	15983	19.8	**2.35**

Load-Displacement Curve

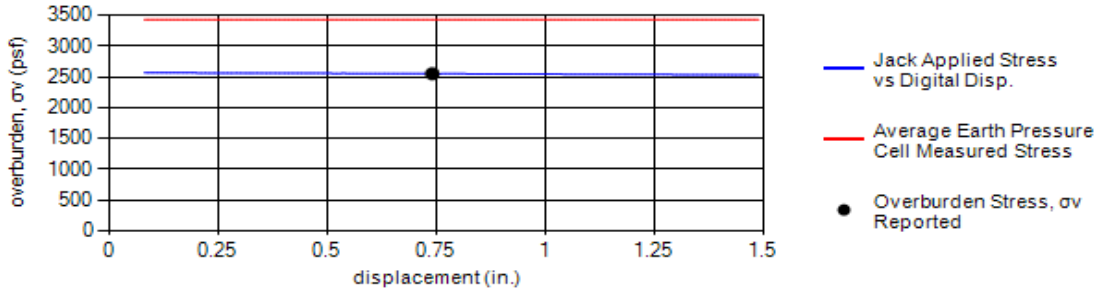


Comments

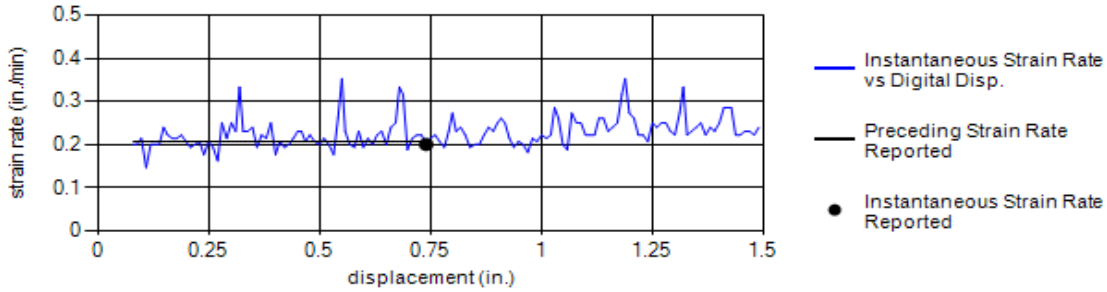
Personnel

Tested:	AS YW DH
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3302	No Data	3313	3676	No Data	3430	1.99	2550



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.20	0.21	0.21



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

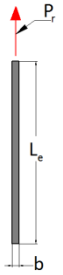
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/20/2011 2:32:00 PM
Test Identification:	TS21.15-S-L4-Z40-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 B

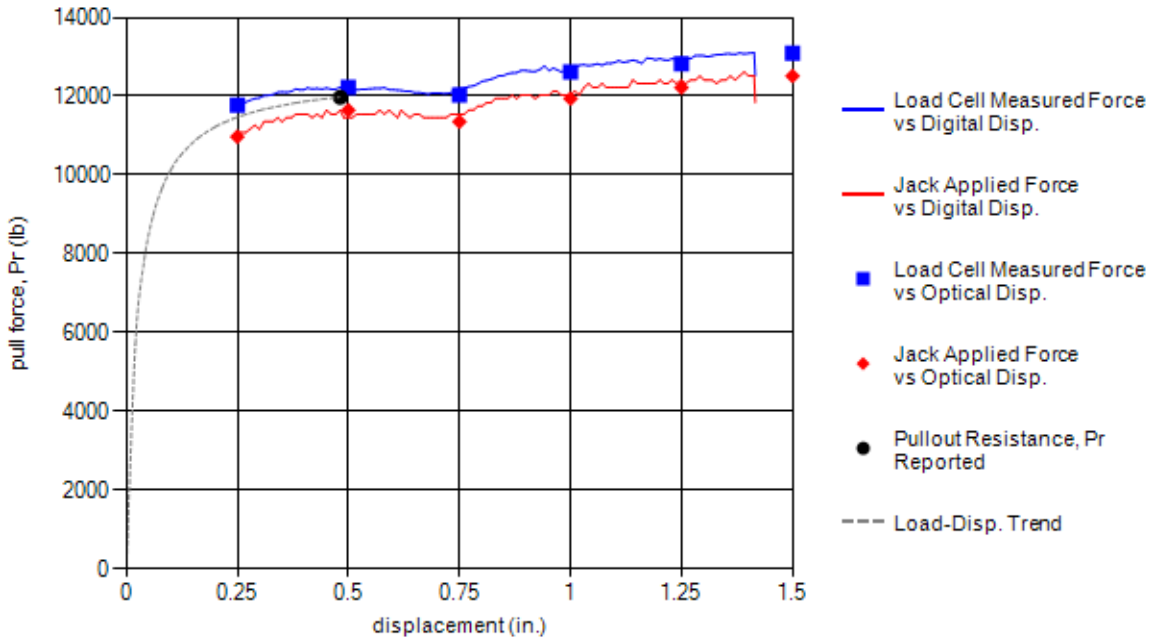
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	119.1	±2.0
Moisture Content, w (%):	8.0	±0.4%
Relative Compaction, C_R (%):	95.6	±1.6%

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	0.48	5079	11974	39.5	**1.77**

Load-Displacement Curve

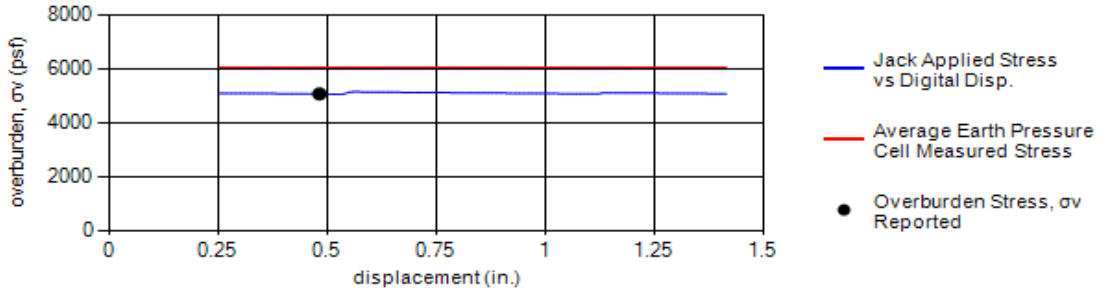


Comments

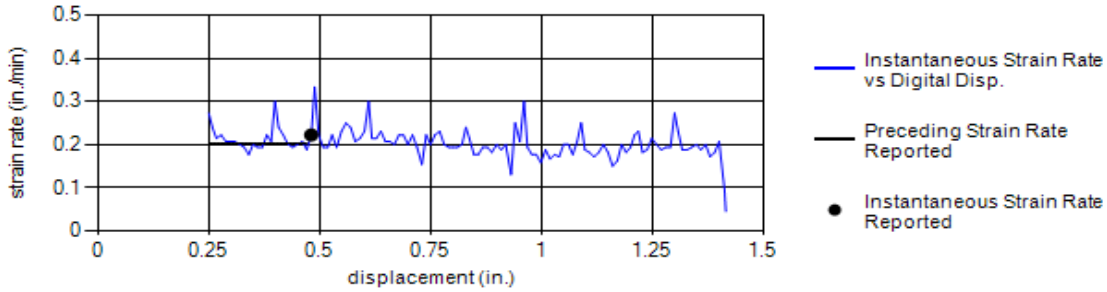
Personnel

Tested:	AS YW DH
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
5757	No Data	6151	6289	No Data	6066	1.06	5079



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.22	0.20	0.18



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

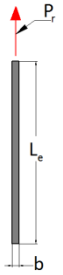
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/20/2011 2:43:00 PM
Test Identification:	TS21.16-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 B

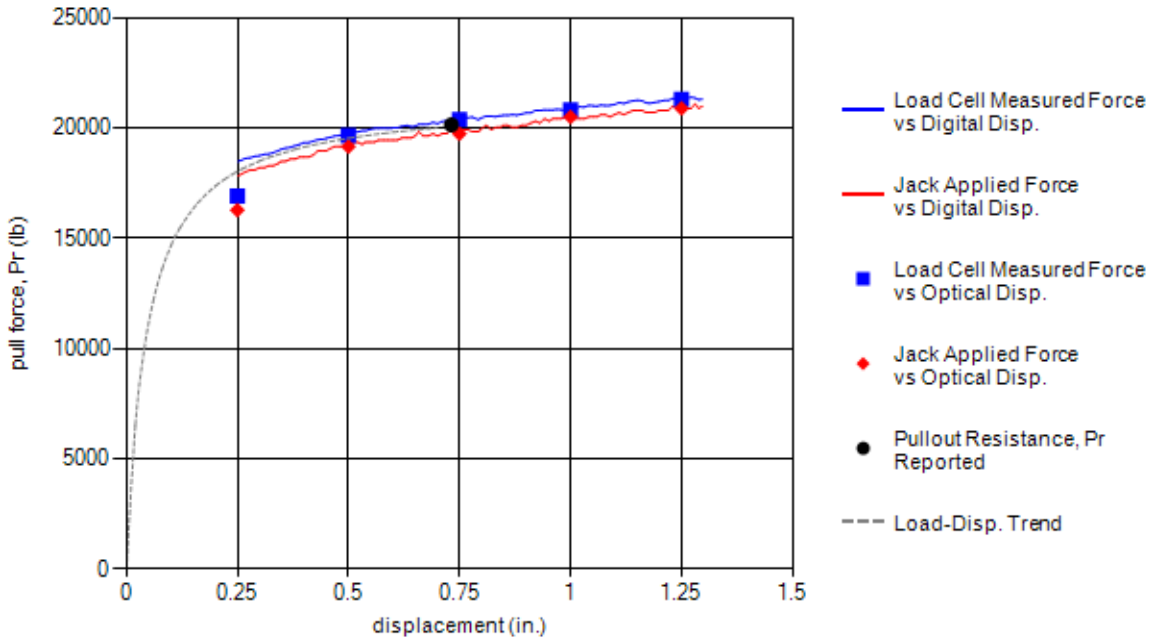
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	119.1	±2.0
Moisture Content, w (%):	8.0	±0.4%
Relative Compaction, C_R (%):	95.6	±1.6%

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	2606	20133	20.3	**2.90**

Load-Displacement Curve

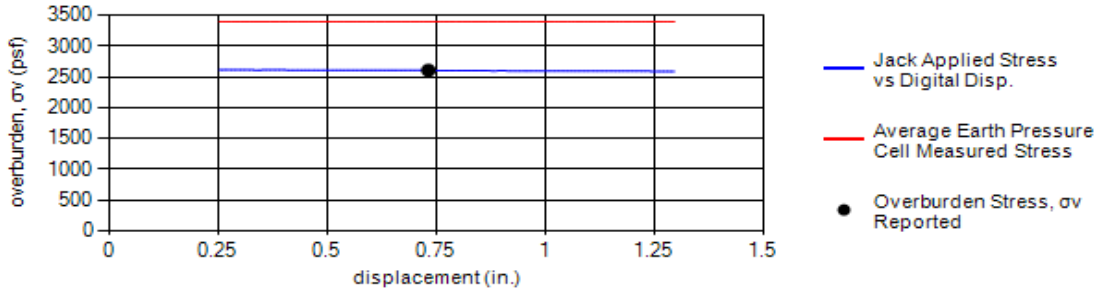


Comments

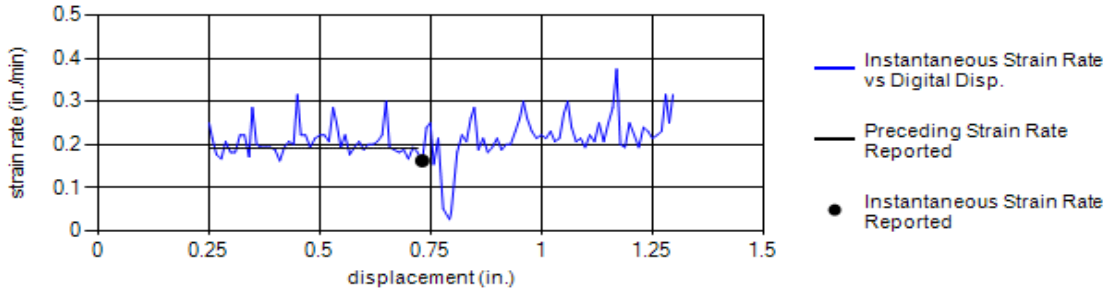
Personnel

Tested:	AS YW DH
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3235	No Data	3288	3668	No Data	3397	1.99	2605



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.16	0.19	0.18



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

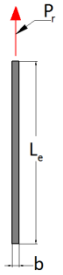
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/20/2011 3:19:00 PM
Test Identification:	TS21.17-S-L4-Z40-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 B

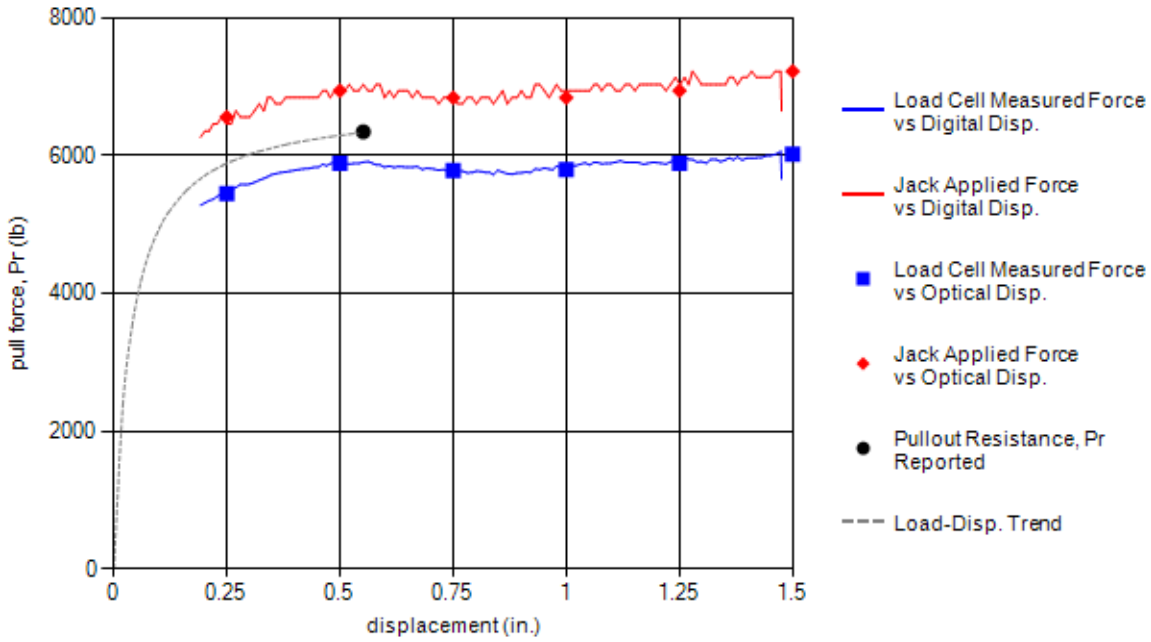
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	119.1	±2.0
Moisture Content, w (%):	8.0	±0.4%
Relative Compaction, C_R (%):	95.6	±1.6%

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	0.55	5038	6342	39.2	**0.94**

Load-Displacement Curve

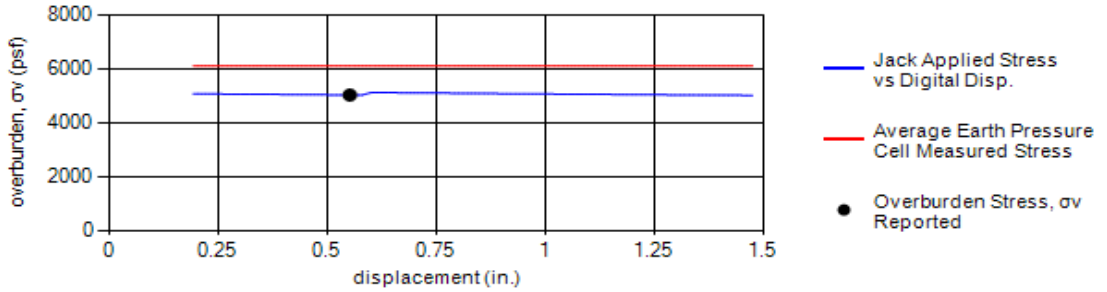


Comments

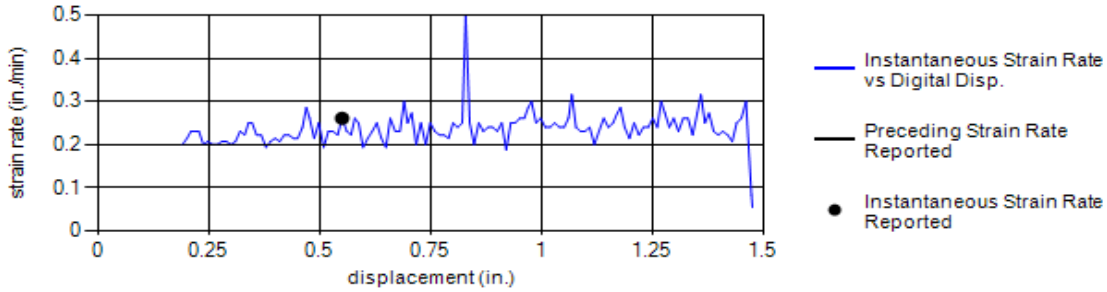
Personnel

Tested:	AS YW DH
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
5756	No Data	6229	6369	No Data	6118	1.08	5038



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.26	0.20	0.21



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

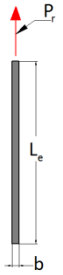
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/20/2011 3:03:00 PM
Test Identification:	TS21.18-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 B

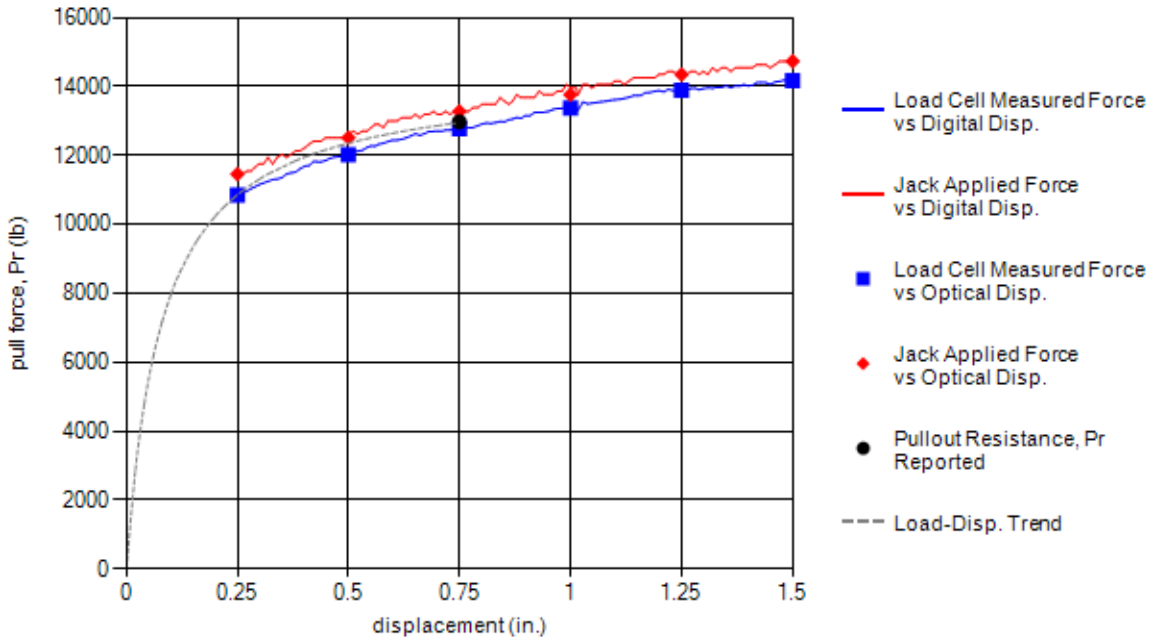
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	119.1	±2.0
Moisture Content, w (%):	8.0	±0.4%
Relative Compaction, C_R (%):	95.6	±1.6%

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	2545	12973	19.8	**1.91**

Load-Displacement Curve

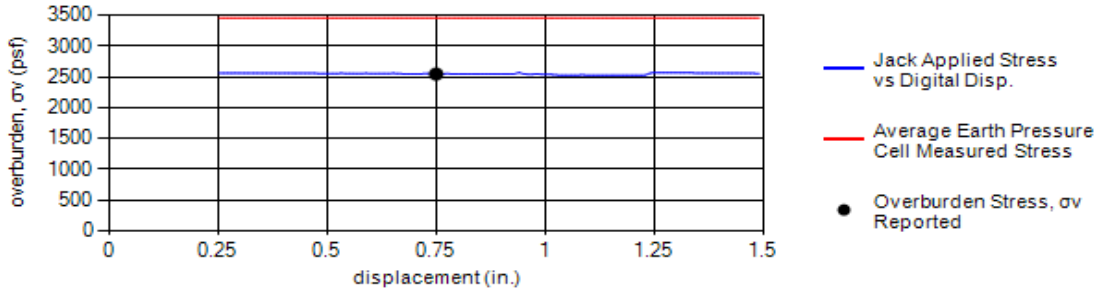


Comments

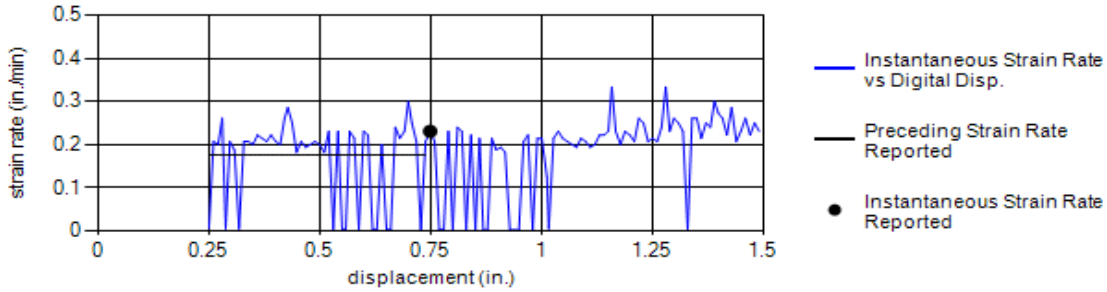
Personnel

Tested:	AS YW DH
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3266	No Data	3320	3785	No Data	3457	2.09	2545



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.23	0.18	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

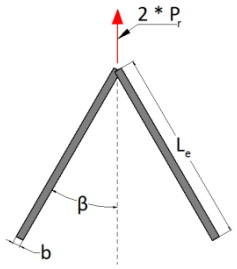
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	2/3/2011 12:17:00 PM
Test Identification:	TS22.07-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 B

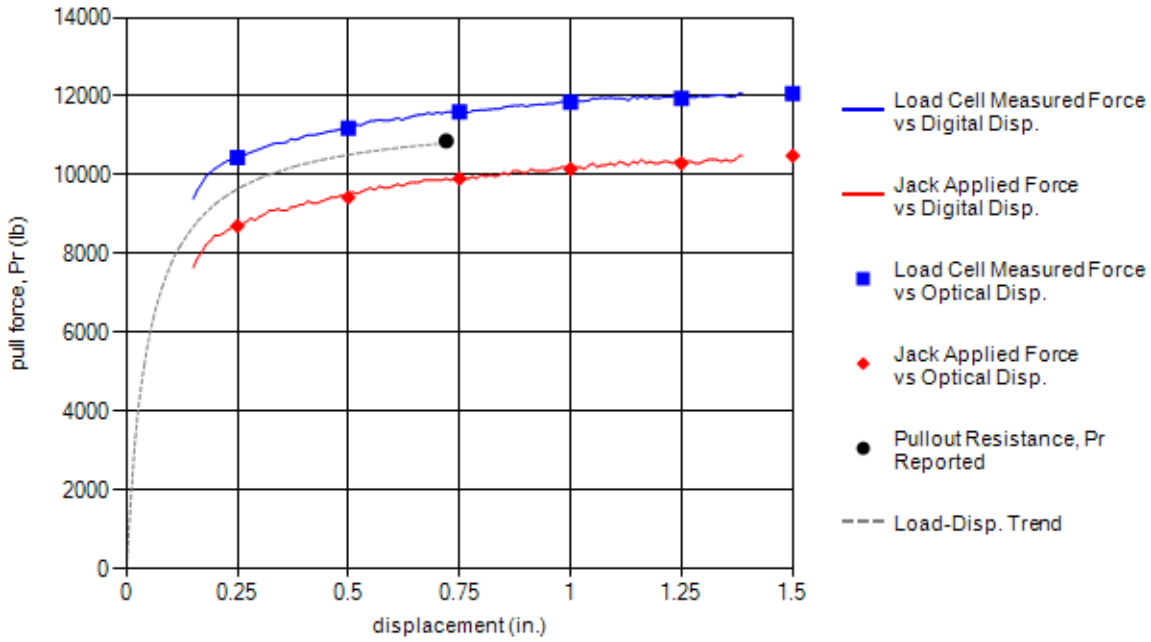
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	116.7	±2.8
Moisture Content, w (%):	5.6	±0.6%
Relative Compaction, C_R (%):	93.8	±2.2%

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	639	10865	5.2	**6.38**

Load-Displacement Curve



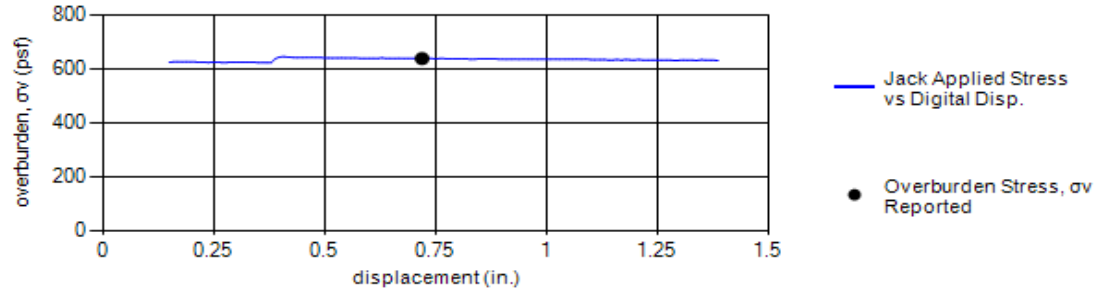
Comments

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.

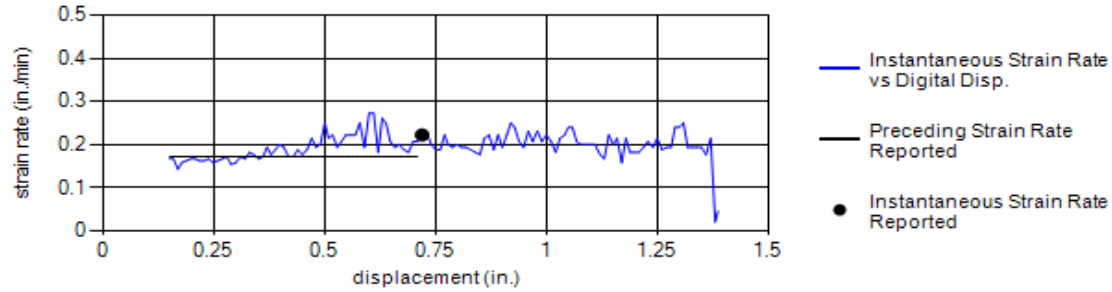
Personnel

Tested:	JL WL 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	639



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.22	0.17	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

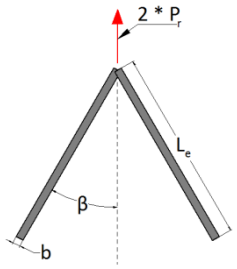
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	2/3/2011 12:50:00 PM
Test Identification:	TS22.08-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, ß (°):	15

Backfill Material

Specification:	TxDOT Item 423 - Type B

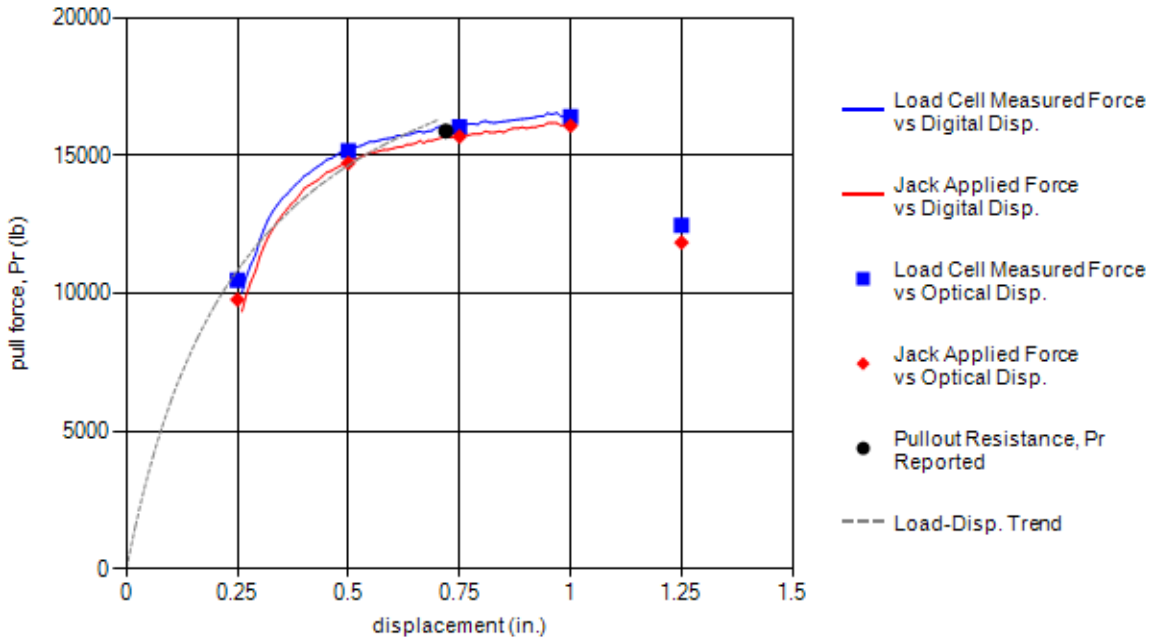
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	116.7	±2.8
Moisture Content, w (%):	5.6	±0.6%
Relative Compaction, C_R (%):	93.8	±2.2%

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	629	15880	5.1	**9.47**

Load-Displacement Curve



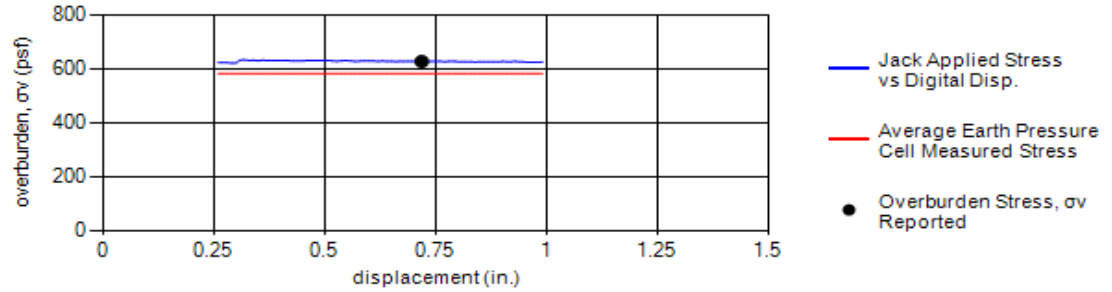
Comments

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.

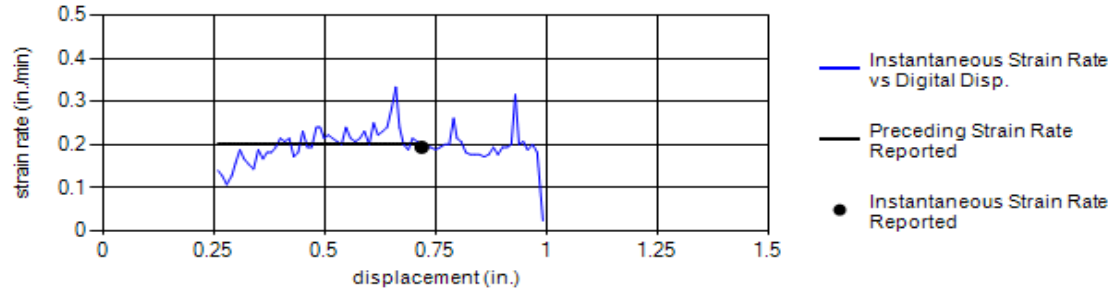
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
582	No Data	625	543	No Data	583	1.54	629



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.19	0.20	0.18



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

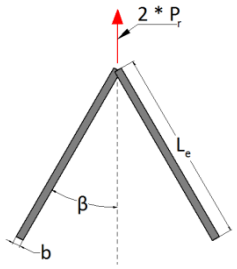
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	2/8/2011 8:50:00 AM
Test Identification:	TS22.09-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 B

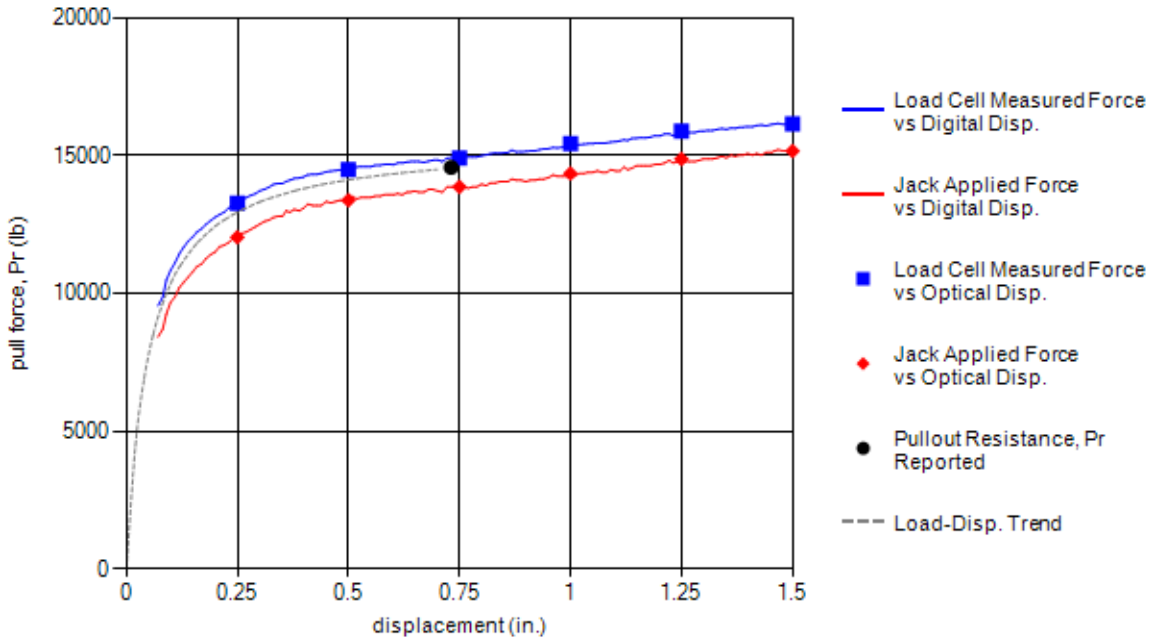
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	116.7	±2.8
Moisture Content, w (%):	5.6	±0.6%
Relative Compaction, C_R (%):	93.8	±2.2%

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	14562	5.1	**8.73**

Load-Displacement Curve



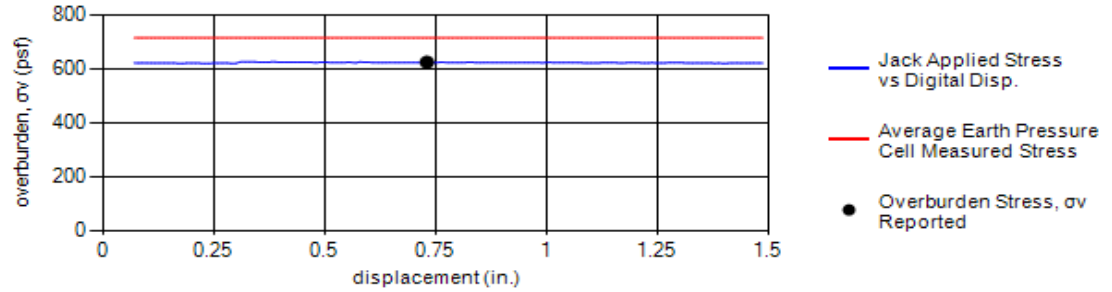
Comments

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.

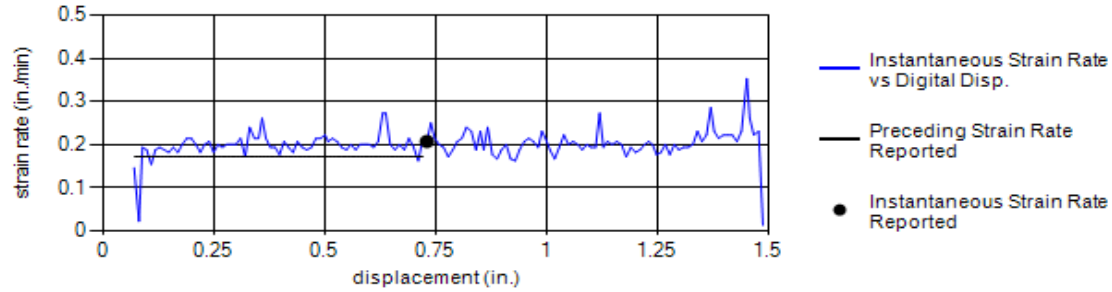
Personnel

Tested:	JL YW DH
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
562	No Data	1098	489	No Data	716	1.42	626



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.21	0.17	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

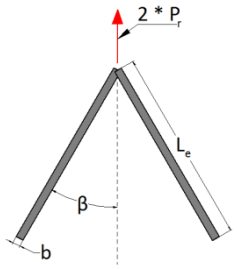
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	2/23/2011 2:02:00 PM
Test Identification:	TS23.07-S-L4.5-ß15°-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 (°):	15

Backfill Material

Specification:	TxDOT Item 423 - Type B

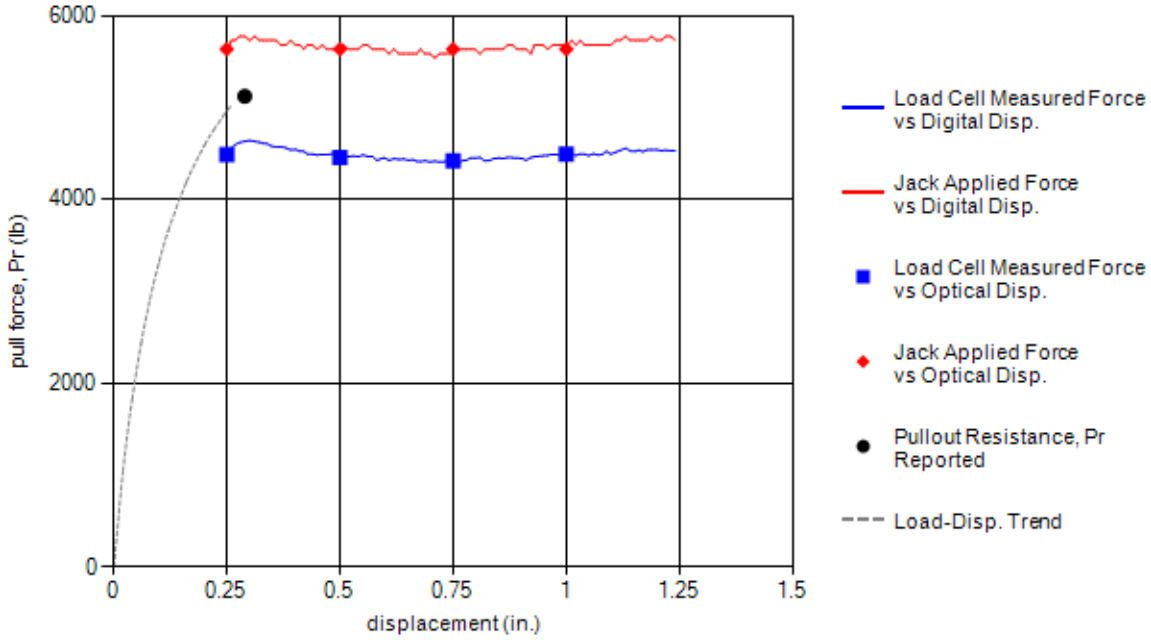
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	119.4	±1.9
Moisture Content, w (%):	5.7	±0.5%
Relative Compaction, C_R (%):	96.0	±1.5%

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	0.29	1528	5120	12.1	**2.23**

Load-Displacement Curve



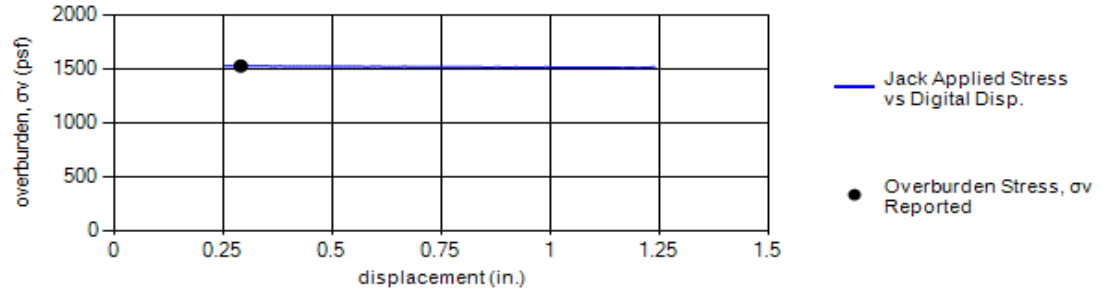
Comments

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.

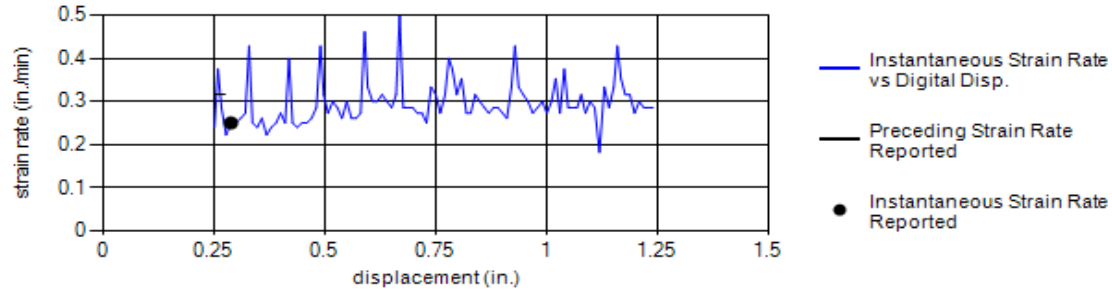
Personnel

Tested:	YW AS 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	1528



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.25	0.32	0.28



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

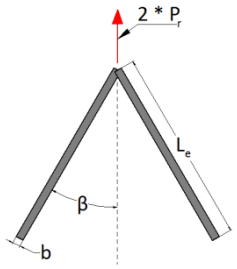
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	2/23/2011 1:45:00 PM
Test Identification:	TS23.08-S-L4.5-ß15°-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 (°):	15

Backfill Material

Specification:	TxDOT Item 423 - Type B

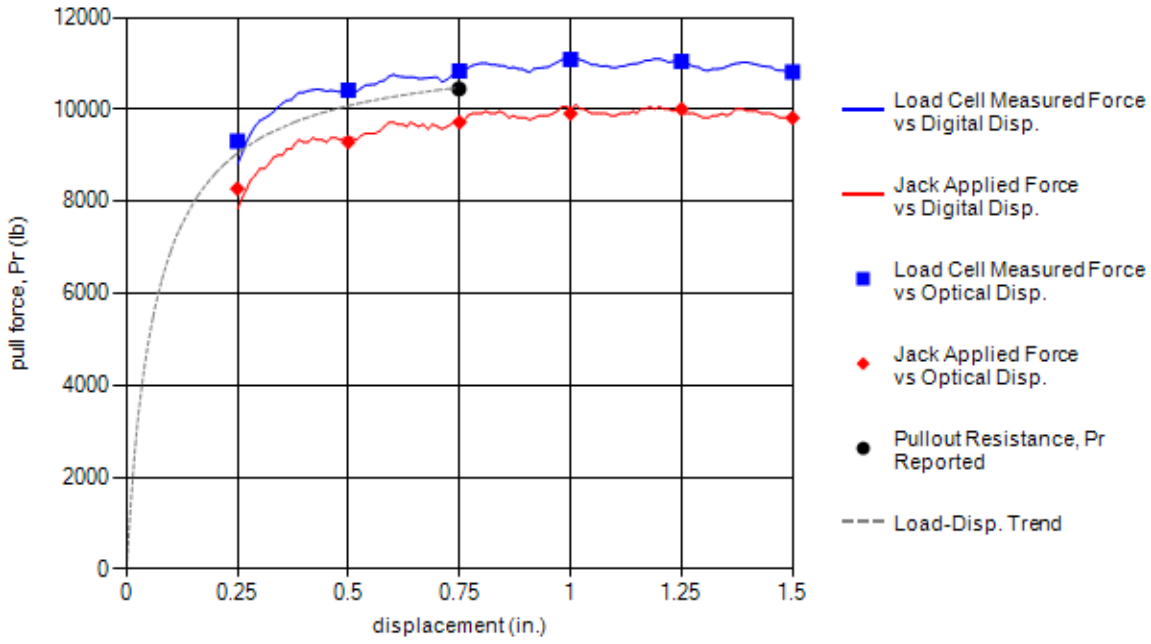
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	119.4	±1.9
Moisture Content, w (%):	5.7	±0.5%
Relative Compaction, C_R (%):	96.0	±1.5%

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	1504	10447	11.9	**4.63**

Load-Displacement Curve



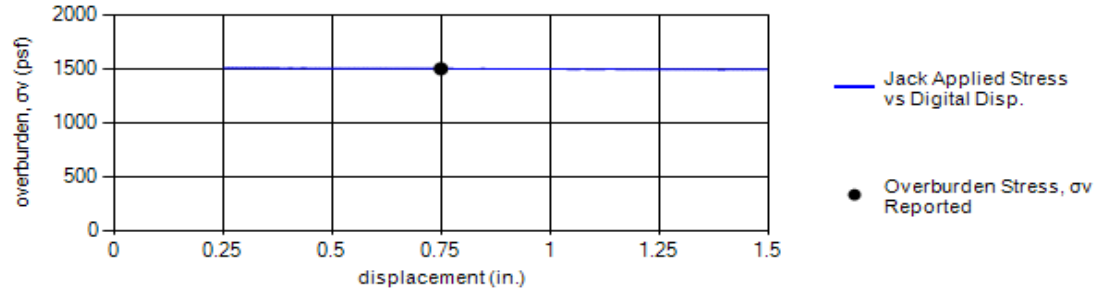
Comments

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.

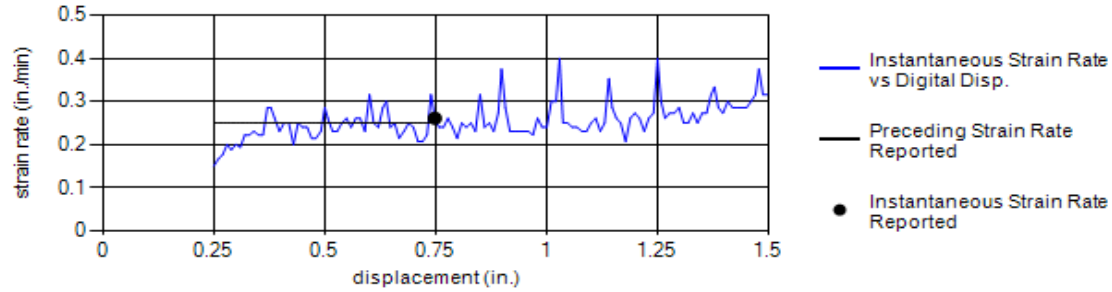
Personnel

Tested:	YW AS 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	1.10	1504



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.26	0.25	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

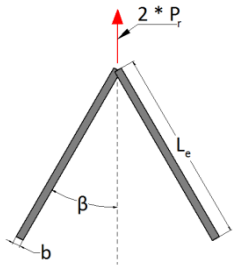
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	2/23/2011 1:26:00 PM
Test Identification:	TS23.09-S-L4.5-ß15°-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 (°):	15

Backfill Material

Specification:	TxDOT Item 423 - Type B

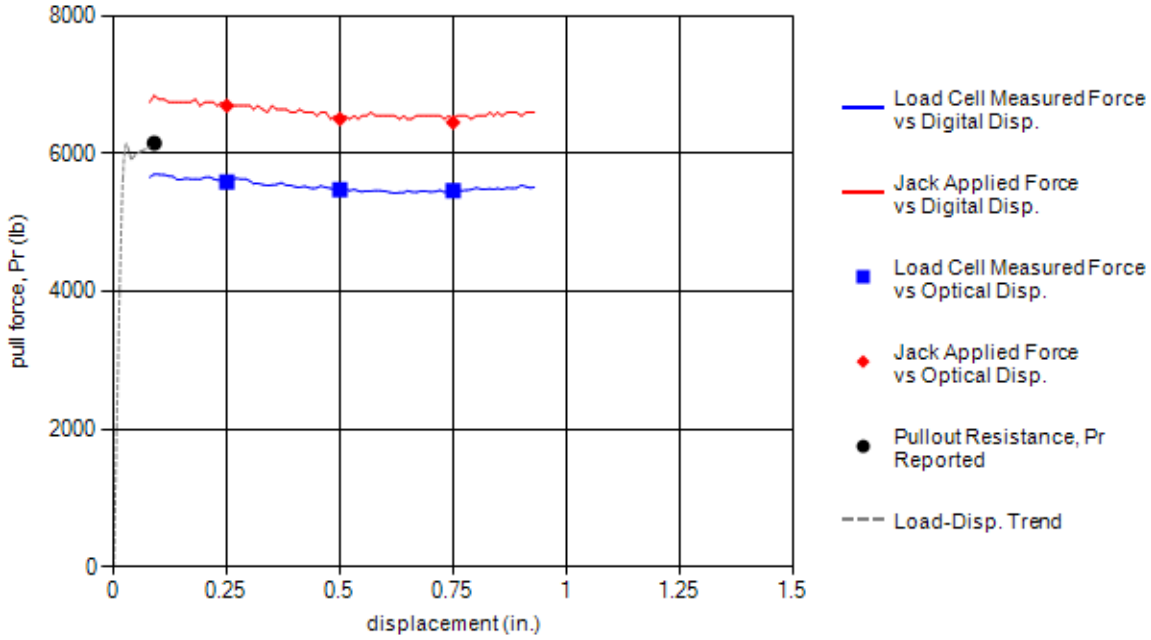
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	119.4	±1.9
Moisture Content, w (%):	5.7	±0.5%
Relative Compaction, C_R (%):	96.0	±1.5%

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	0.09	1500	6147	11.9	**2.73**

Load-Displacement Curve



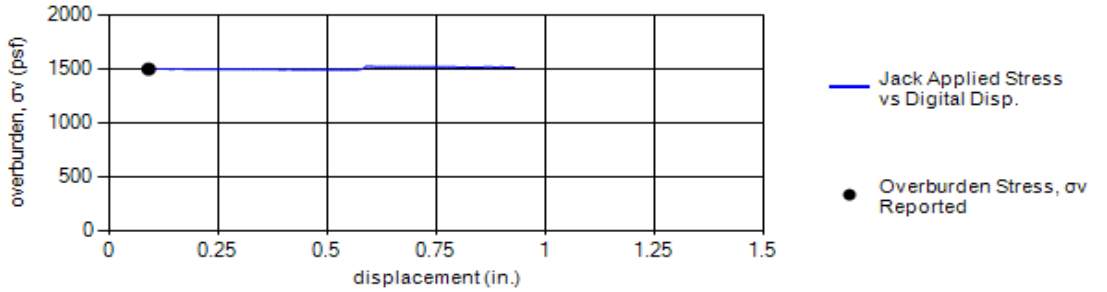
Comments

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.

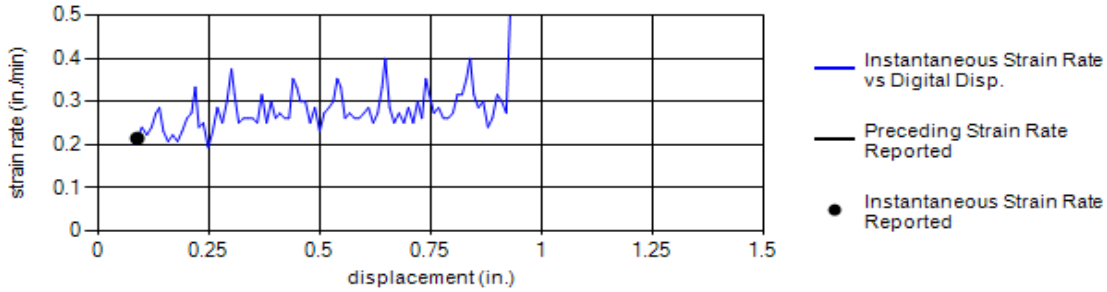
Personnel

Tested:	YW AS 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	1.19	1500



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.21	0.23	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

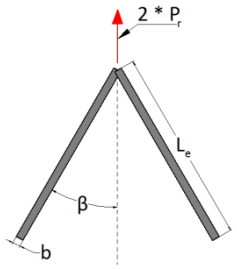
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	4/8/2011 3:00:00 PM
Test Identification:	TS24.13-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 B

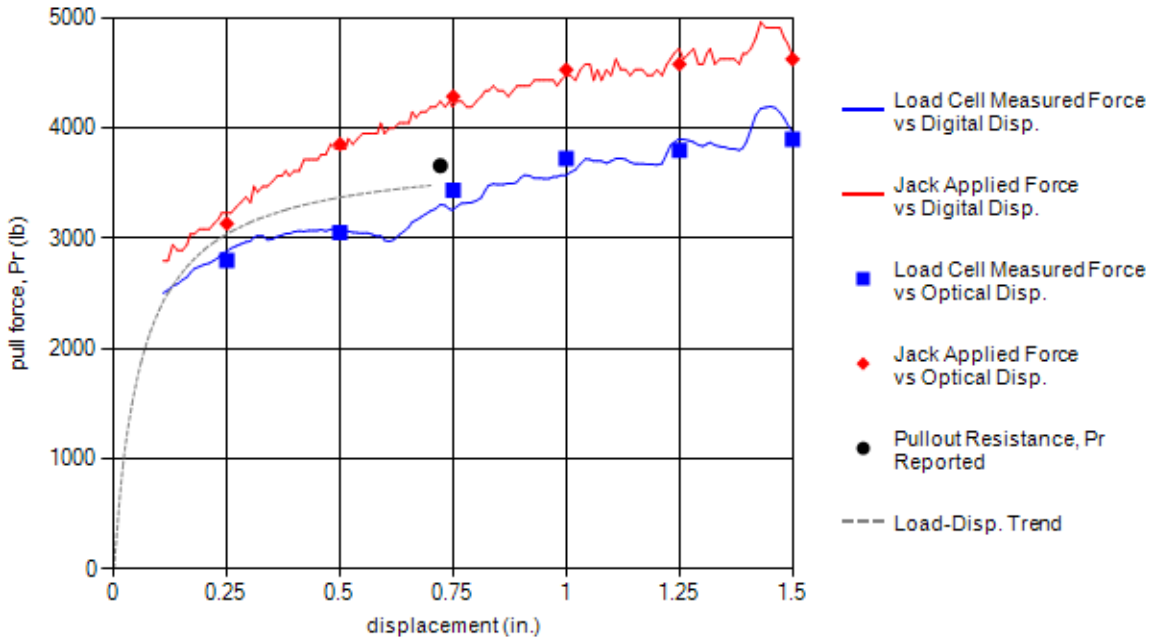
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	117.9	±1.5
Moisture Content, w (%):	7.3	±1.0%
Relative Compaction, C_R (%):	94.7	±1.3%

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	1517	3656	12.0	**1.61**

Load-Displacement Curve



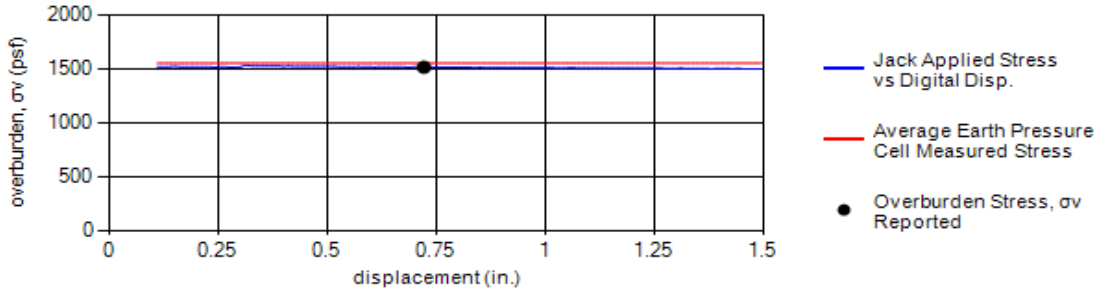
Comments

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.

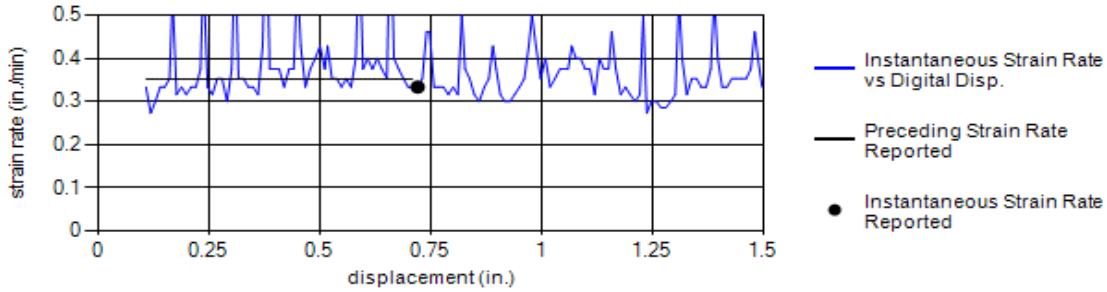
Personnel

Tested:	AS YW DH
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1806	No Data	1624	1503	1288	1555	1.13	1517



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.33	0.35	0.34



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

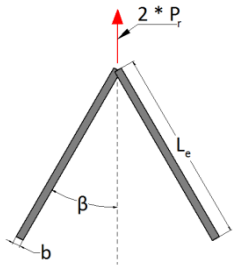
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	4/8/2011 2:50:00 PM
Test Identification:	TS24.14-S-L4.5-ß15°-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 (°):	15

Backfill Material

Specification:	TxDOT Item 423 - Type B

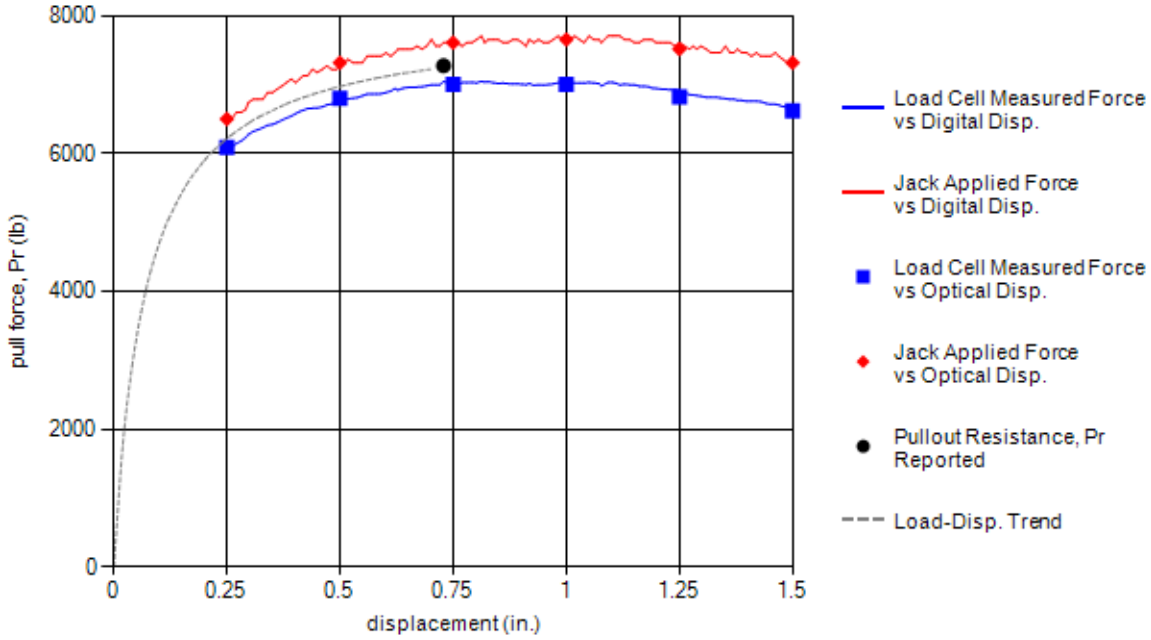
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	117.9	±1.5
Moisture Content, w (%):	7.3	±1.0%
Relative Compaction, C_R (%):	94.7	±1.3%

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	1526	7271	12.1	**3.18**

Load-Displacement Curve



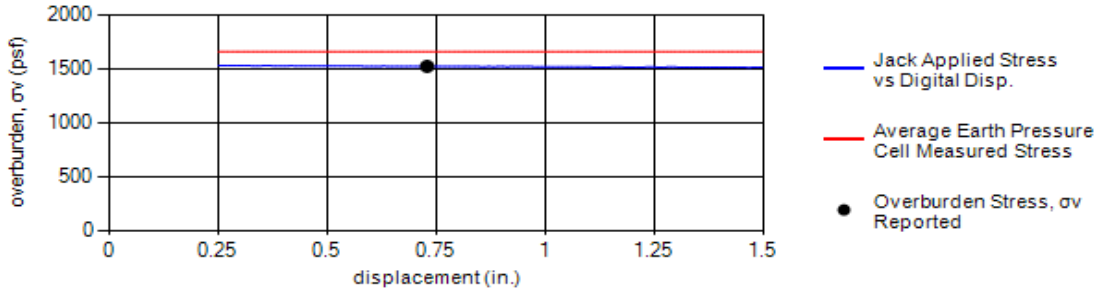
Comments

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.

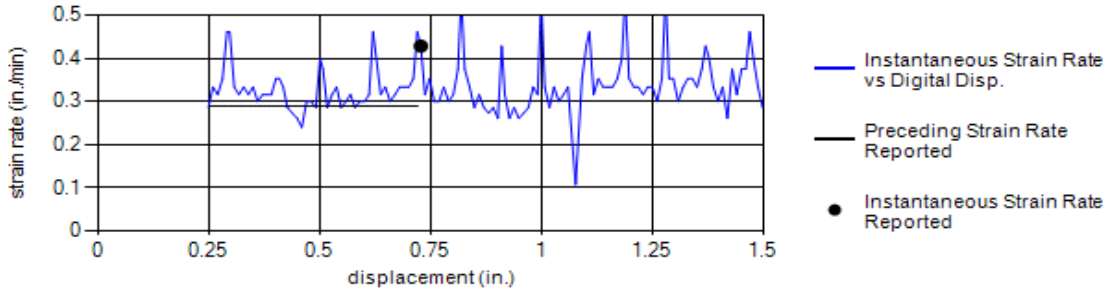
Personnel

Tested:	AS YW DH
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1982	No Data	1713	1610	1346	1663	1.09	1526



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.43	0.29	0.30



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

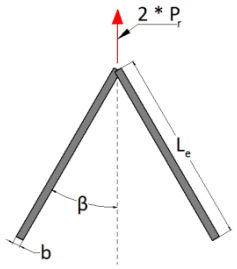
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	4/8/2011 2:27:00 PM
Test Identification:	TS24.15-S-L4.5-ß15°-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 (°):	15

Backfill Material

Specification:	TxDOT Item 423 - Type B

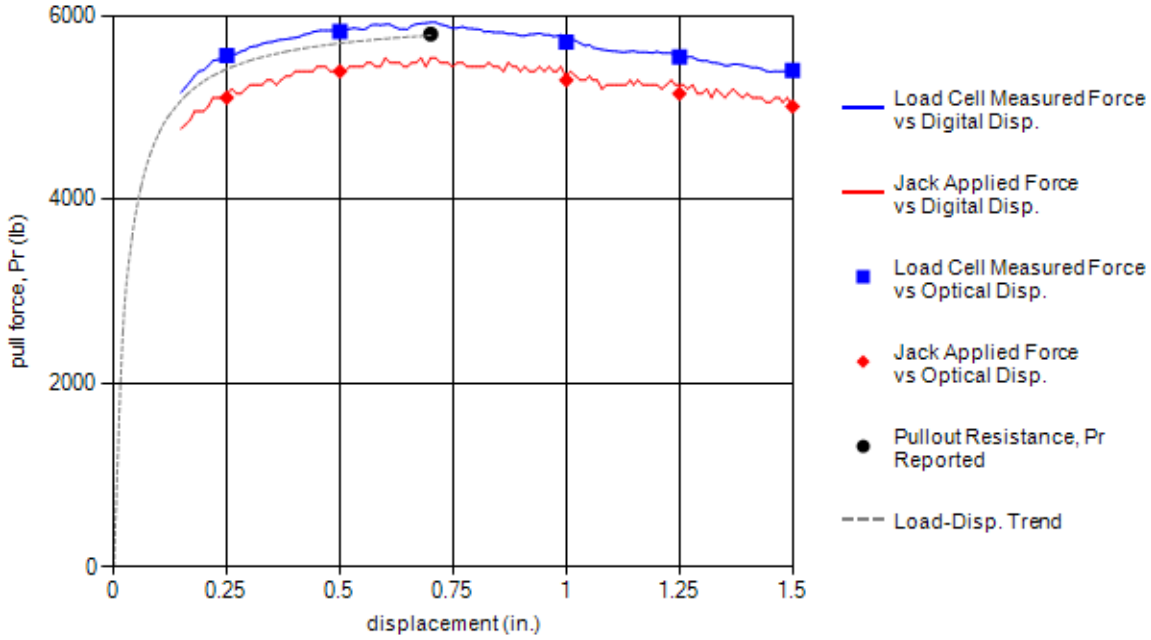
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	117.9	±1.5
Moisture Content, w (%):	7.3	±1.0%
Relative Compaction, C_R (%):	94.7	±1.3%

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	1527	5797	12.1	**2.53**

Load-Displacement Curve



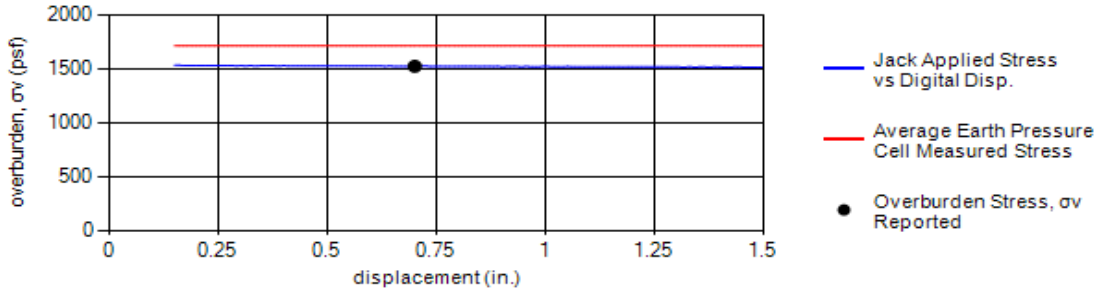
Comments

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.

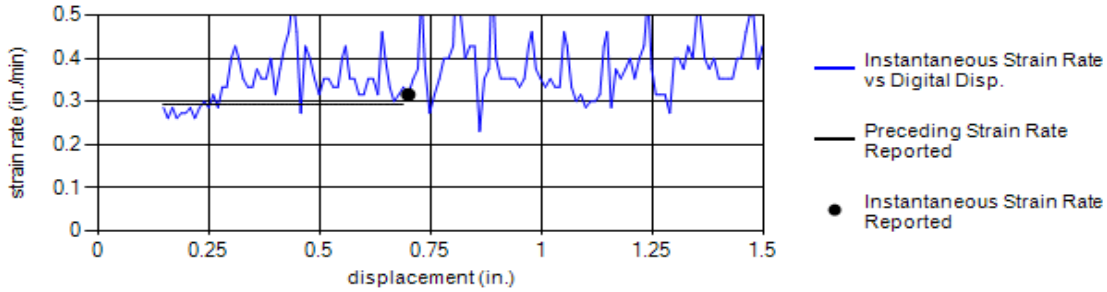
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2094	No Data	1781	1650	1334	1715	1.15	1527



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.32	0.29	0.31



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

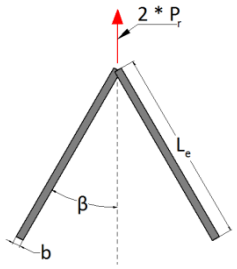
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/5/2011 2:17:00 PM
Test Identification:	TS25.13-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 B

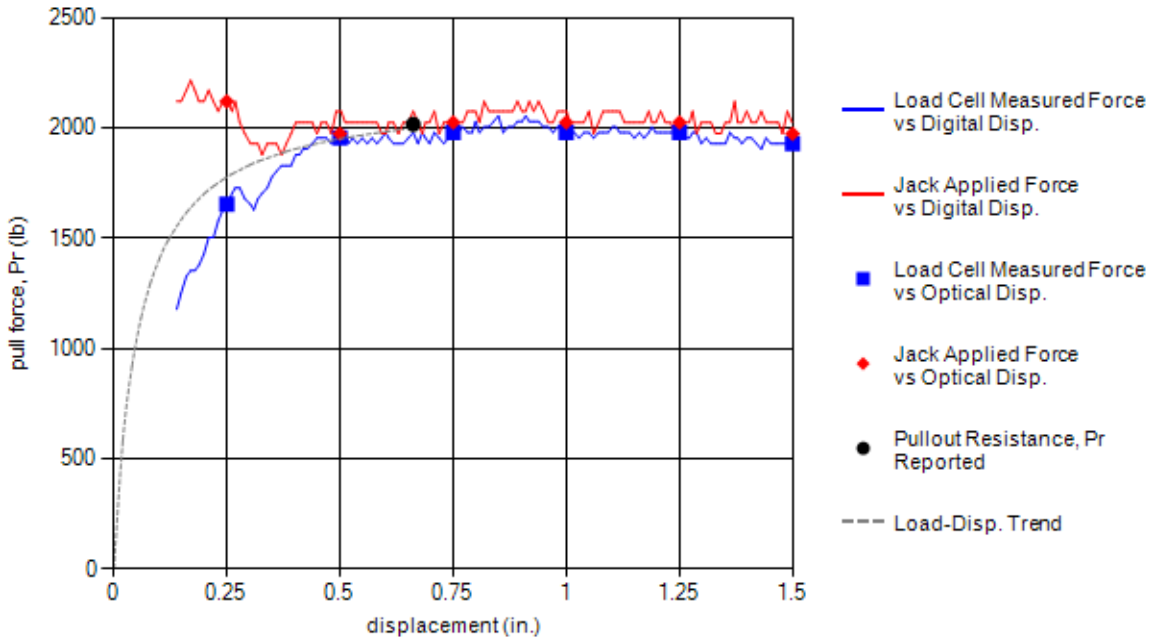
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	120.3	±3.7
Moisture Content, w (%):	5.6	±0.5%
Relative Compaction, C_R (%):	96.6	±2.9%

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	1516	2015	11.9	**0.89**

Load-Displacement Curve



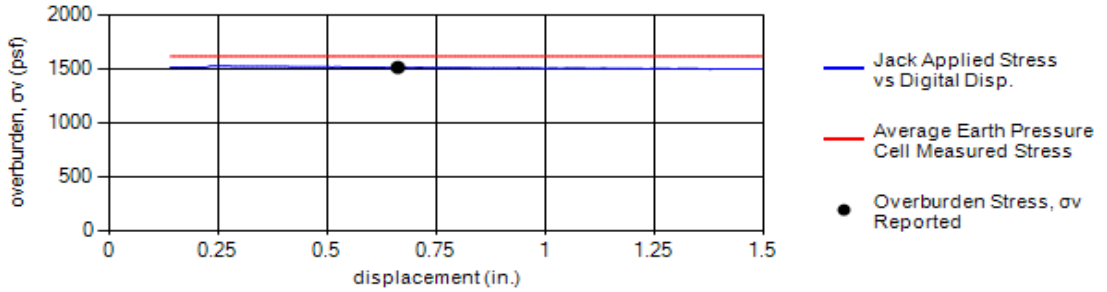
Comments

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.

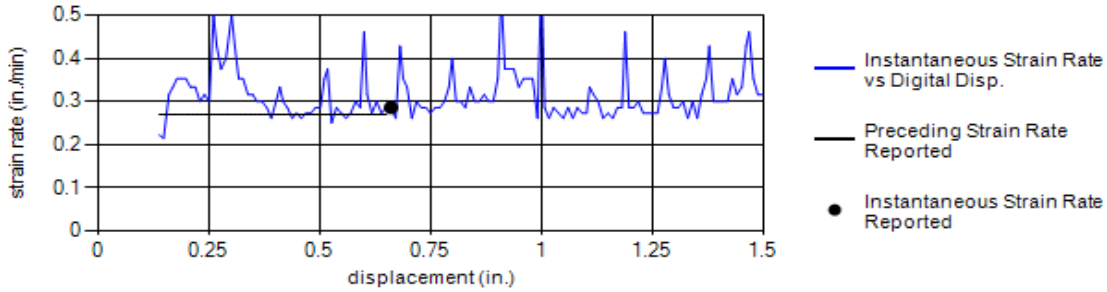
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1874	No Data	1524	1461	No Data	1620	1.12	1516



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.29	0.27	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

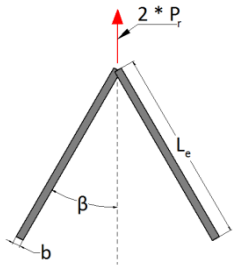
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/5/2011 2:32:00 PM
Test Identification:	TS25.14-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 B

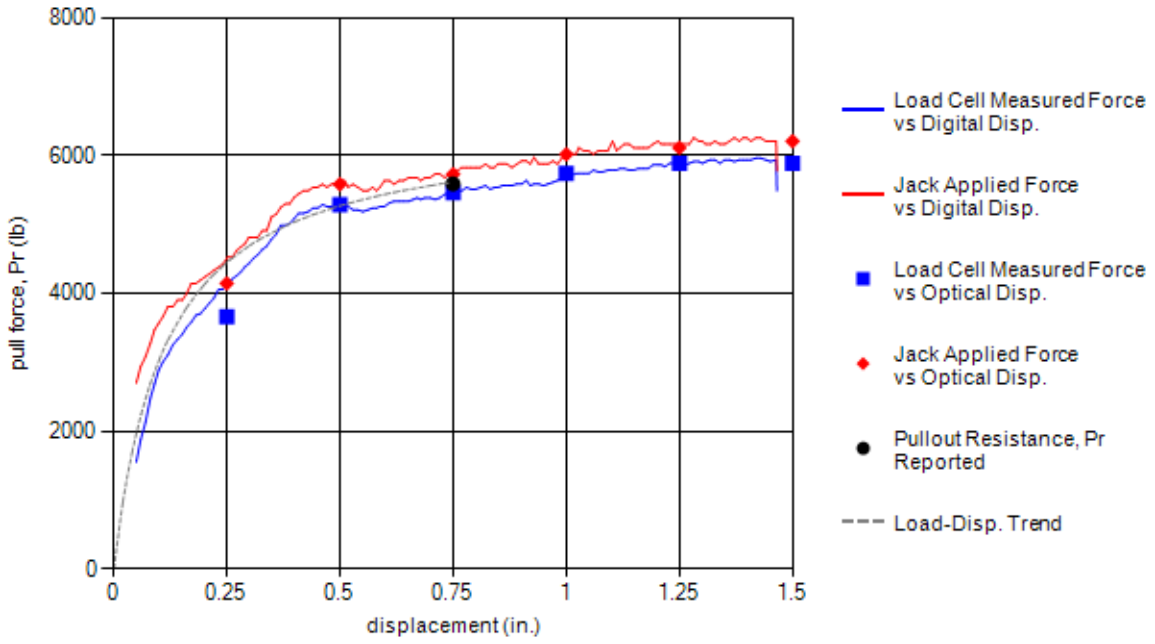
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	120.3	±3.7
Moisture Content, w (%):	5.6	±0.5%
Relative Compaction, C_R (%):	96.6	±2.9%

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	1535	5587	12.1	**2.43**

Load-Displacement Curve



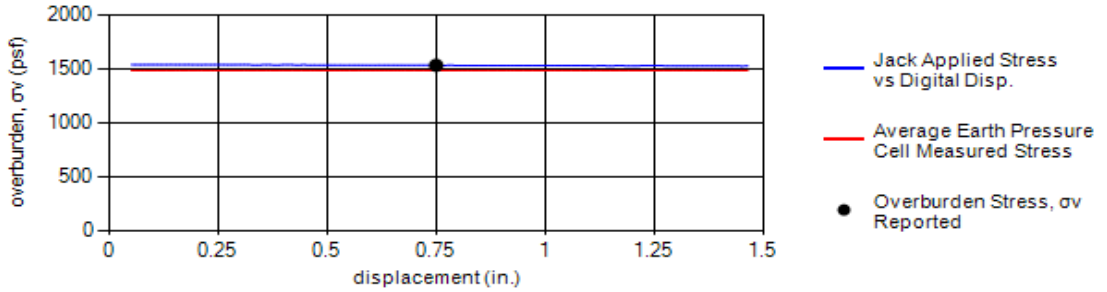
Comments

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.

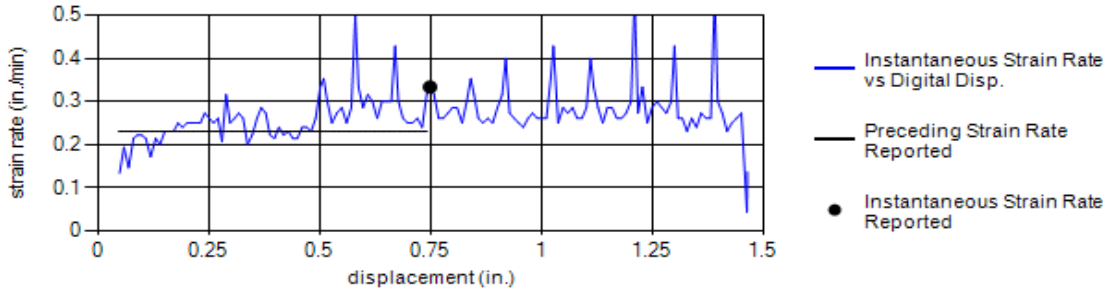
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1740	No Data	1378	1339	No Data	1486	1.21	1535



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.33	0.23	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

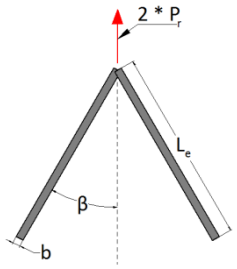
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/5/2011 2:56:00 PM
Test Identification:	TS25.15-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 B

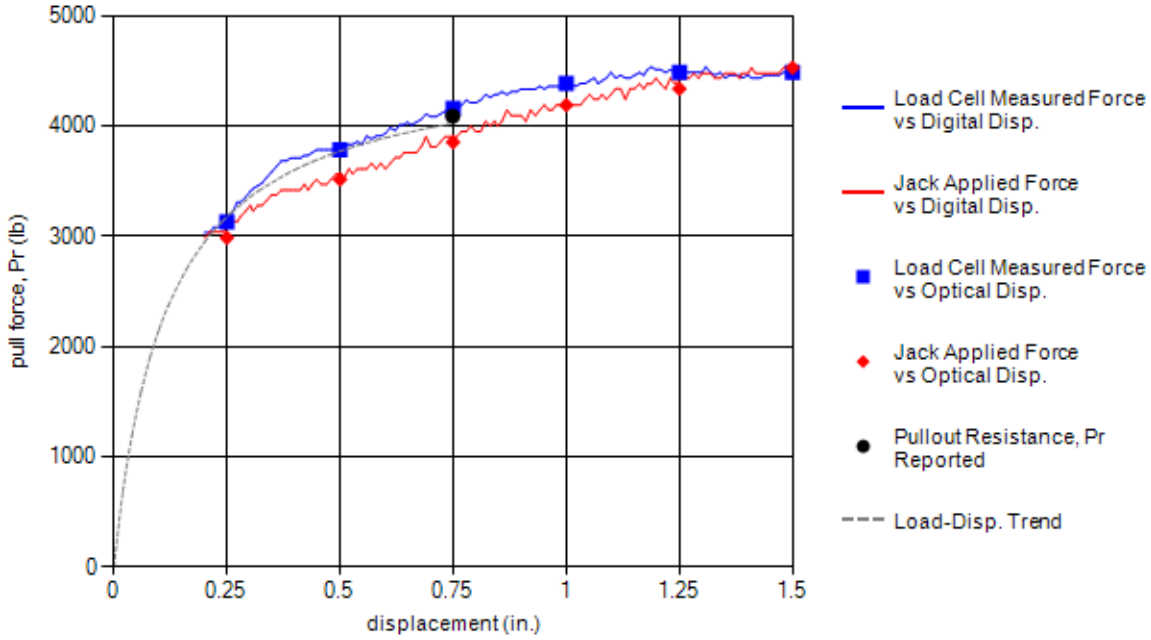
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	120.3	±3.7
Moisture Content, w (%):	5.6	±0.5%
Relative Compaction, C_R (%):	96.6	±2.9%

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	1546	4087	12.2	**1.76**

Load-Displacement Curve



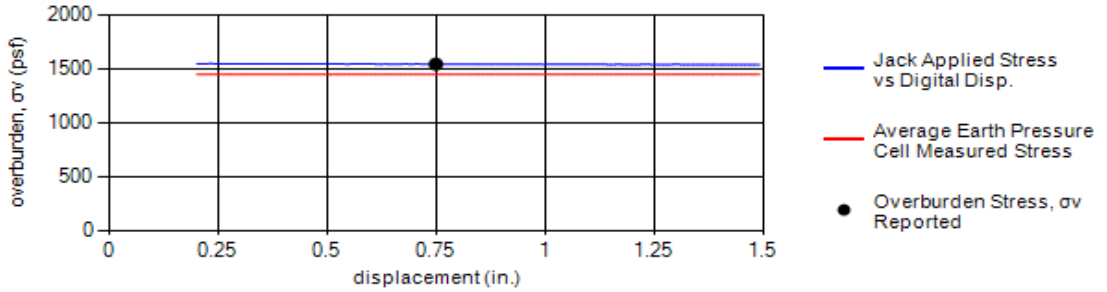
Comments

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.

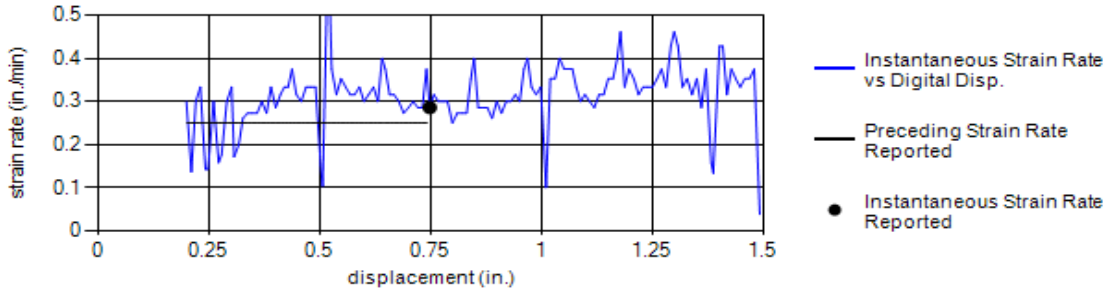
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1695	No Data	1352	1303	No Data	1450	1.31	1546



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.29	0.25	0.27



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

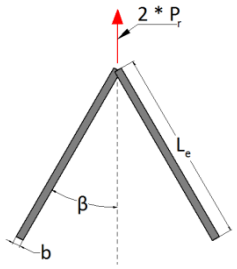
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	6/1/2011 10:22:00 AM
Test Identification:	TS27.07-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 B

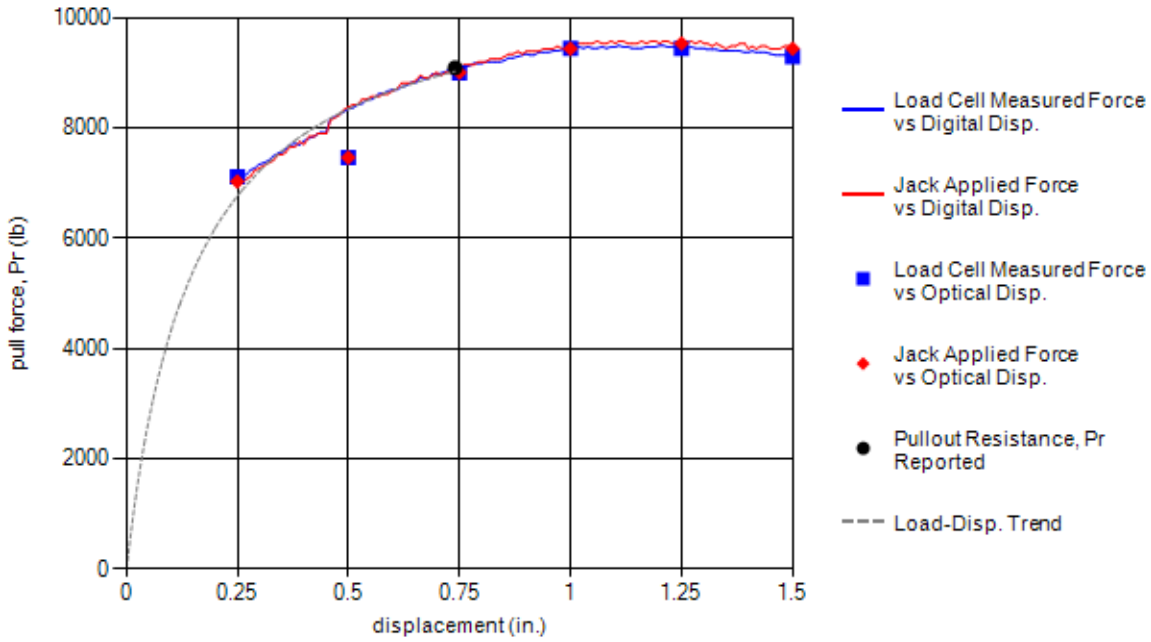
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	119.8	±1.2
Moisture Content, w (%):	8.0	±0.2%
Relative Compaction, C_R (%):	96.2	±0.9%

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	642	9086	5.0	**5.31**

Load-Displacement Curve



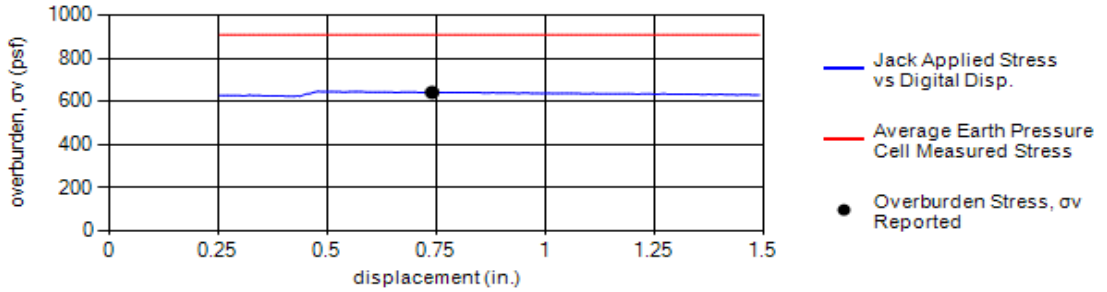
Comments

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.

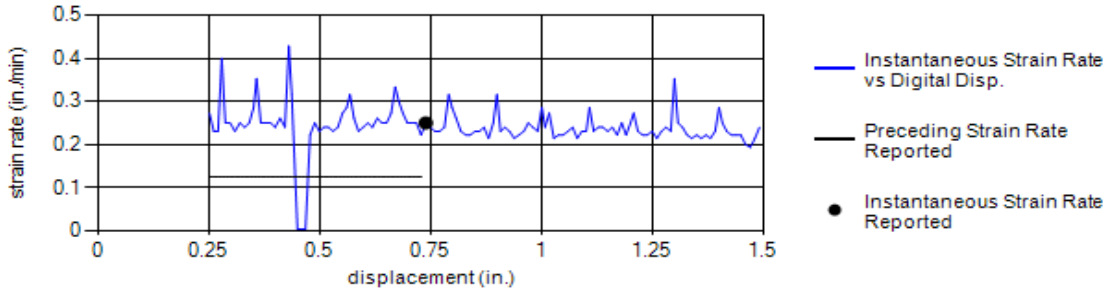
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1113	No Data	724	893	No Data	910	7.77	641



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.25	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

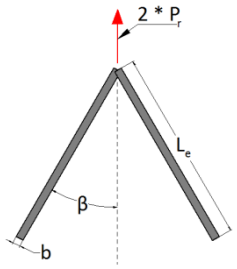
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	6/1/2011 10:01:00 AM
Test Identification:	TS27.08-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 B

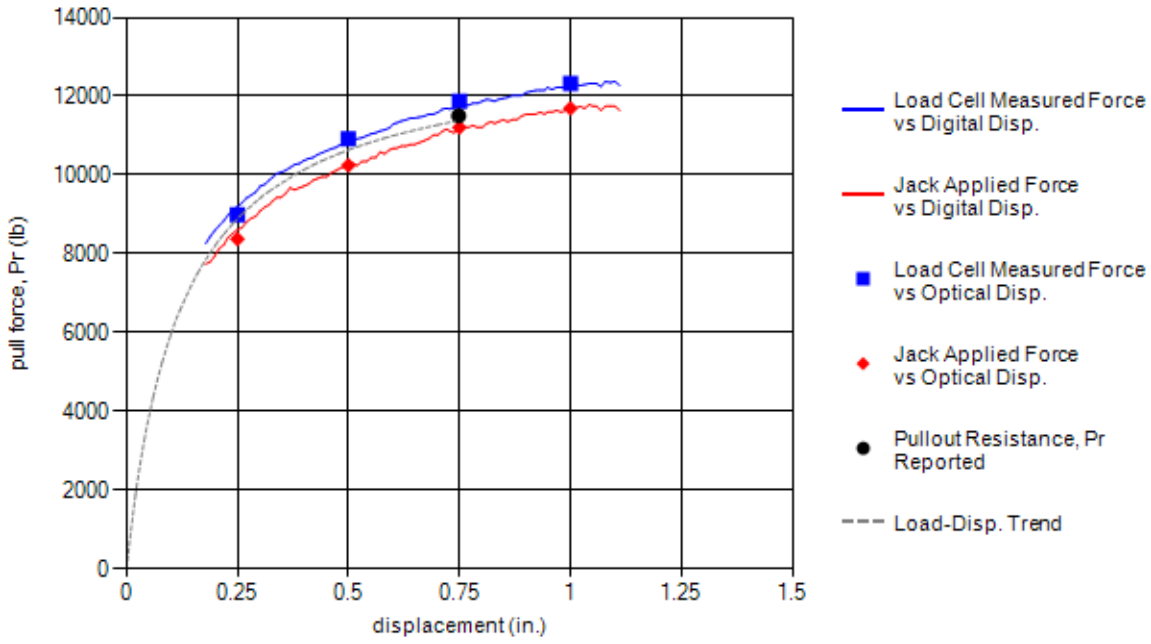
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	119.8	±1.2
Moisture Content, w (%):	8.0	±0.2%
Relative Compaction, C_R (%):	96.2	±0.9%

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	646	11504	5.0	**6.68**

Load-Displacement Curve



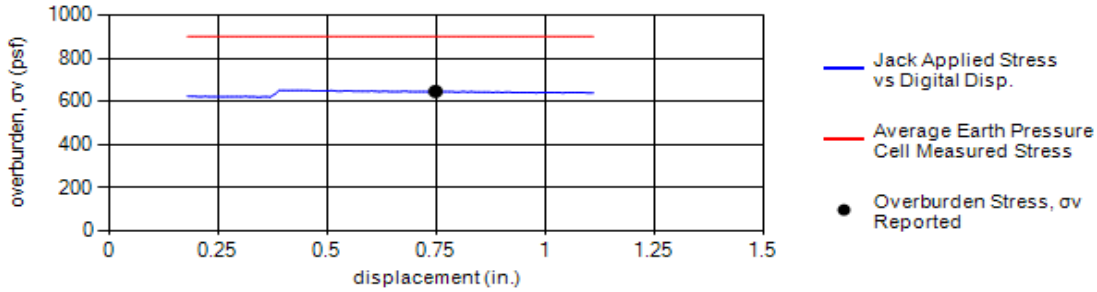
Comments

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.

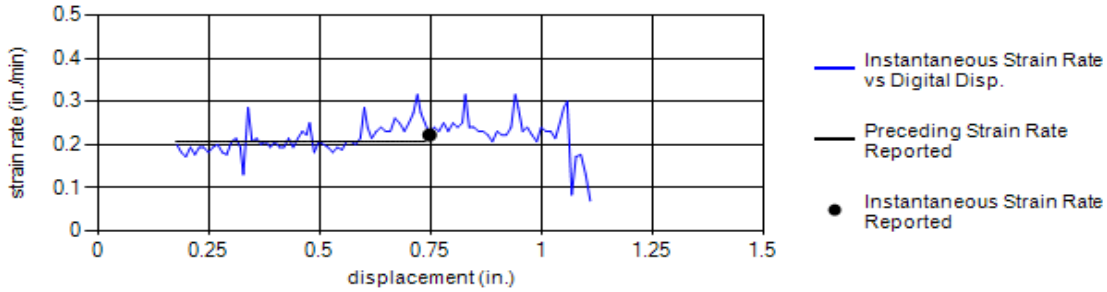
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1123	No Data	720	861	No Data	901	7.91	646



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.22	0.21	0.21



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

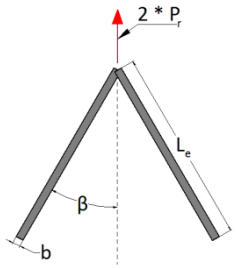
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	6/1/2011 9:44:00 AM
Test Identification:	TS27.09-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, ß (°):	30

Backfill Material

Specification:	TxDOT Item 423 - Type B

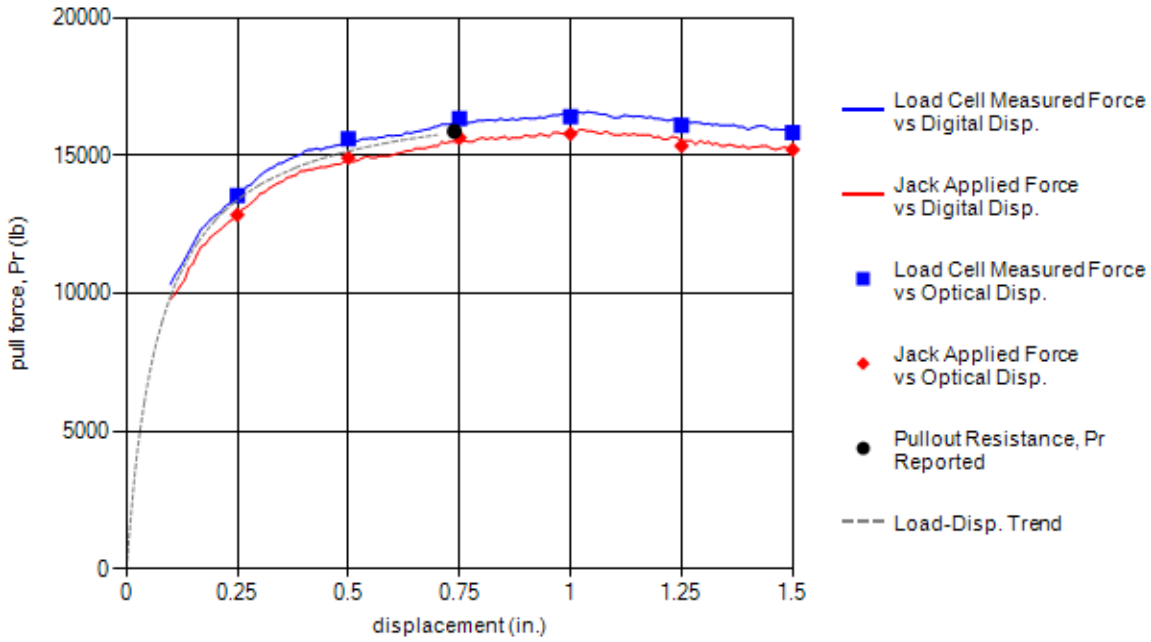
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	119.8	±1.2
Moisture Content, w (%):	8.0	±0.2%
Relative Compaction, C_R (%):	96.2	±0.9%

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	636	15872	4.9	**9.37**

Load-Displacement Curve



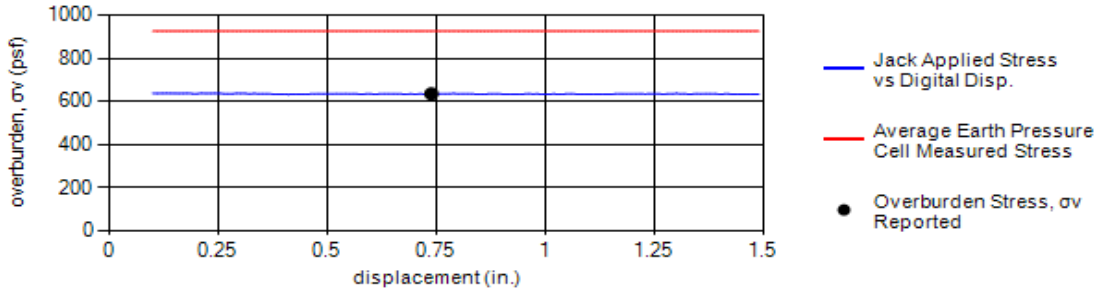
Comments

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.

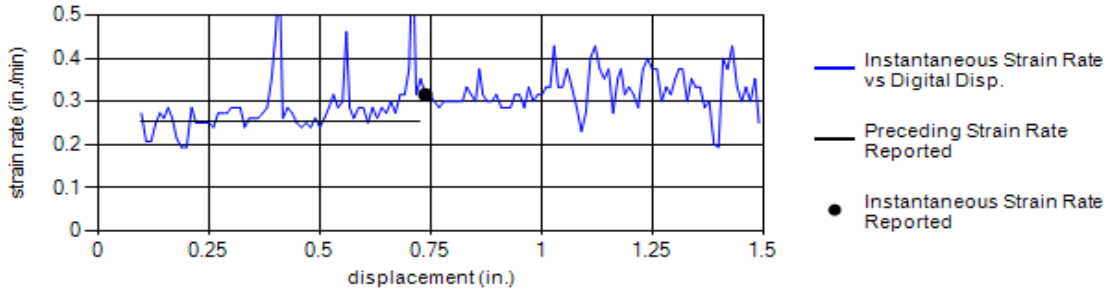
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1163	No Data	829	787	No Data	926	8.25	635



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.32	0.25	0.28



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

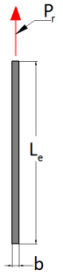
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	6/20/2011 1:08:00 PM
Test Identification:	TS29.01-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 B

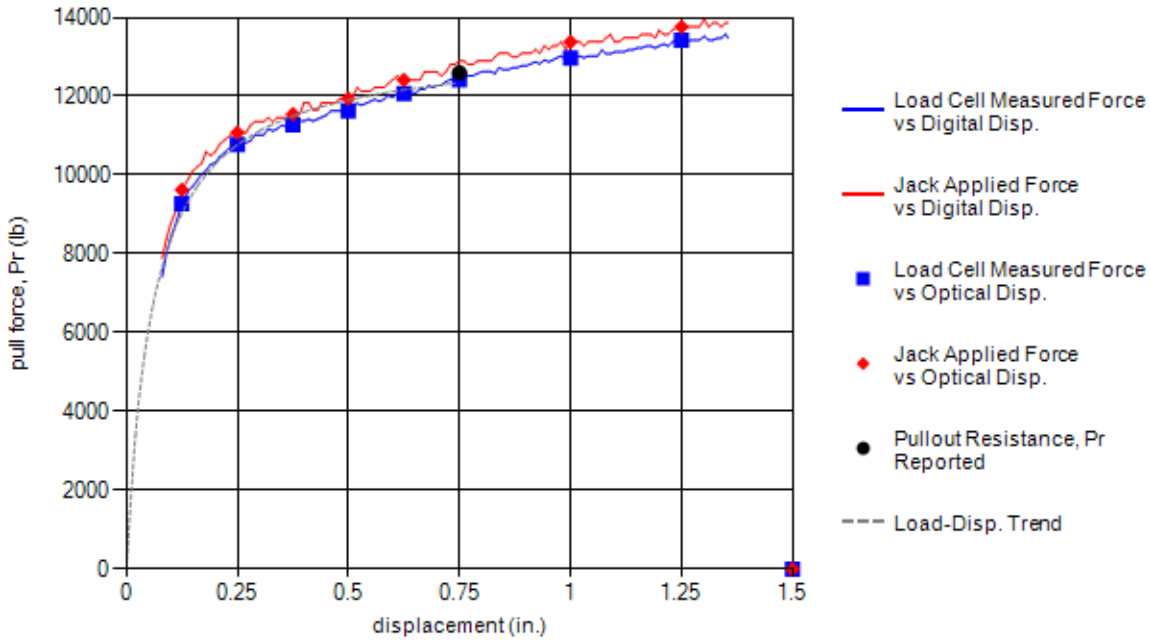
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	119.4	±2.5
Moisture Content, w (%):	7.1	±0.5%
Relative Compaction, C_R (%):	95.9	±2.0%

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	12595	4.9	**5.03**

Load-Displacement Curve

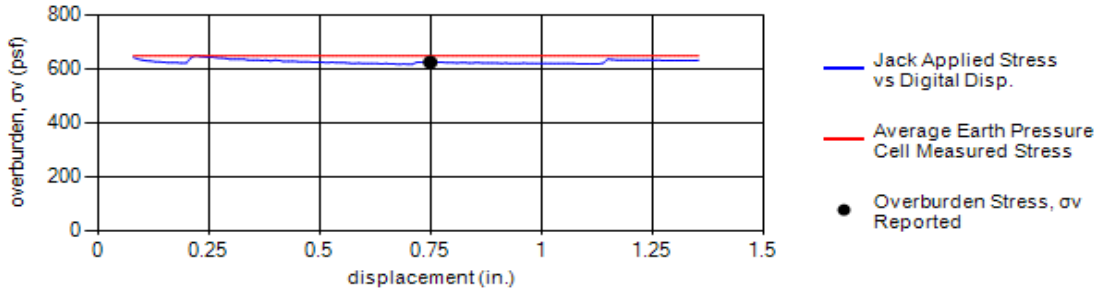


Comments

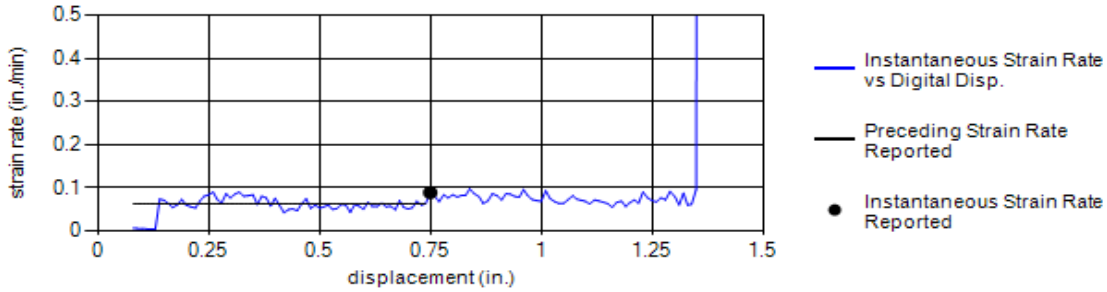
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
720	613	No Data	665	597	649	1.06	625



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

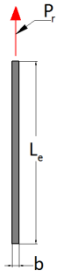
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	6/20/2011 1:41:00 PM
Test Identification:	TS29.02-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 B

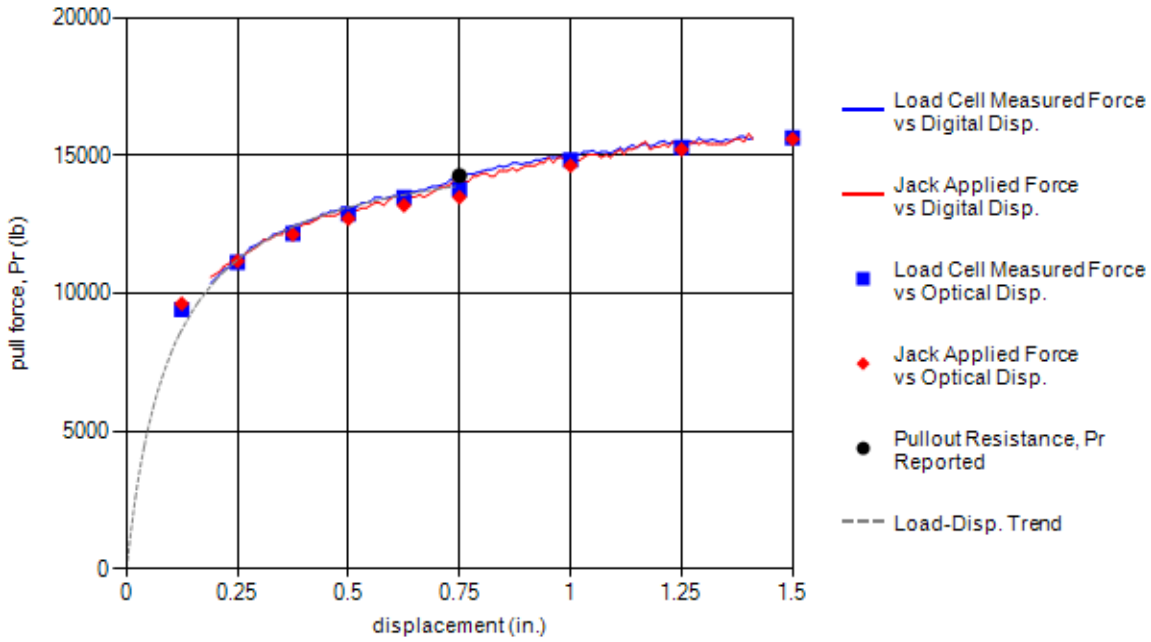
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	119.4	±2.5
Moisture Content, w (%):	7.1	±0.5%
Relative Compaction, C_R (%):	95.9	±2.0%

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	1569	14261	12.3	**2.27**

Load-Displacement Curve

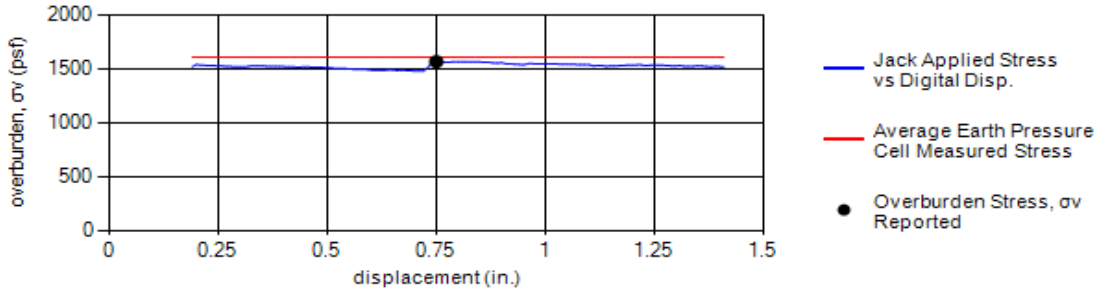


Comments

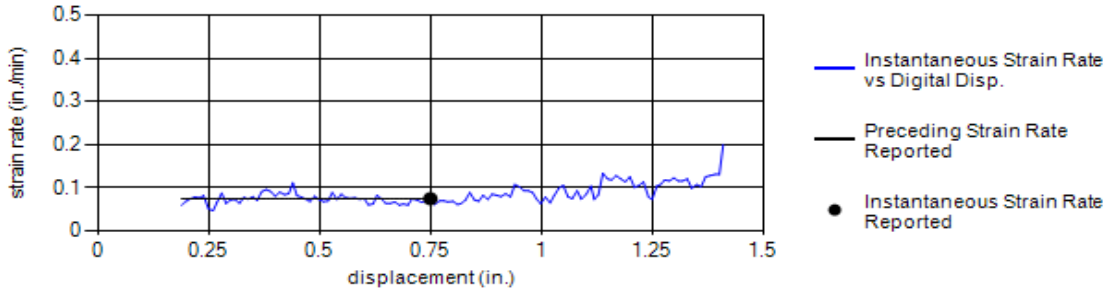
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1759	1548	No Data	1627	1513	1612	1.04	1569



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*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

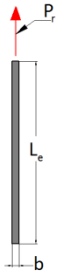
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	6/20/2011 2:40:00 PM
Test Identification:	TS29.03-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 B

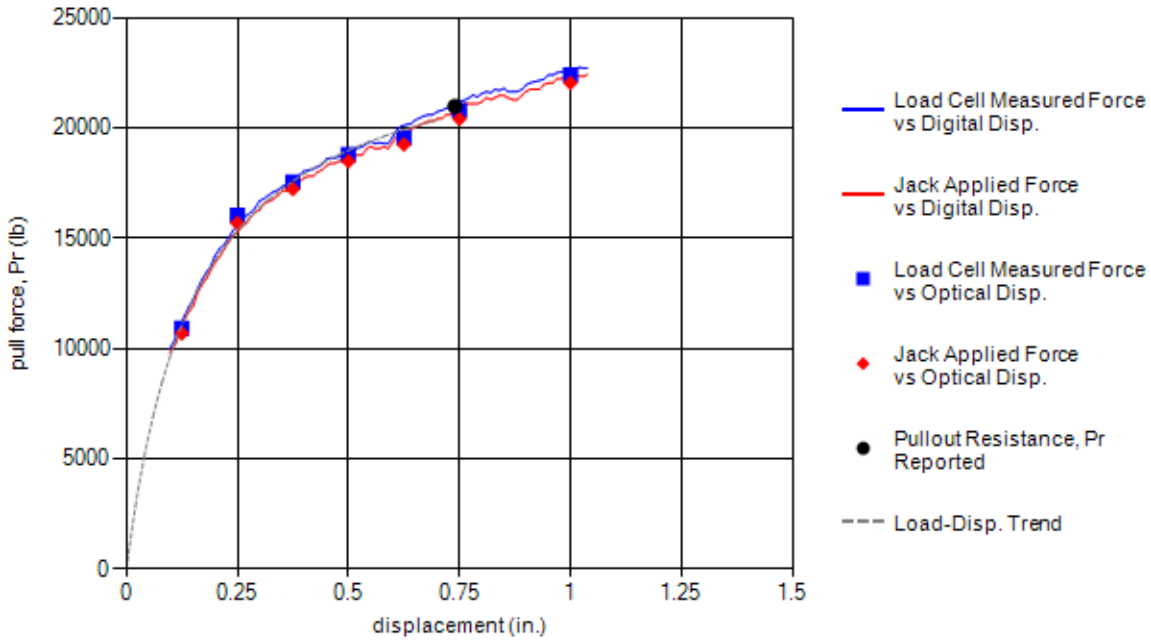
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	119.4	±2.5
Moisture Content, w (%):	7.1	±0.5%
Relative Compaction, C_R (%):	95.9	±2.0%

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	2547	20972	19.9	**2.06**

Load-Displacement Curve

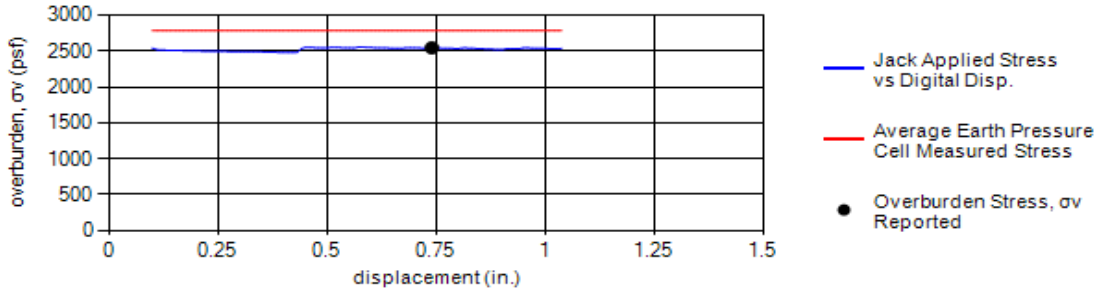


Comments

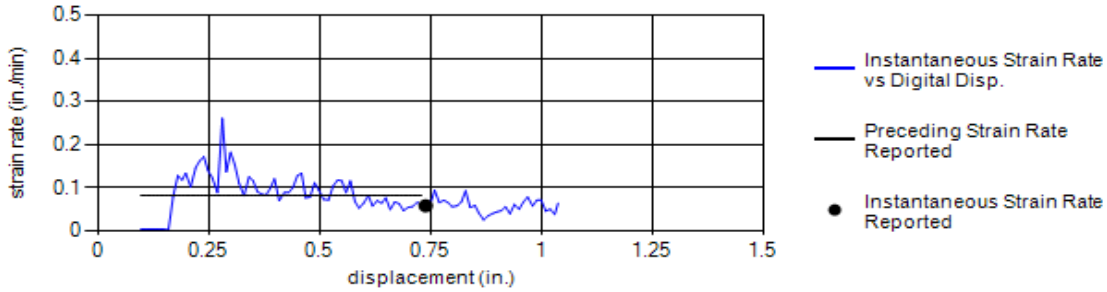
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2965	2720	No Data	2847	2614	2786	1.01	2547



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

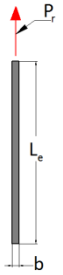
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	6/20/2011 3:15:00 PM
Test Identification:	TS29.04-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 B

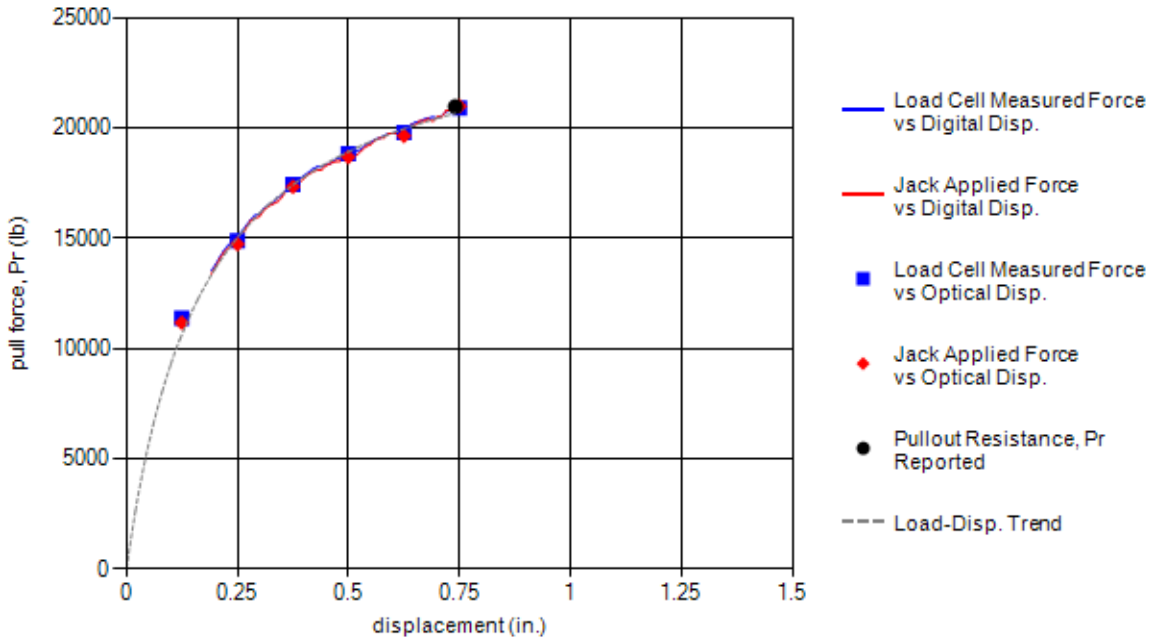
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	119.4	±2.5
Moisture Content, w (%):	7.1	±0.5%
Relative Compaction, C_R (%):	95.9	±2.0%

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	0.74	5026	20954	39.3	**1.04**

Load-Displacement Curve



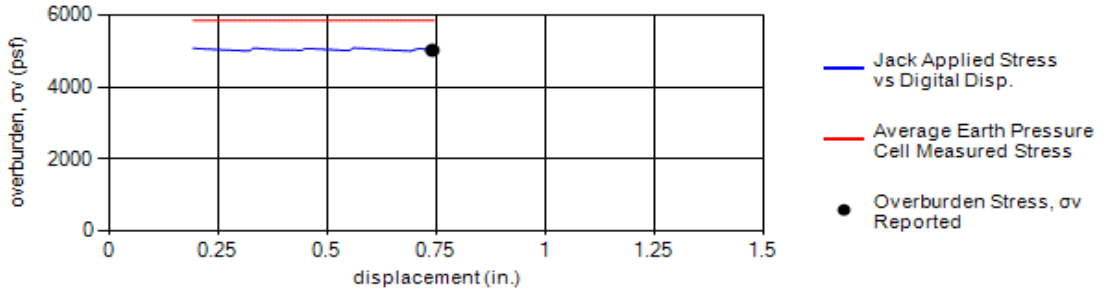
Comments

Connection rupture at 0.74in.

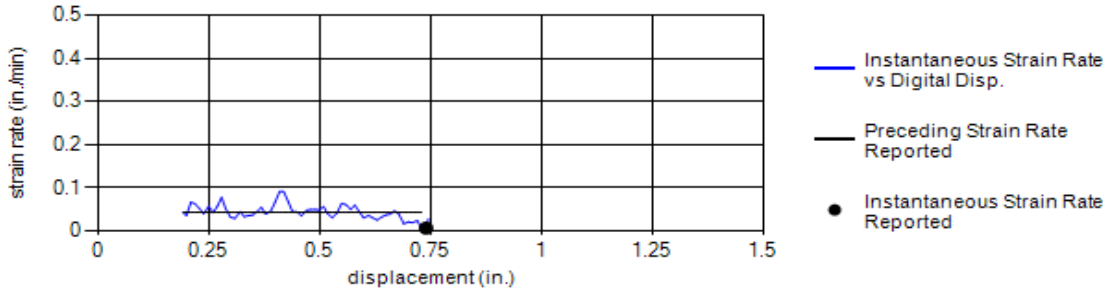
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
6223	5687	No Data	5962	5551	5856	1.03	5025



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.01	0.04	0.04



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

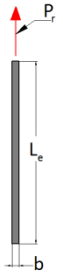
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	6/21/2011 4:24:00 PM
Test Identification:	TS29.05-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 B

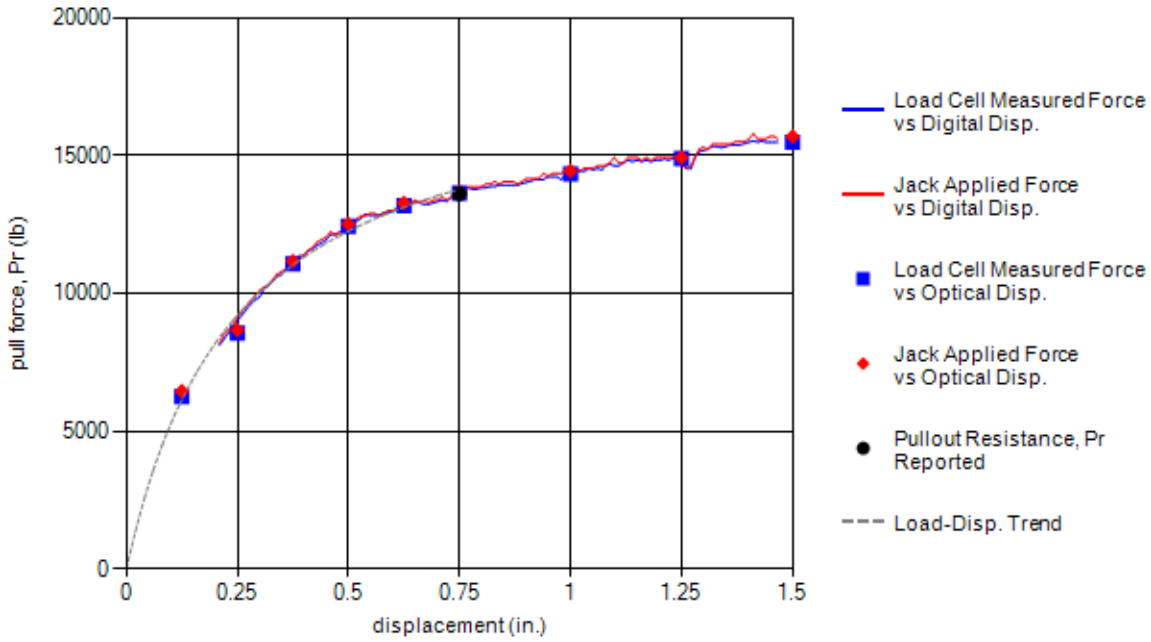
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	119.4	±2.5
Moisture Content, w (%):	7.1	±0.5%
Relative Compaction, C_R (%):	95.9	±2.0%

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	623	13611	4.9	**5.46**

Load-Displacement Curve

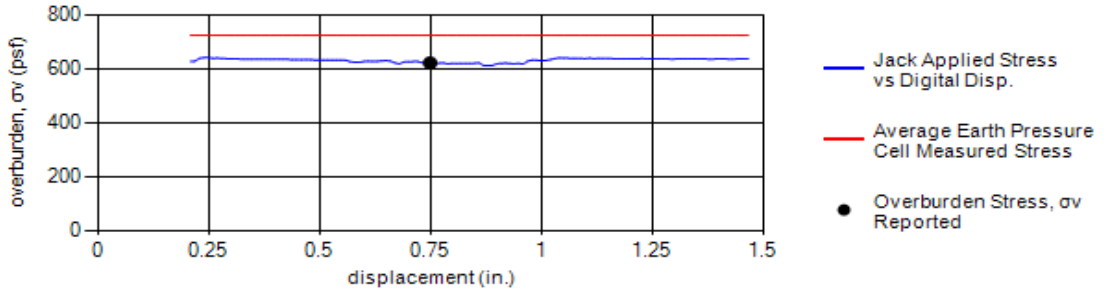


Comments

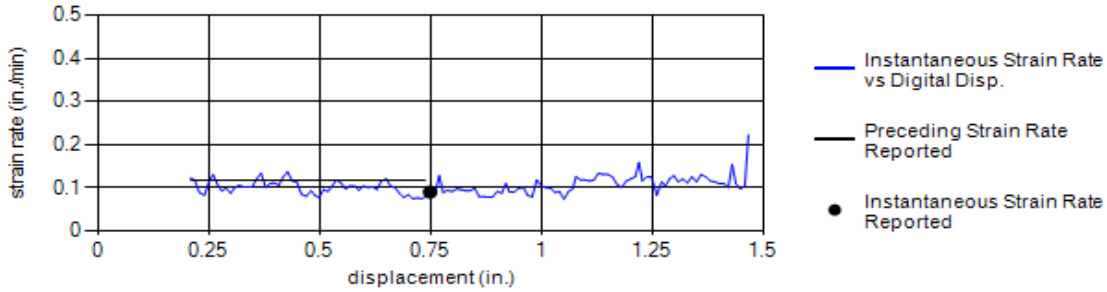
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
711	742	No Data	667	786	726	8.88	619



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

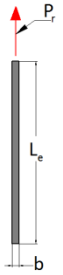
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	6/21/2011 12:11:00 PM
Test Identification:	TS29.06-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 B

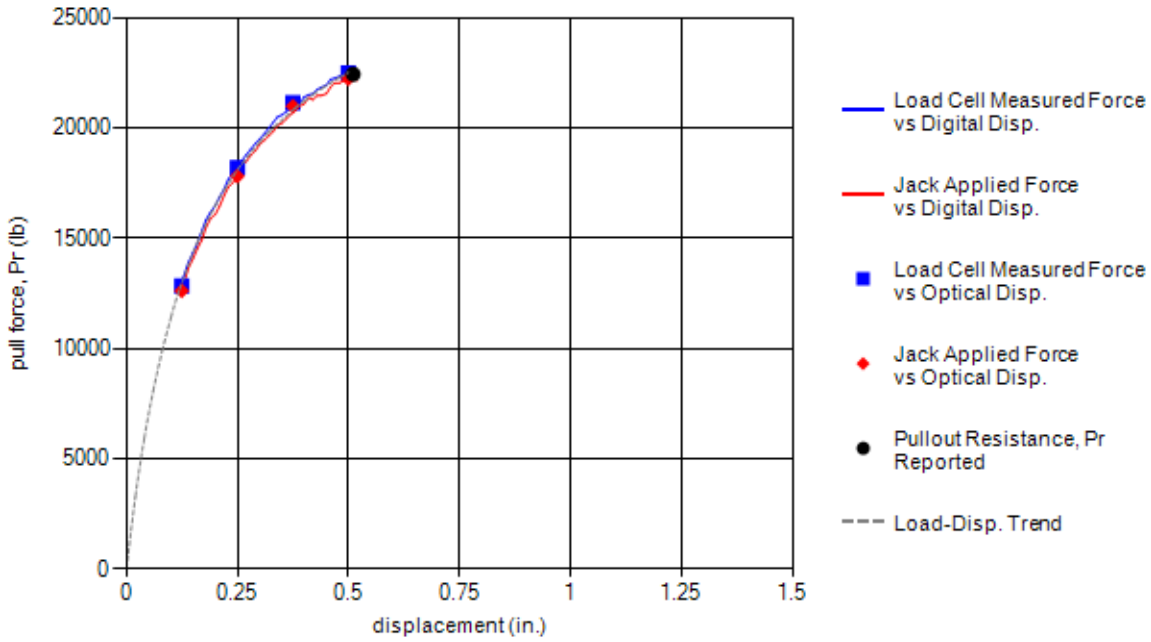
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	121.9	±3.3
Moisture Content, w (%):	6.4	±0.8%
Relative Compaction, C_R (%):	97.9	±2.6%

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	0.51	1539	22427	11.9	**3.64**

Load-Displacement Curve



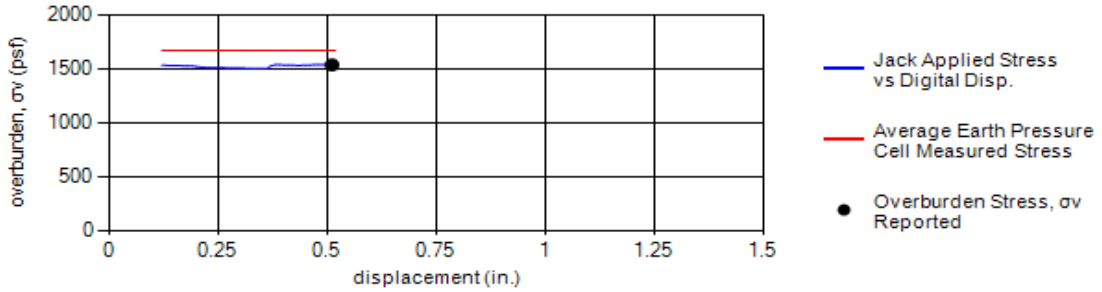
Comments

Connection rupture at 0.51in.

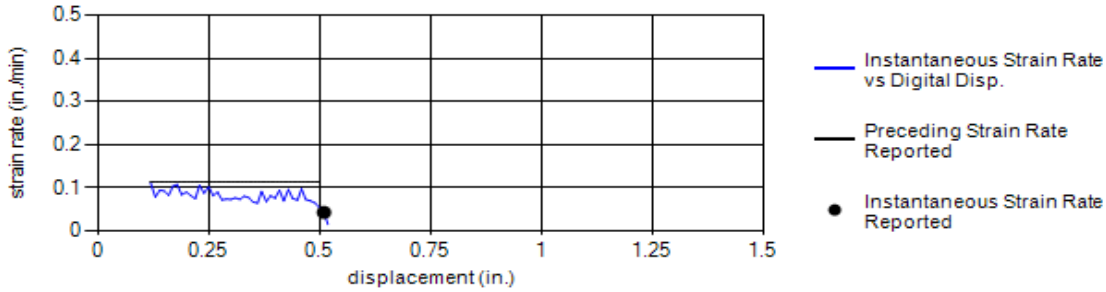
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1833	1587	No Data	1667	1608	1674	3.68	1539



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.04	0.11	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

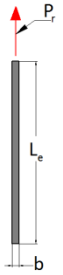
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	6/21/2011 10:48:00 AM
Test Identification:	TS29.07-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 B

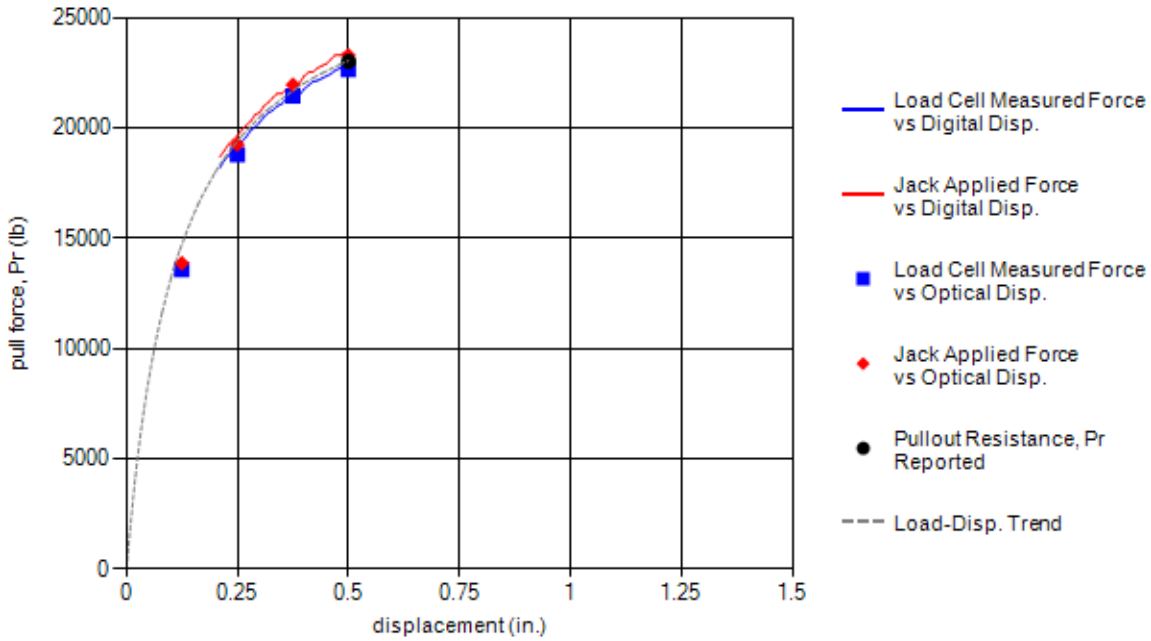
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	121.9	±3.3
Moisture Content, w (%):	6.4	±0.8%
Relative Compaction, C_R (%):	97.9	±2.6%

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	0.50	2573	23009	19.8	**2.24**

Load-Displacement Curve



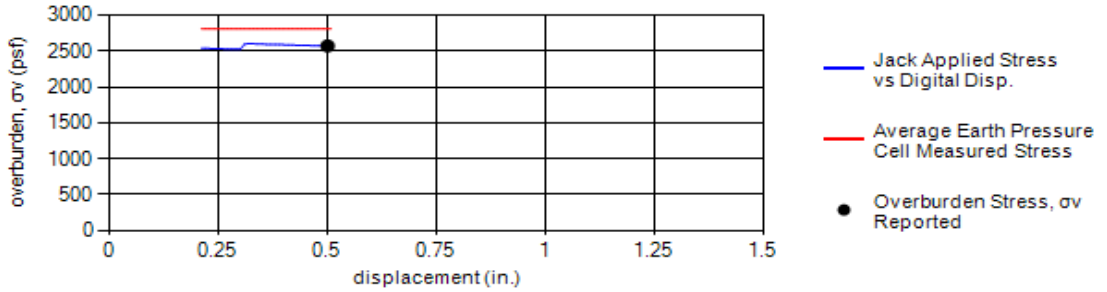
Comments

Connection rupture at 0.50in.

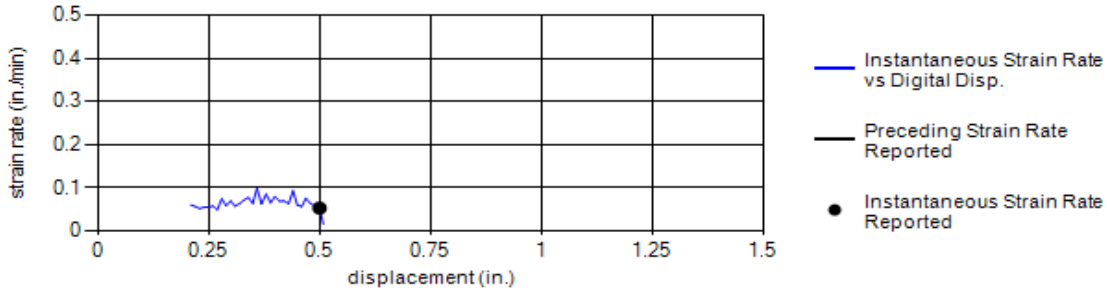
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3037	2657	No Data	2842	2711	2812	2.20	2573



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

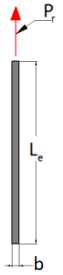
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	6/21/2011 10:22:00 AM
Test Identification:	TS29.08-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 B

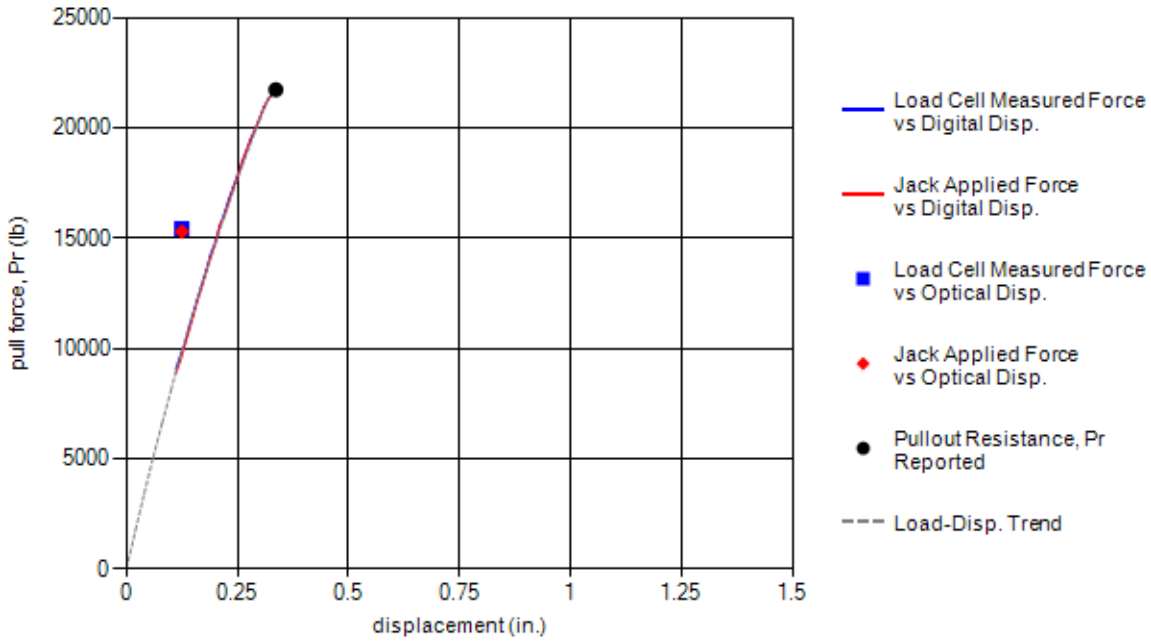
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	121.9	±3.3
Moisture Content, w (%):	6.4	±0.8%
Relative Compaction, C_R (%):	97.9	±2.6%

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	0.34	5667	21725	43.7	**0.96**

Load-Displacement Curve



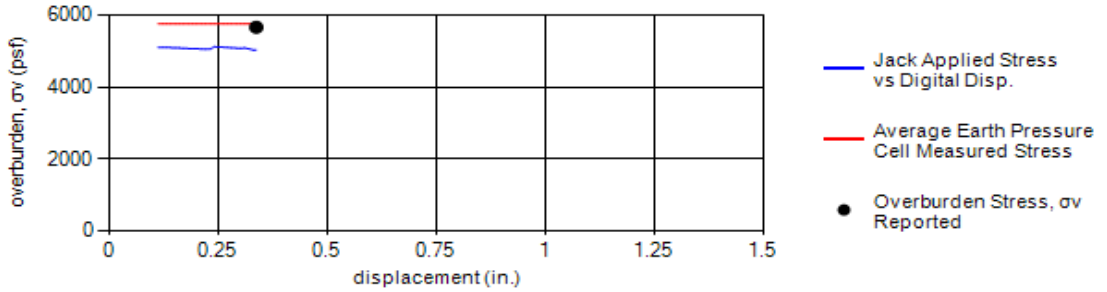
Comments

Connection rupture at 0.34in.

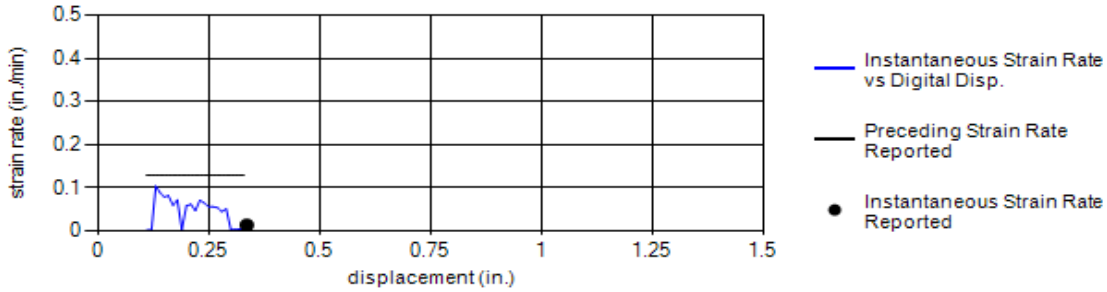
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
6216	5438	No Data	5843	5549	5762	2.00	5040



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.01	0.13	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

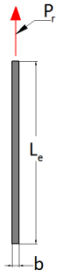
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	6/21/2011 9:15:00 AM
Test Identification:	TS29.09-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 B

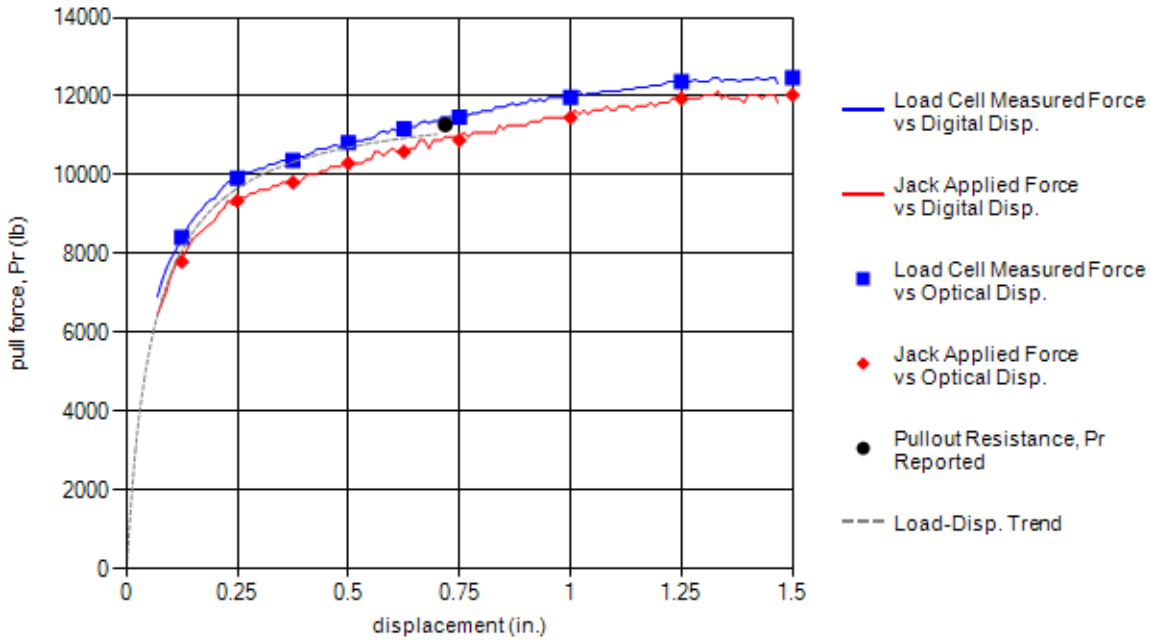
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	121.9	±3.3
Moisture Content, w (%):	6.4	±0.8%
Relative Compaction, C_R (%):	97.9	±2.6%

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	0.72	635	11278	4.9	**6.66**

Load-Displacement Curve

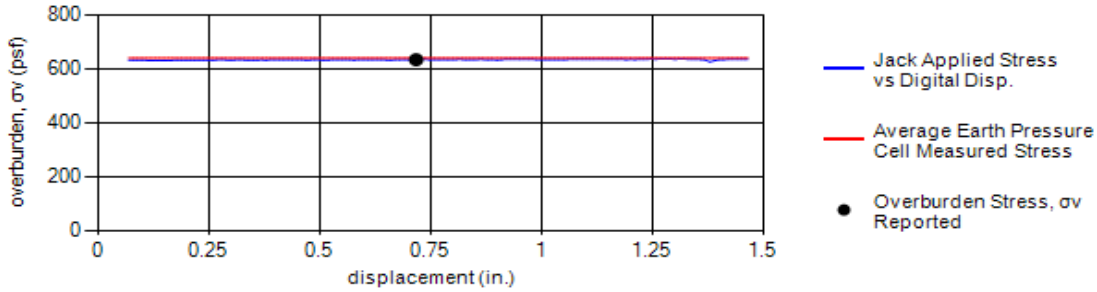


Comments

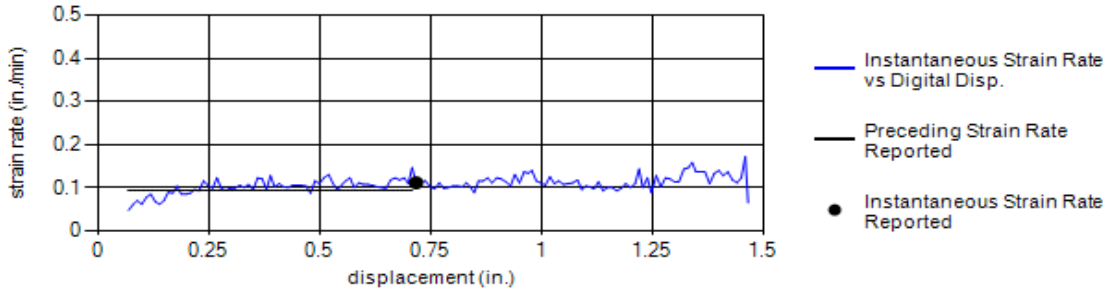
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
708	665	No Data	614	583	642	9.46	635



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

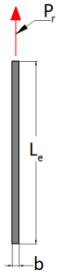
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	6/21/2011 8:53:00 AM
Test Identification:	TS29.10-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 B

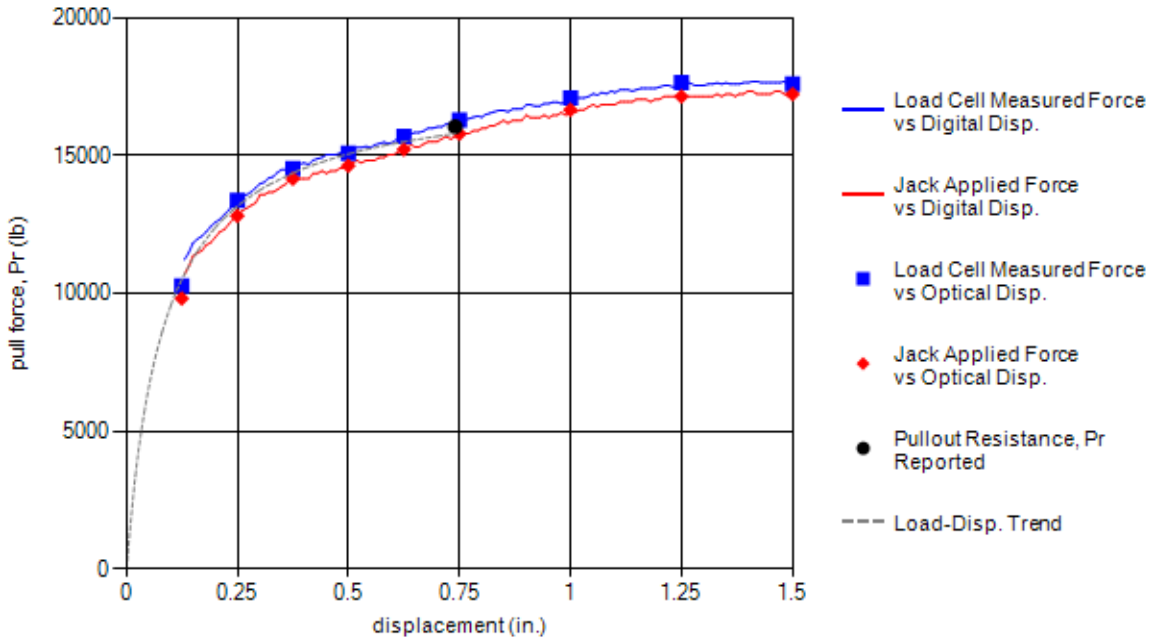
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	121.9	±3.3
Moisture Content, w (%):	6.4	±0.8%
Relative Compaction, C_R (%):	97.9	±2.6%

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	1529	16037	11.8	**3.93**

Load-Displacement Curve

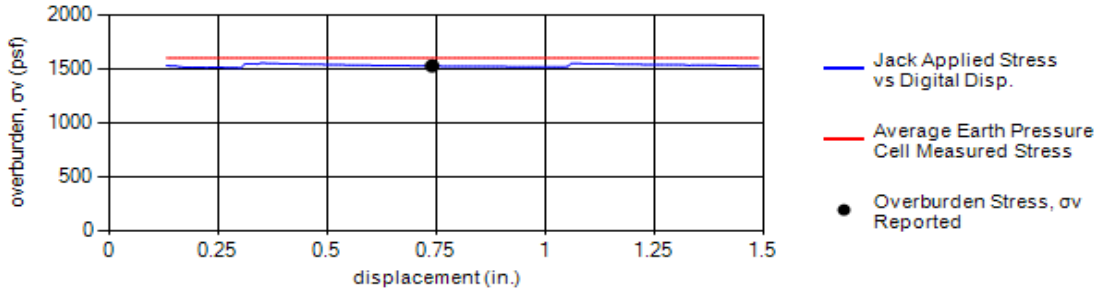


Comments

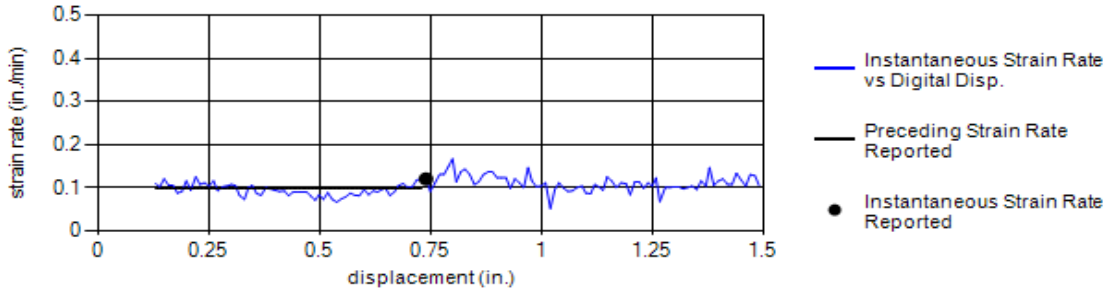
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1713	1601	No Data	1595	1512	1605	3.79	1529



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*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

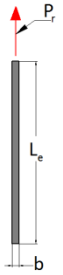
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	6/21/2011 12:47:00 PM
Test Identification:	TS29.11-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 B

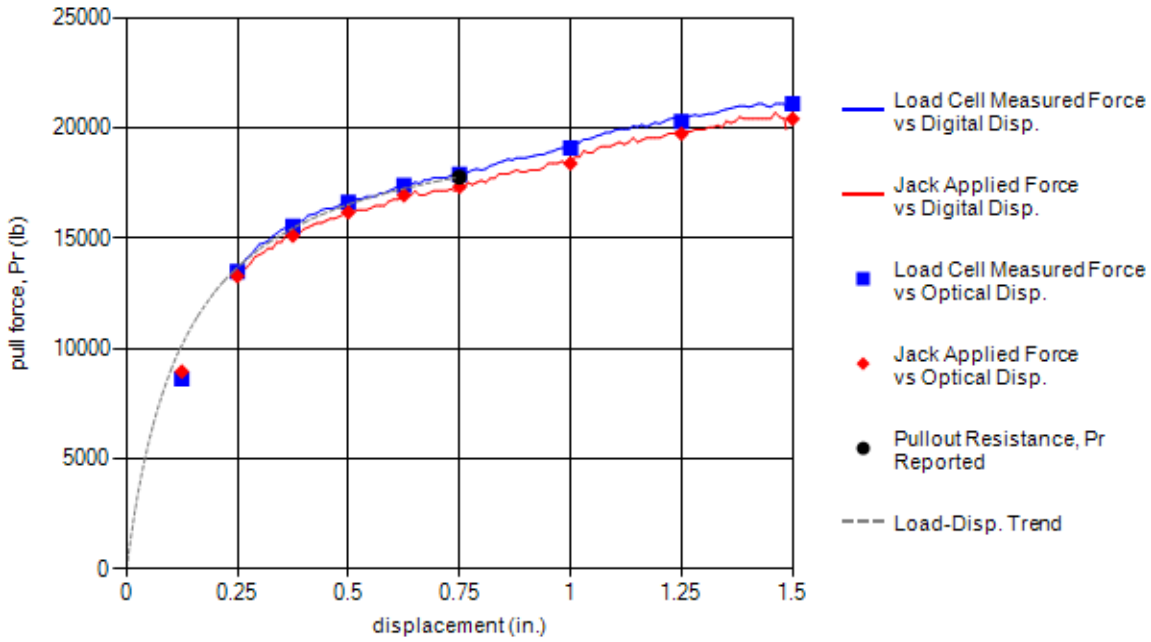
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	124.4	±1.5
Moisture Content, w (%):	5.8	±0.5%
Relative Compaction, C_R (%):	99.9	±1.2%

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	2560	17762	19.5	**2.60**

Load-Displacement Curve

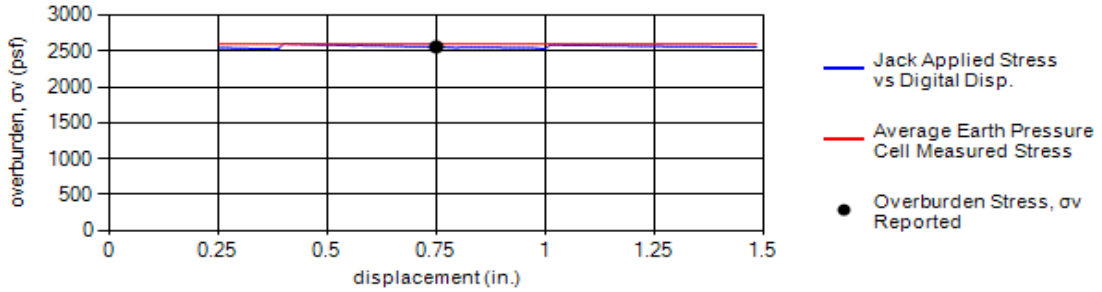


Comments

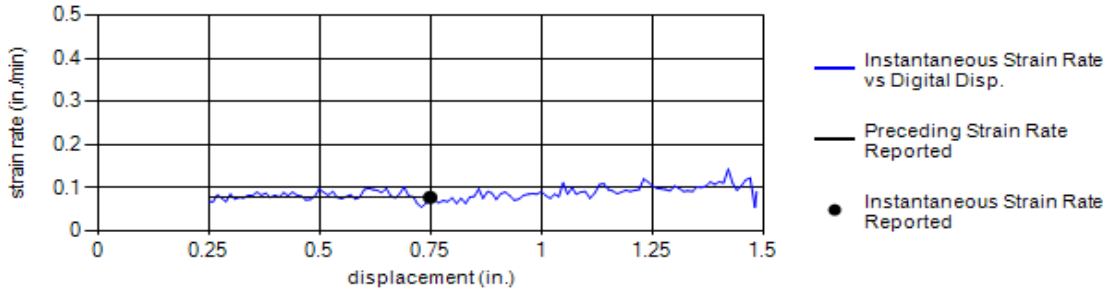
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2788	2485	No Data	2571	2557	2600	2.34	2559



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

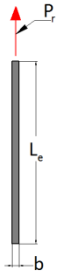
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	6/21/2011 1:17:00 PM
Test Identification:	TS29.12-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 B

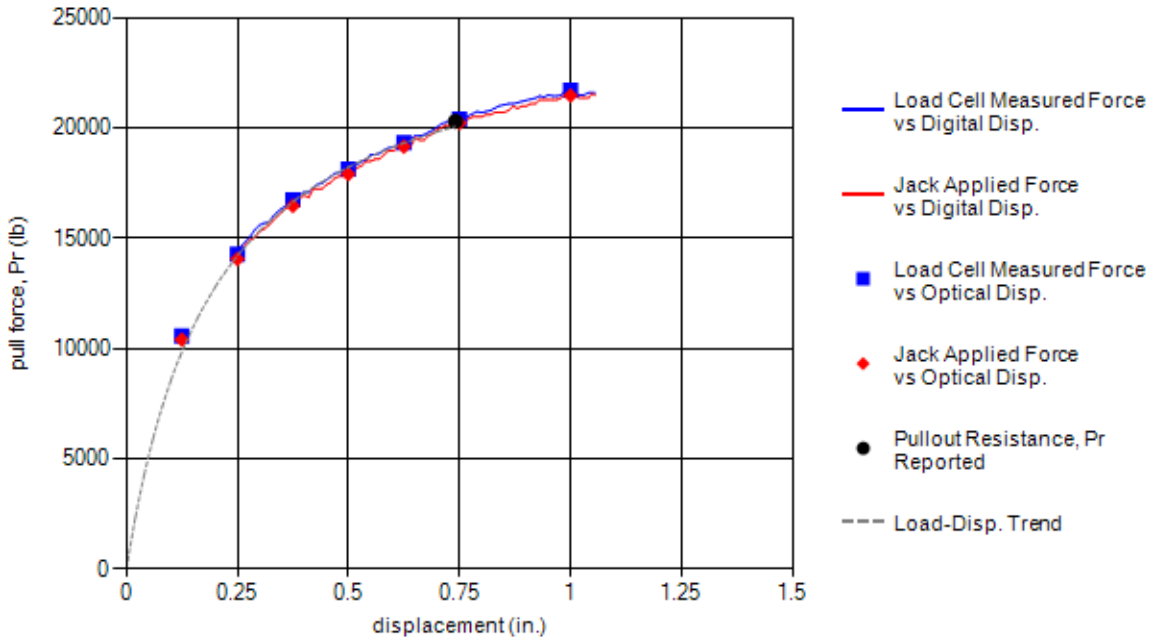
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	124.4	±1.5
Moisture Content, w (%):	5.8	±0.5%
Relative Compaction, C_R (%):	99.9	±1.2%

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	5116	20289	38.9	**1.49**

Load-Displacement Curve

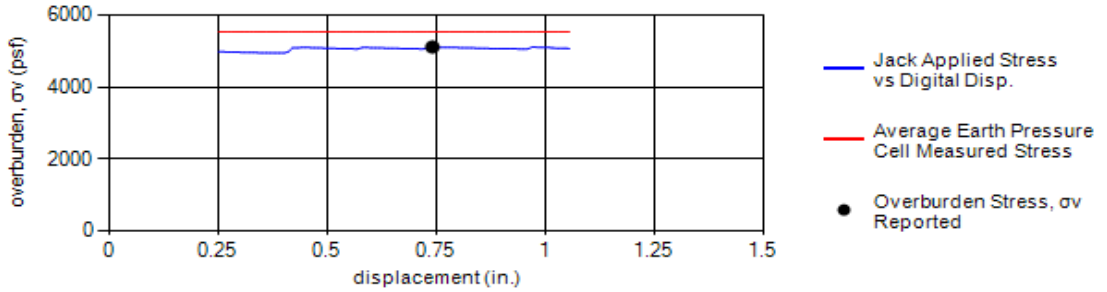


Comments

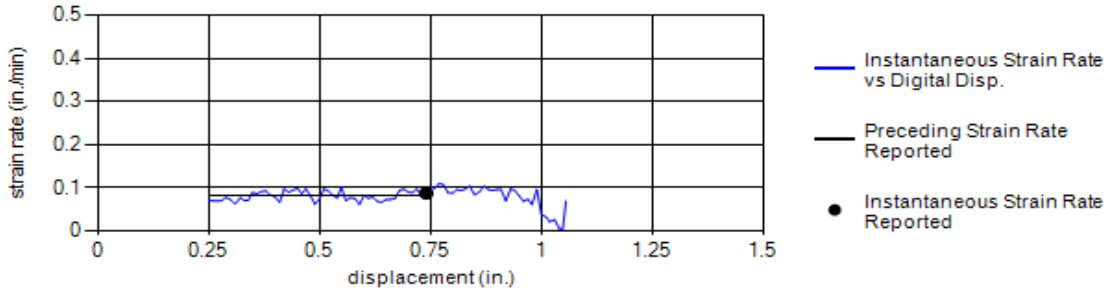
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
5687	5290	No Data	5632	5536	5536	1.13	5116



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*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

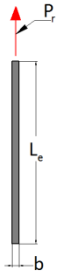
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	6/21/2011 2:32:00 PM
Test Identification:	TS29.13-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 B

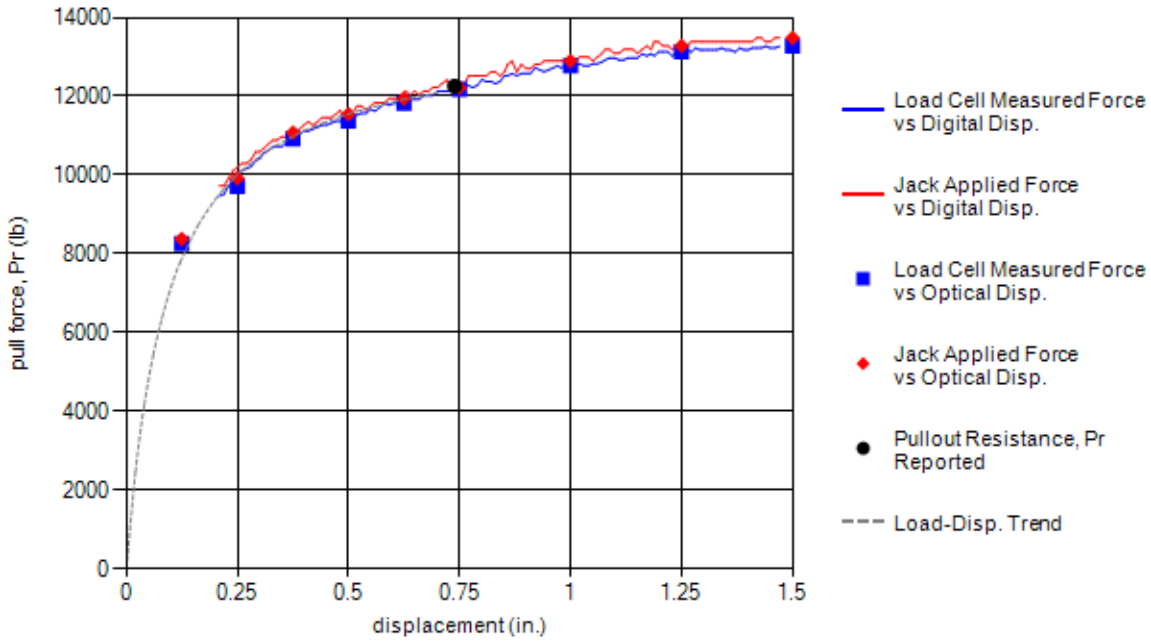
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	124.4	±1.5
Moisture Content, w (%):	5.8	±0.5%
Relative Compaction, C_R (%):	99.9	±1.2%

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	12255	4.8	**7.25**

Load-Displacement Curve

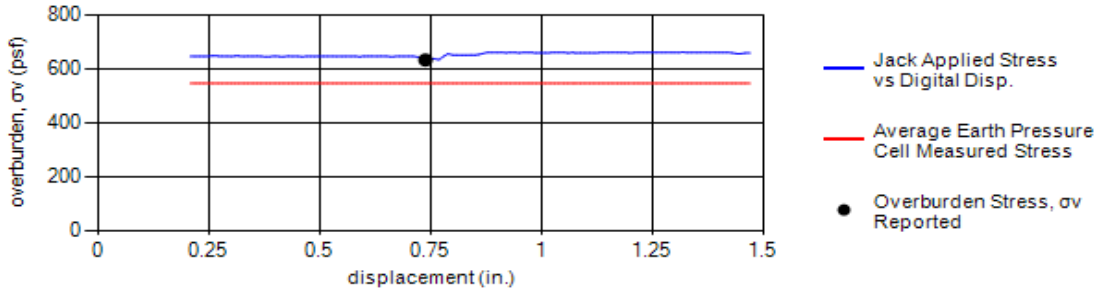


Comments

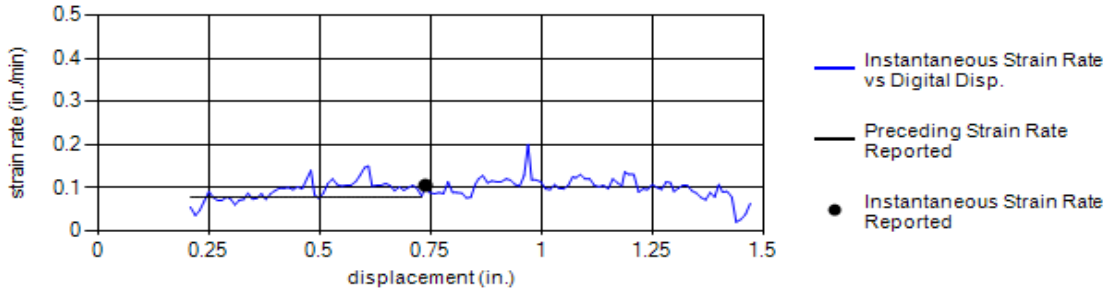
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
611	456	No Data	513	607	547	11.23	636



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*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

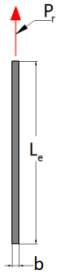
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	6/21/2011 2:57:00 PM
Test Identification:	TS29.14-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 B

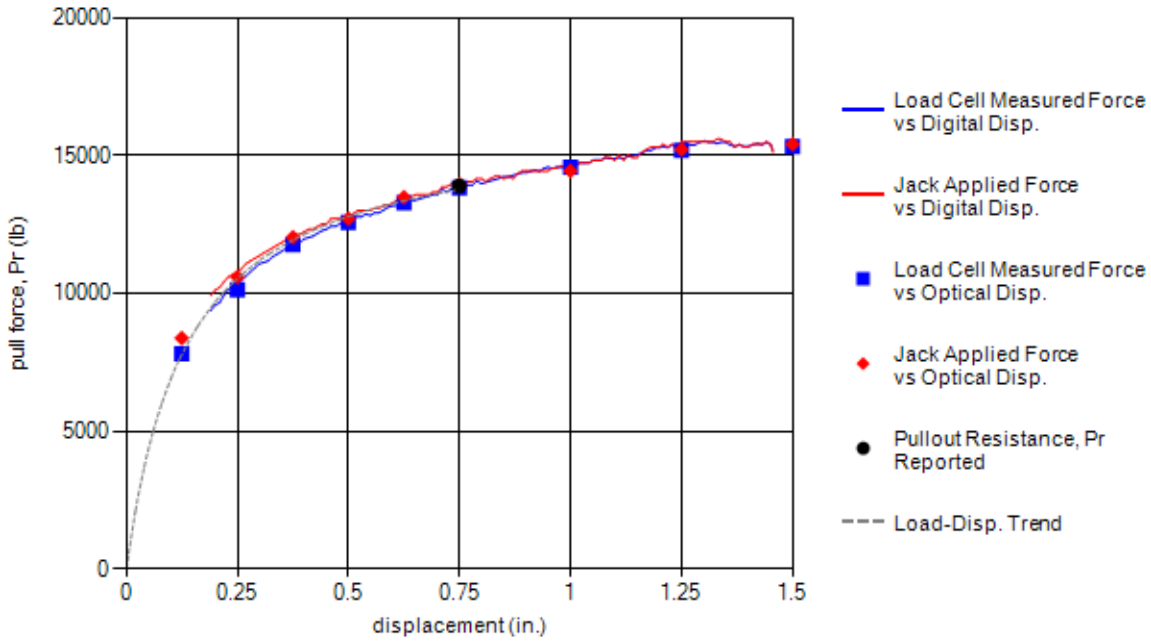
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	124.4	±1.5
Moisture Content, w (%):	5.8	±0.5%
Relative Compaction, C_R (%):	99.9	±1.2%

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	1520	13887	11.6	**3.43**

Load-Displacement Curve

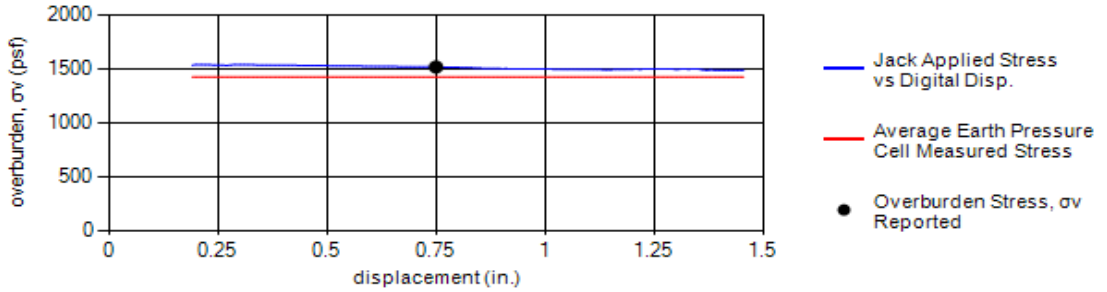


Comments

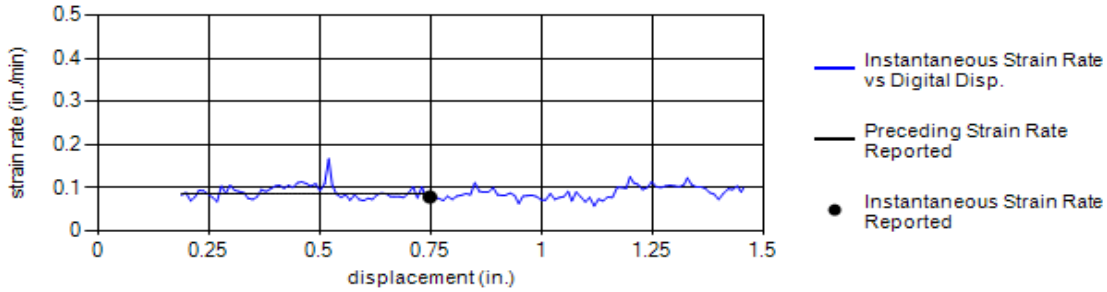
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1515	1274	No Data	1414	1506	1427	4.35	1520



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

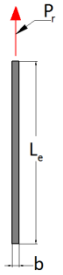
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	6/21/2011 3:36:00 PM
Test Identification:	TS29.15-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 B

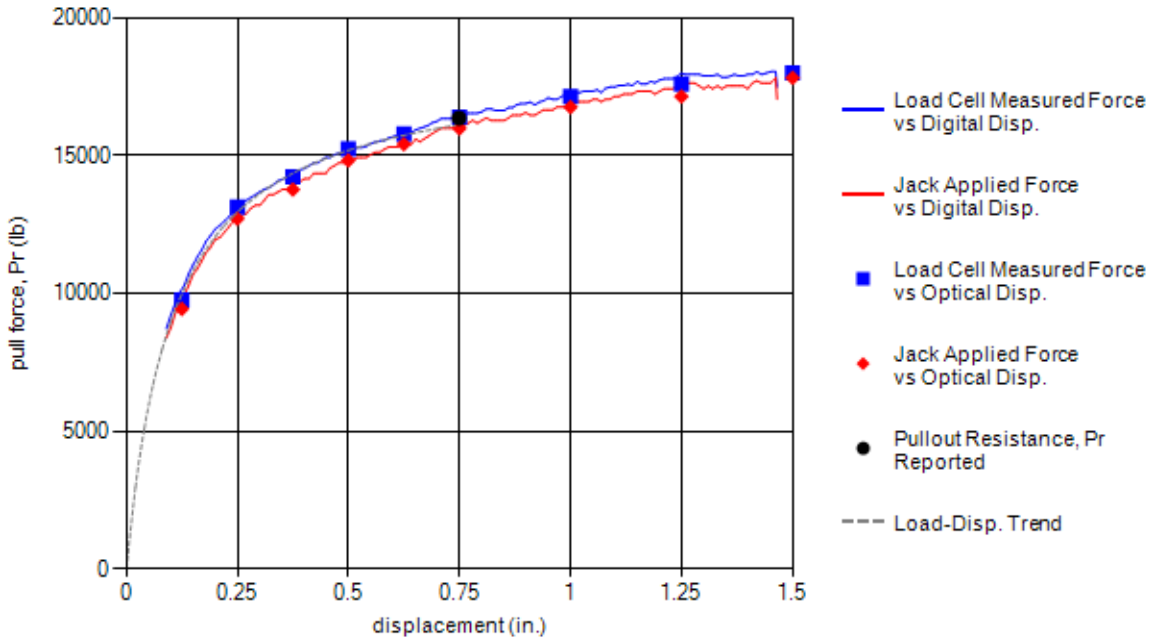
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	124.4	±1.5
Moisture Content, w (%):	5.8	±0.5%
Relative Compaction, C_R (%):	99.9	±1.2%

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	2555	16350	19.4	**2.40**

Load-Displacement Curve

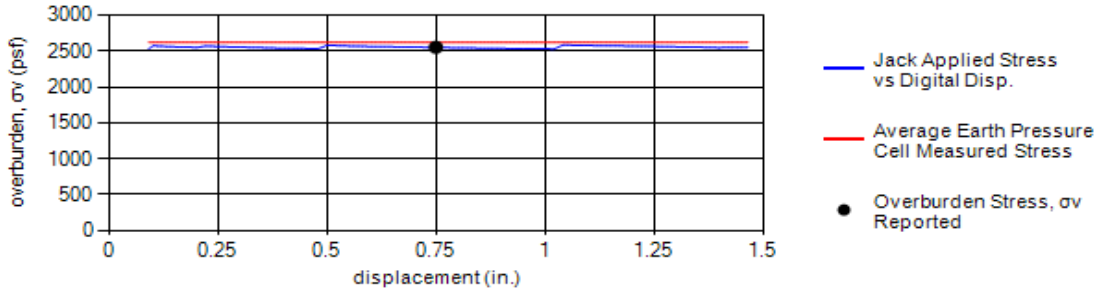


Comments

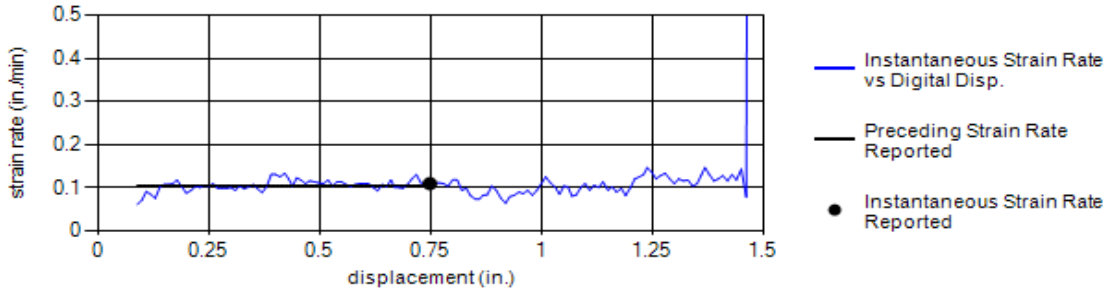
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2656	2610	No Data	2611	2623	2625	2.34	2552



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*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

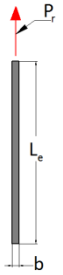
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	6/21/2011 12:00:00 PM
Test Identification:	TS29.16-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 B

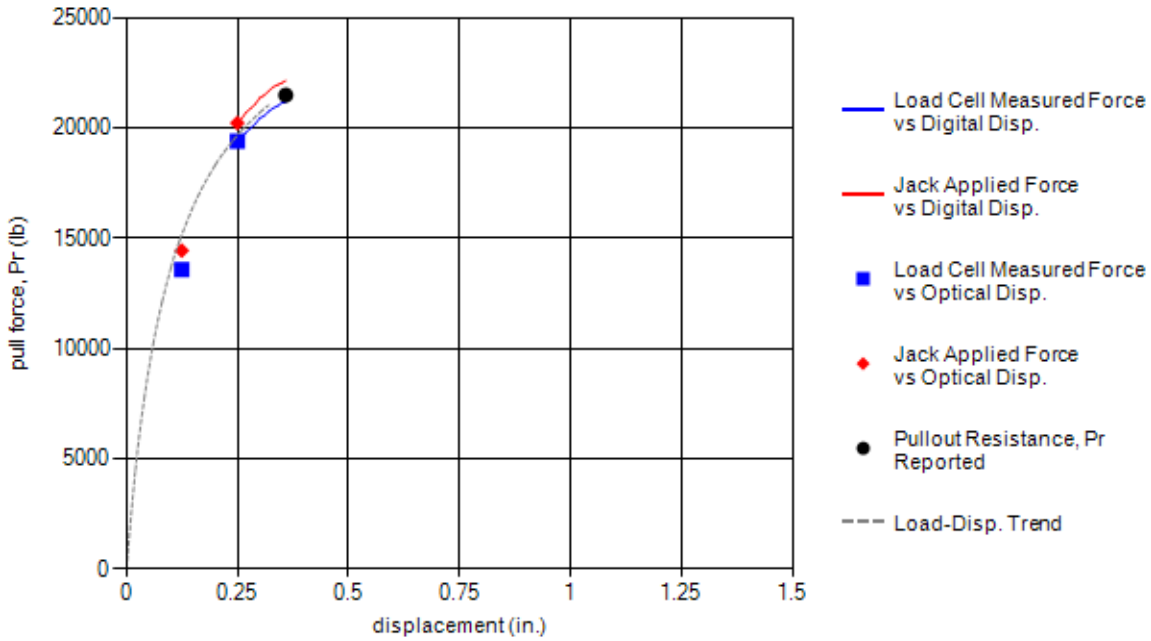
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	124.4	±1.5
Moisture Content, w (%):	5.8	±0.5%
Relative Compaction, C_R (%):	99.9	±1.2%

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	0.36	5118	21479	38.9	**1.57**

Load-Displacement Curve



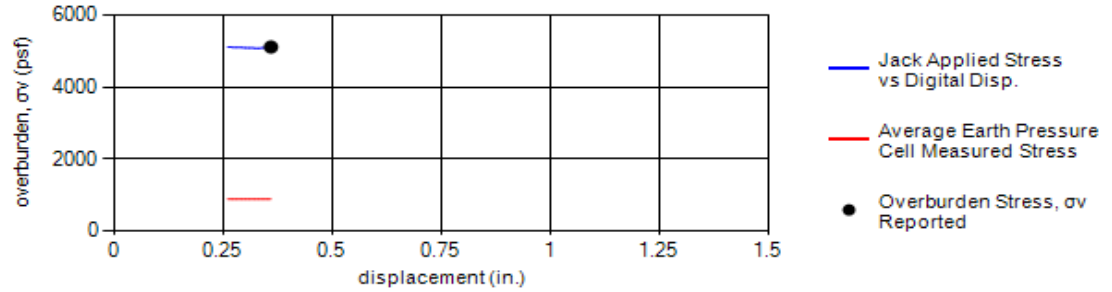
Comments

Connection rupture at 0.36in.

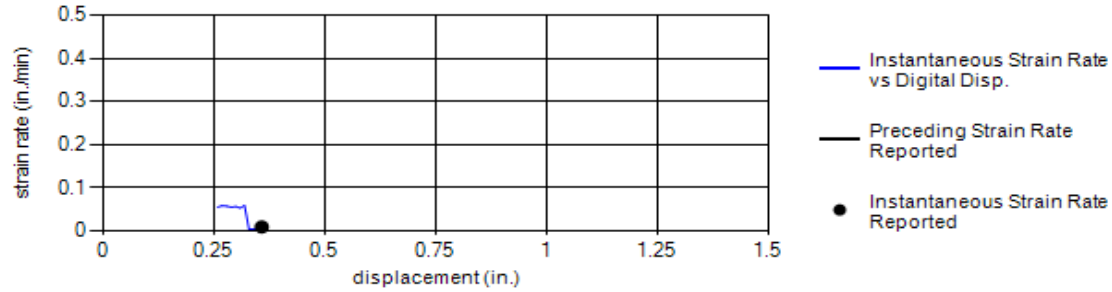
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
977	776	No Data	858	898	877	7.00	5118



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.01	0.10	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 (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

Appendix G

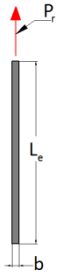
MSE Reinforcement Pullout Test Reports: Ribbed Strips in Type B Backfill – Under-Compacted

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/27/2010 9:26:00 AM
Test Identification:	TS01.04-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 B

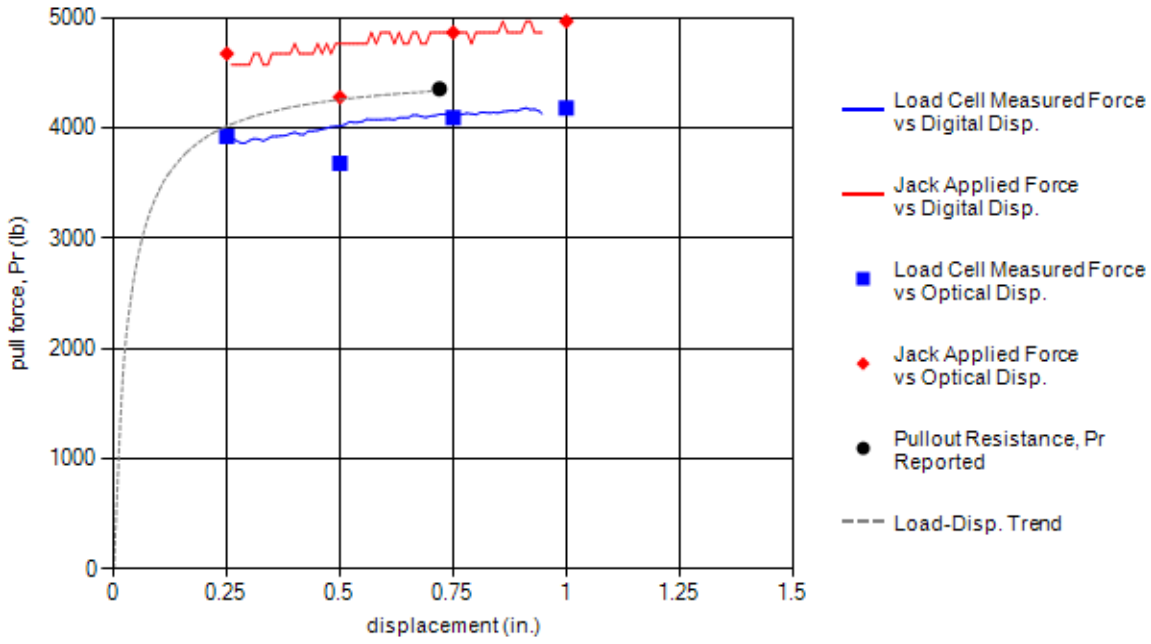
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	113.7	±2.6
Moisture Content, w (%):	7.4	±0.9%
Relative Compaction, C_R (%):	91.3	±2.1%

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	597	4352	4.9	**2.73**

Load-Displacement Curve



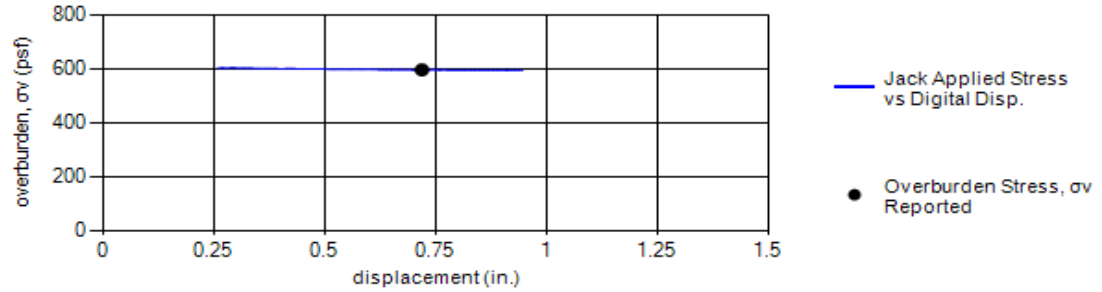
Comments

One inch displacement gage used. No earth pressure cell data.

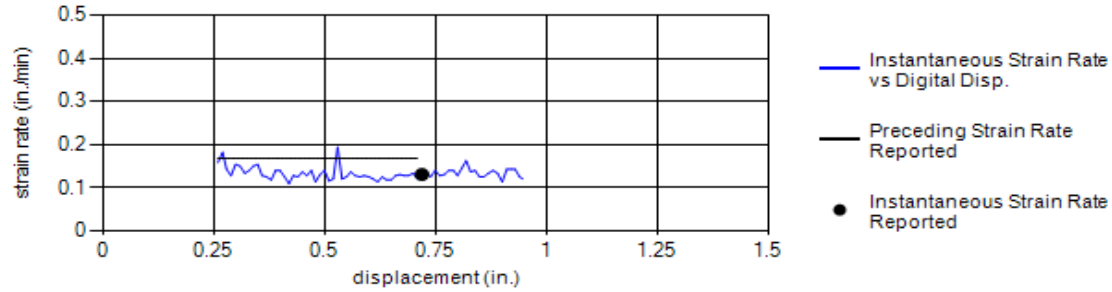
Personnel

Tested:	TW AS MB
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	1.18	597



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.13	0.17	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

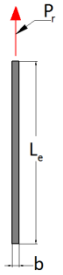
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/27/2010 9:51:00 AM
Test Identification:	TS01.05-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 B

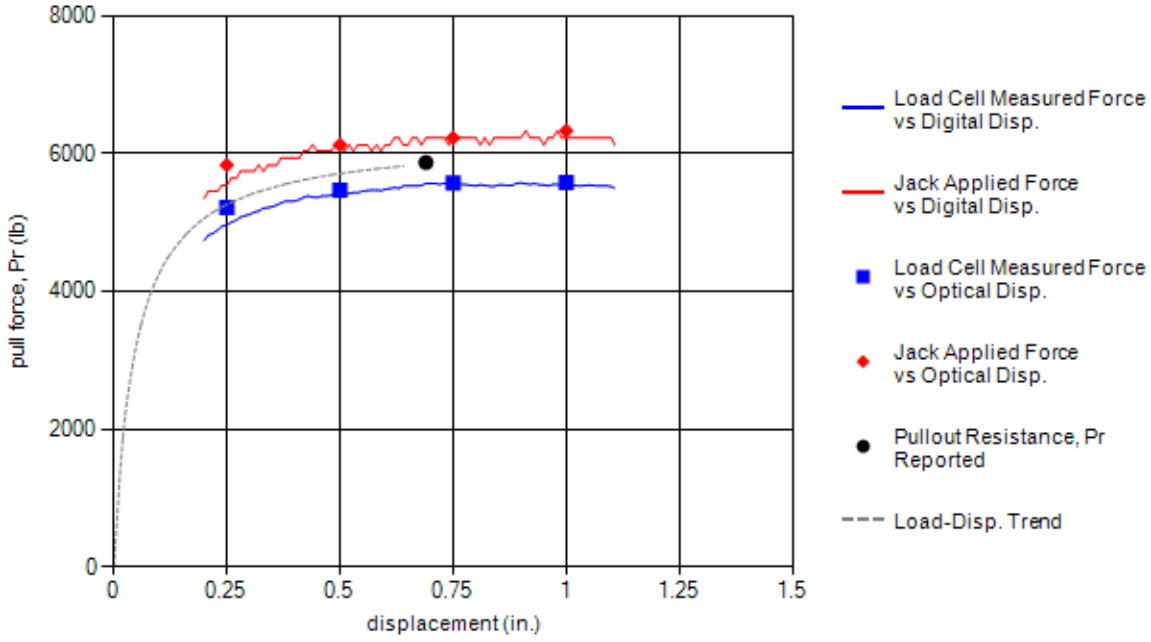
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	113.7	±2.6
Moisture Content, w (%):	7.4	±0.9%
Relative Compaction, C_R (%):	91.3	±2.1%

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	0.69	617	5867	5.0	**3.57**

Load-Displacement Curve



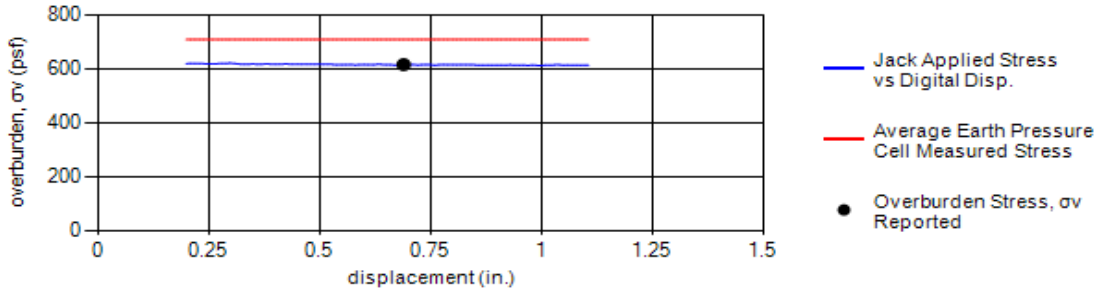
Comments

One inch displacement gage used.

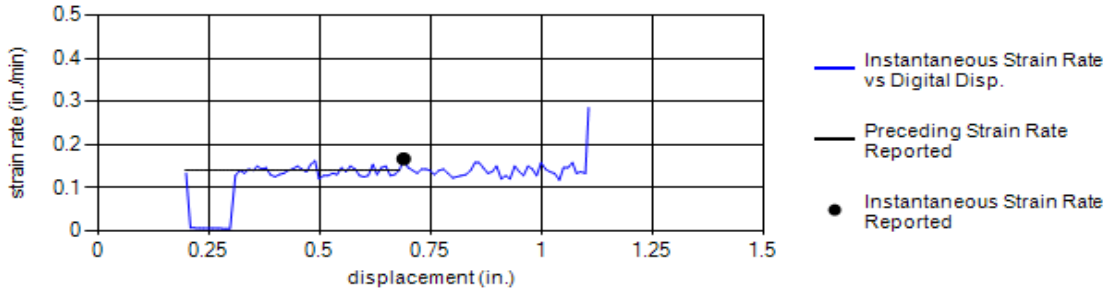
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
656	561	841	814	680	710	1.80	617



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

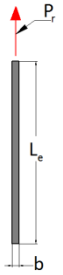
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/26/2010 2:47:00 PM
Test Identification:	TS01.06-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 B

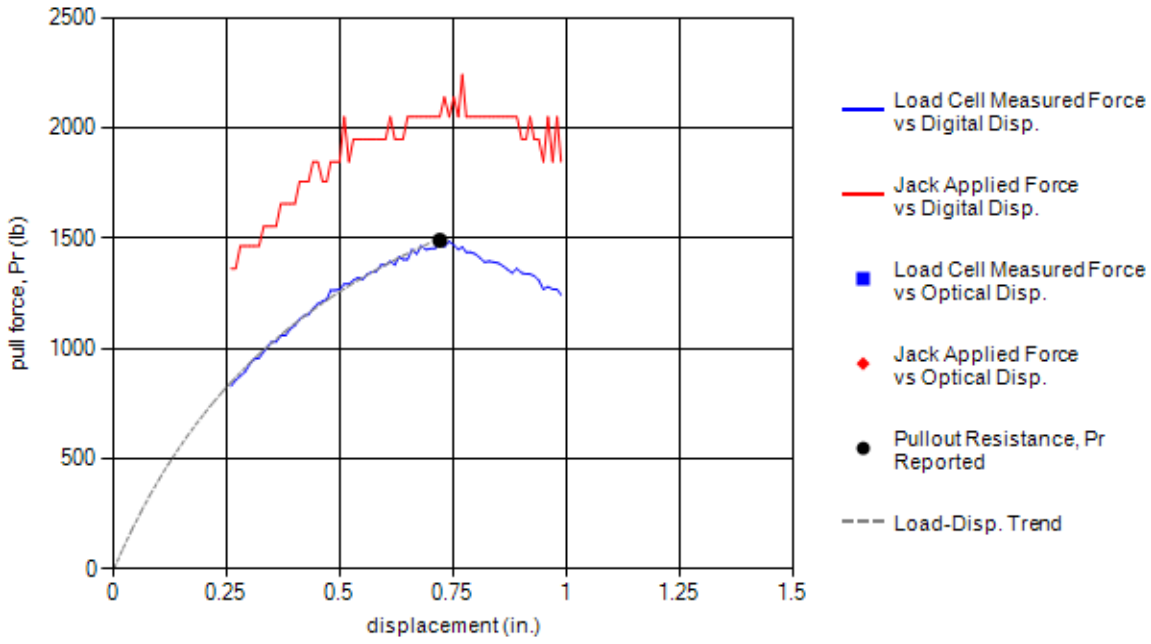
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	113.7	±2.6
Moisture Content, w (%):	7.4	±0.9%
Relative Compaction, C_R (%):	91.3	±2.1%

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	827	1490	6.8	**0.68**

Load-Displacement Curve



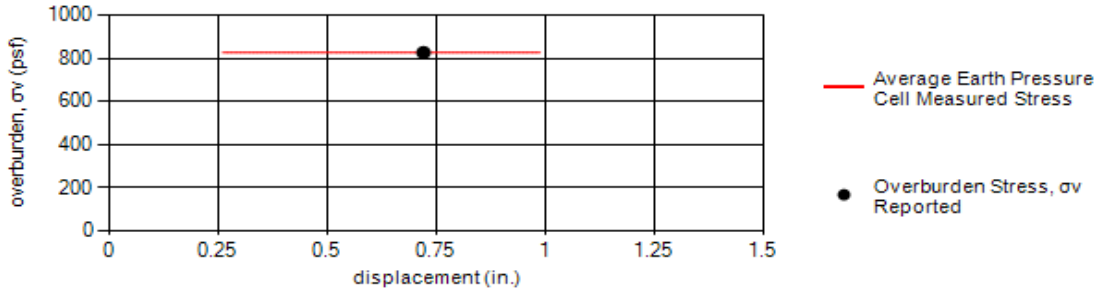
Comments

One inch displacement gage used. Overburden jack transducer error; no overburden jack data.

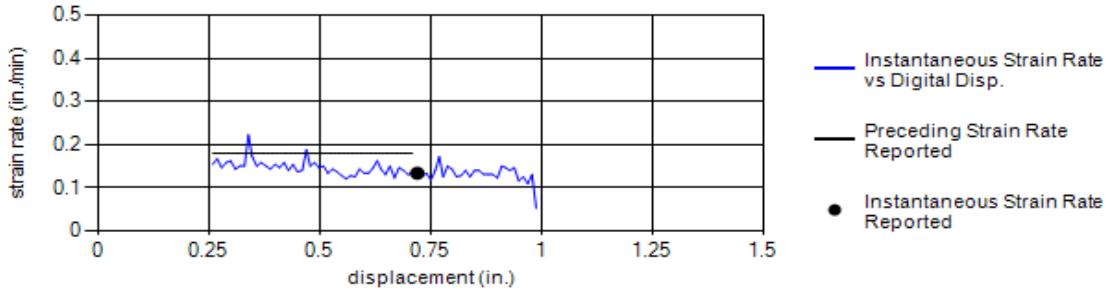
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
702	753	858	945	878	827	1.82	No Data



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.13	0.18	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

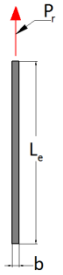
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/27/2010 11:41:00 AM
Test Identification:	TS01.10-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 B

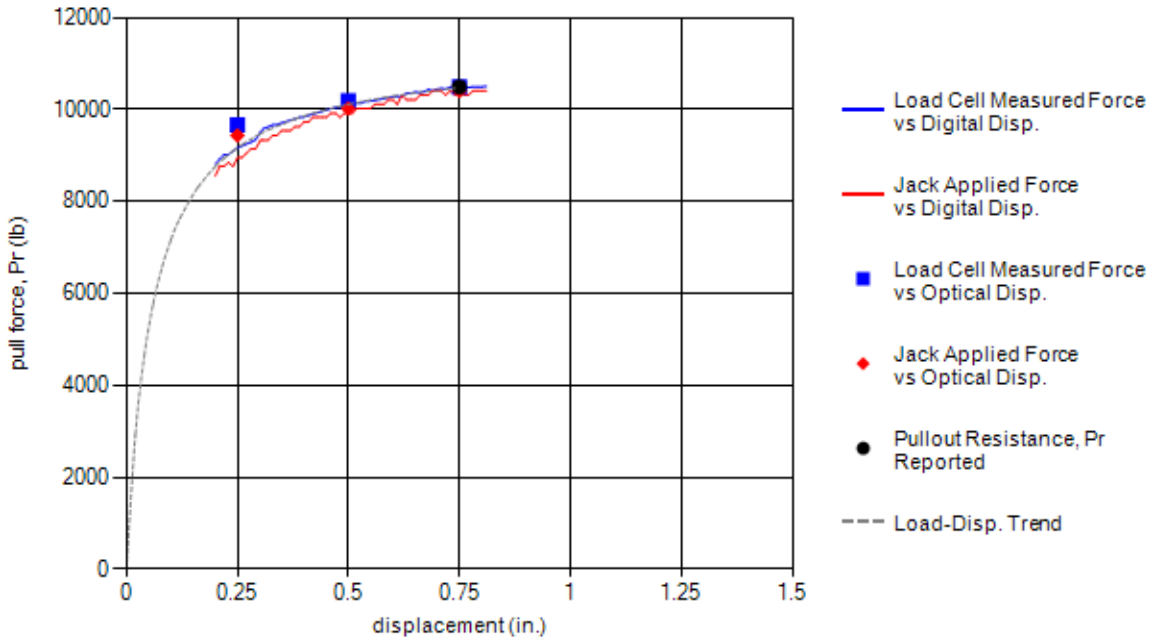
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	113.7	±2.6
Moisture Content, w (%):	7.4	±0.9%
Relative Compaction, C_R (%):	91.3	±2.1%

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	1773	10488	14.5	**4.44**

Load-Displacement Curve



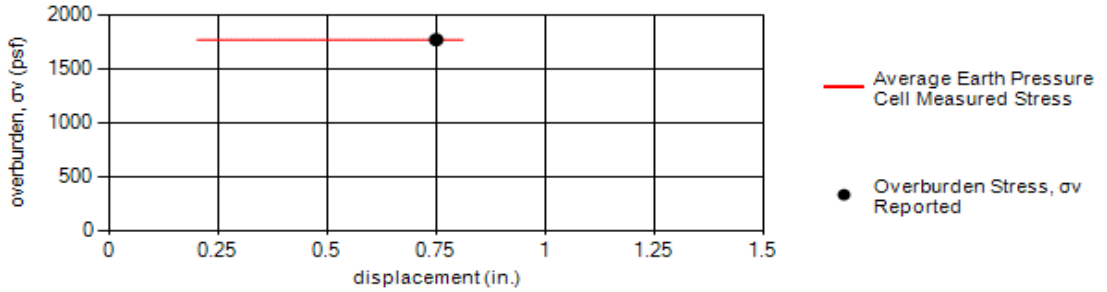
Comments

One inch displacement gage used. Overburden jack transducer error; no overburden jack data.

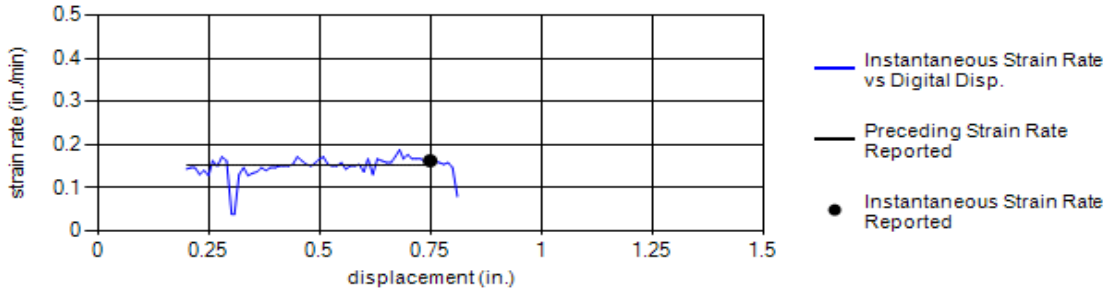
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1503	1361	2195	2099	1708	1773	1.02	No Data



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.16	0.15	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

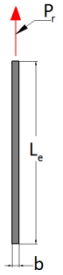
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/27/2010 11:25:00 AM
Test Identification:	TS01.11-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 B

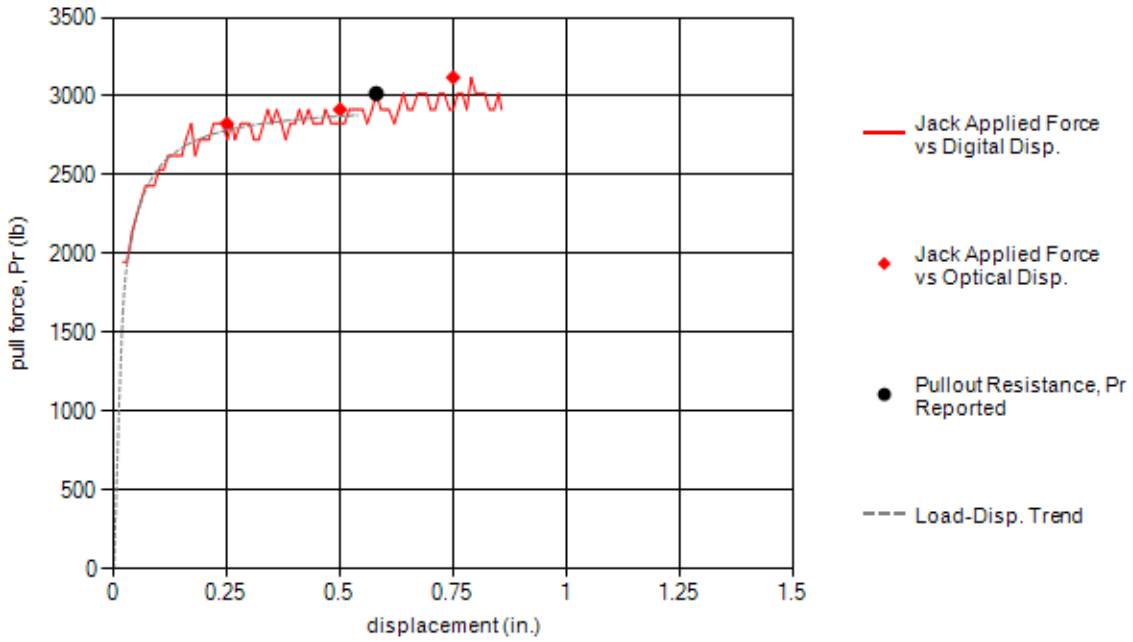
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	113.7	±2.6
Moisture Content, w (%):	7.4	±0.9%
Relative Compaction, C_R (%):	91.3	±2.1%

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	1506	3017	12.3	**1.50**

Load-Displacement Curve



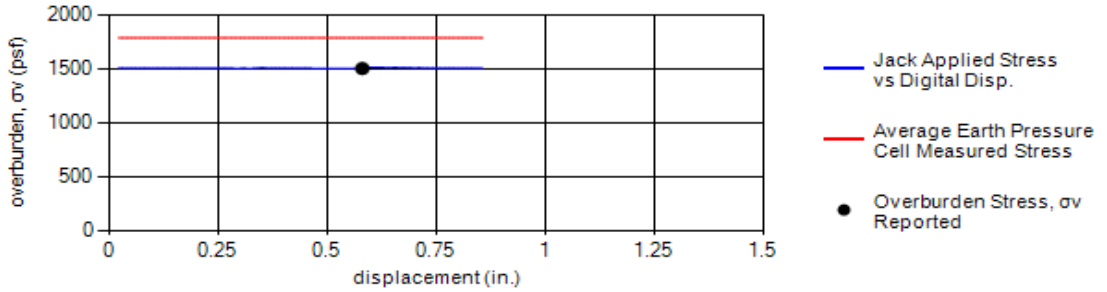
Comments

One inch displacement gage used. Load cell error; no load cell data.

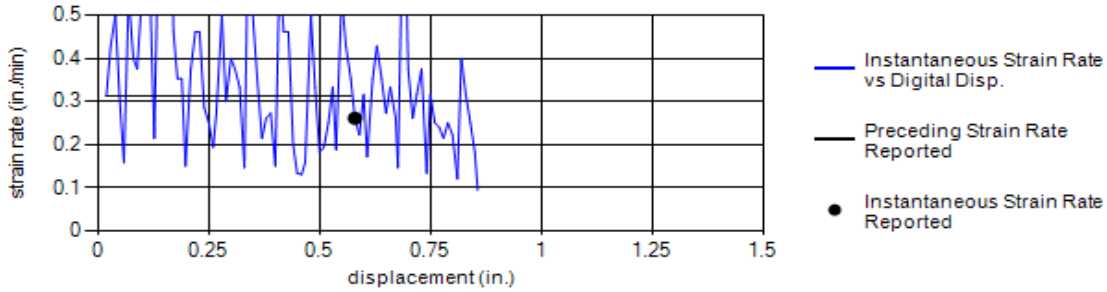
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1654	1351	2167	2087	1697	1791	1.01	1506



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.26	0.31	0.44



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

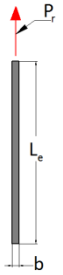
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/27/2010 11:06:00 AM
Test Identification:	TS01.12-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 B

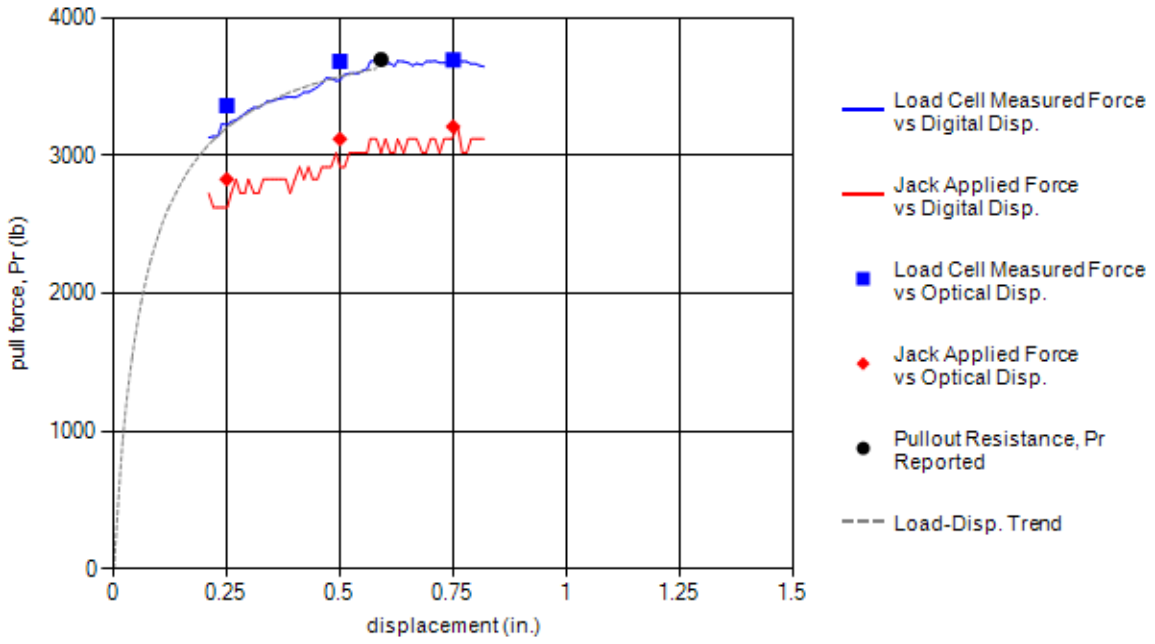
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	113.7	±2.6
Moisture Content, w (%):	7.4	±0.9%
Relative Compaction, C_R (%):	91.3	±2.1%

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	0.59	1518	3694	12.4	**1.83**

Load-Displacement Curve



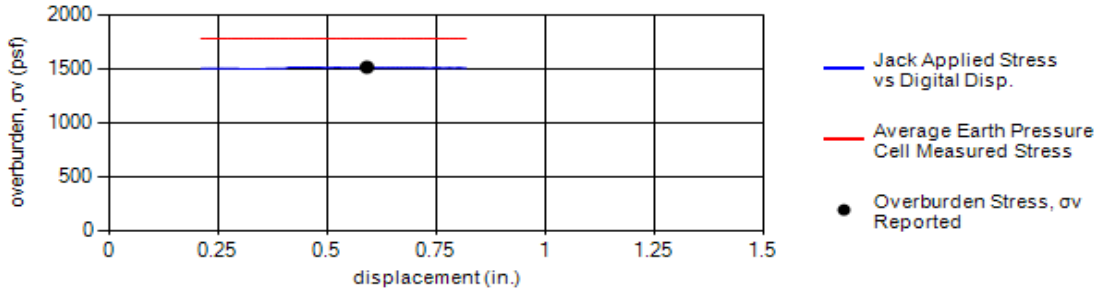
Comments

One inch displacement gage used.

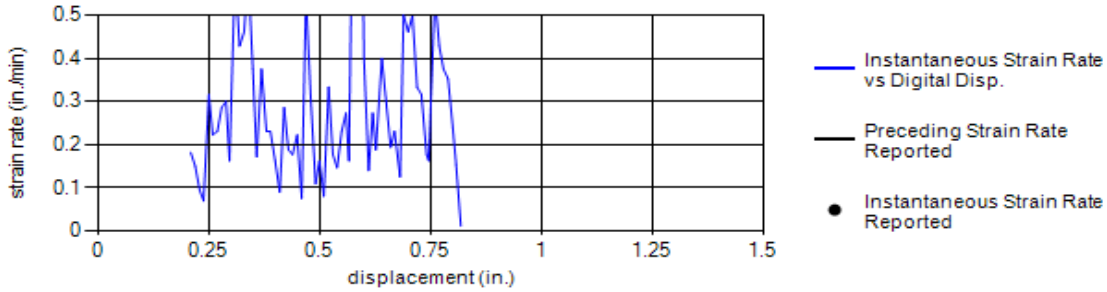
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1629	1341	2160	2082	1696	1782	1.00	1517



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
1.20	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

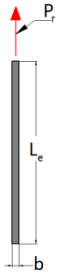
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/27/2010 10:45:00 AM
Test Identification:	TS01.13-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 B

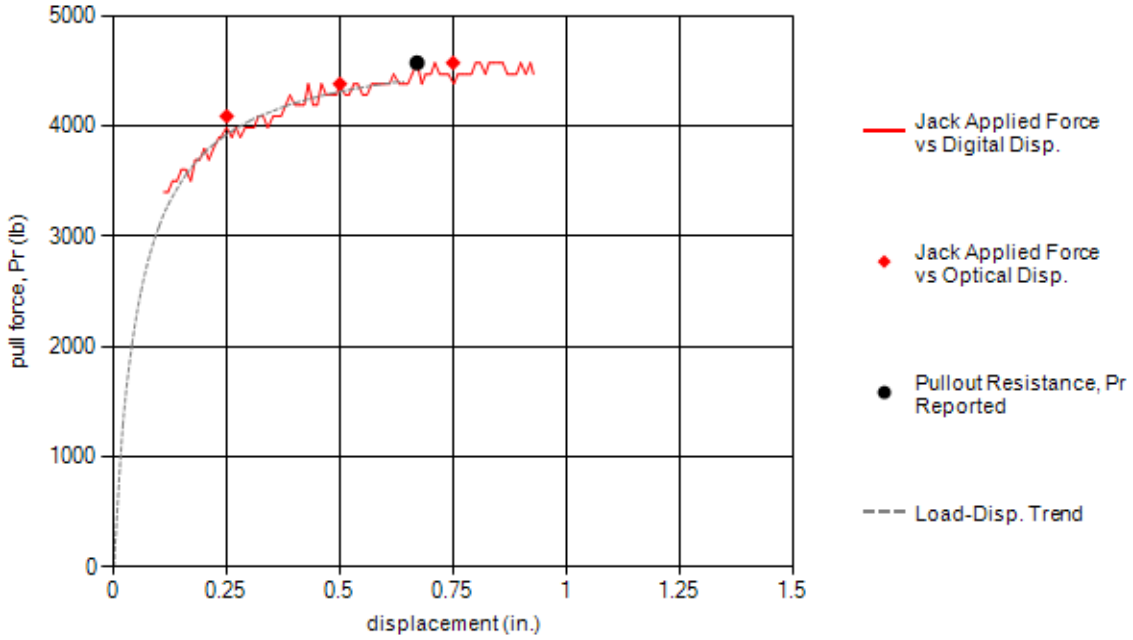
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	113.7	±2.6
Moisture Content, w (%):	7.4	±0.9%
Relative Compaction, C_R (%):	91.3	±2.1%

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	0.67	1510	4570	12.4	**1.13**

Load-Displacement Curve



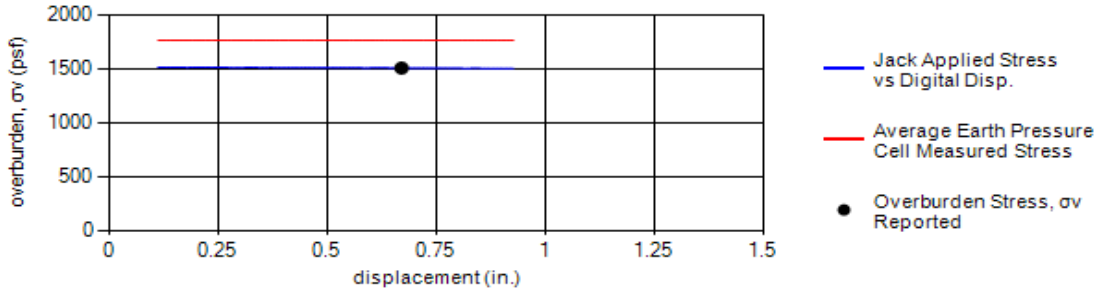
Comments

One inch displacement gage used. Load cell error; no load cell data.

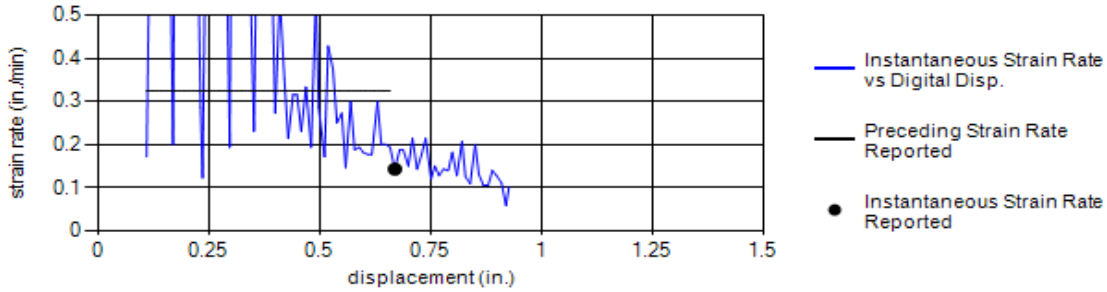
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1616	1313	2140	2076	1691	1767	1.00	1510



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.14	0.33	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

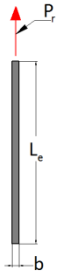
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/27/2010 10:24:00 AM
Test Identification:	TS01.14-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 B

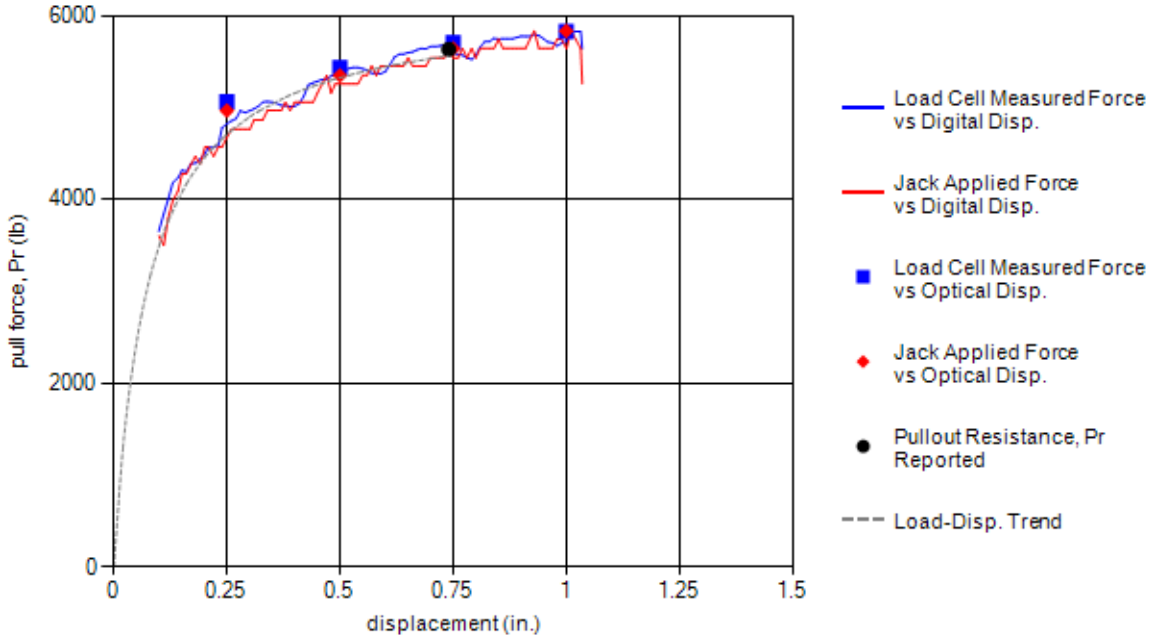
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	113.7	±2.6
Moisture Content, w (%):	7.4	±0.9%
Relative Compaction, C_R (%):	91.3	±2.1%

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	1508	5631	12.3	**1.40**

Load-Displacement Curve



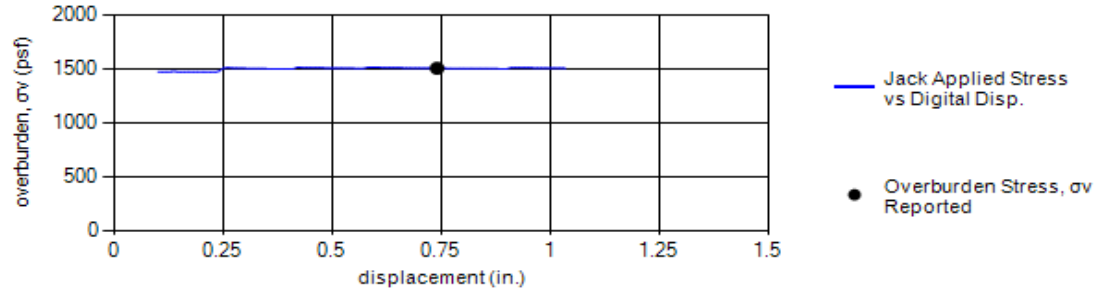
Comments

One inch displacement gage used. No earth pressure cell data.

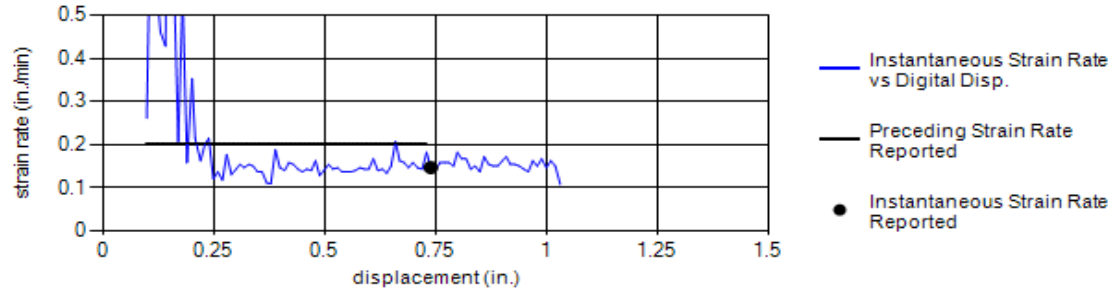
Personnel

Tested:	TW AS MB
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	1508



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.15	0.20	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

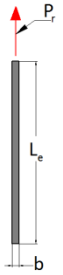
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	6/3/2010 10:40:00 AM
Test Identification:	TS02.01-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 B

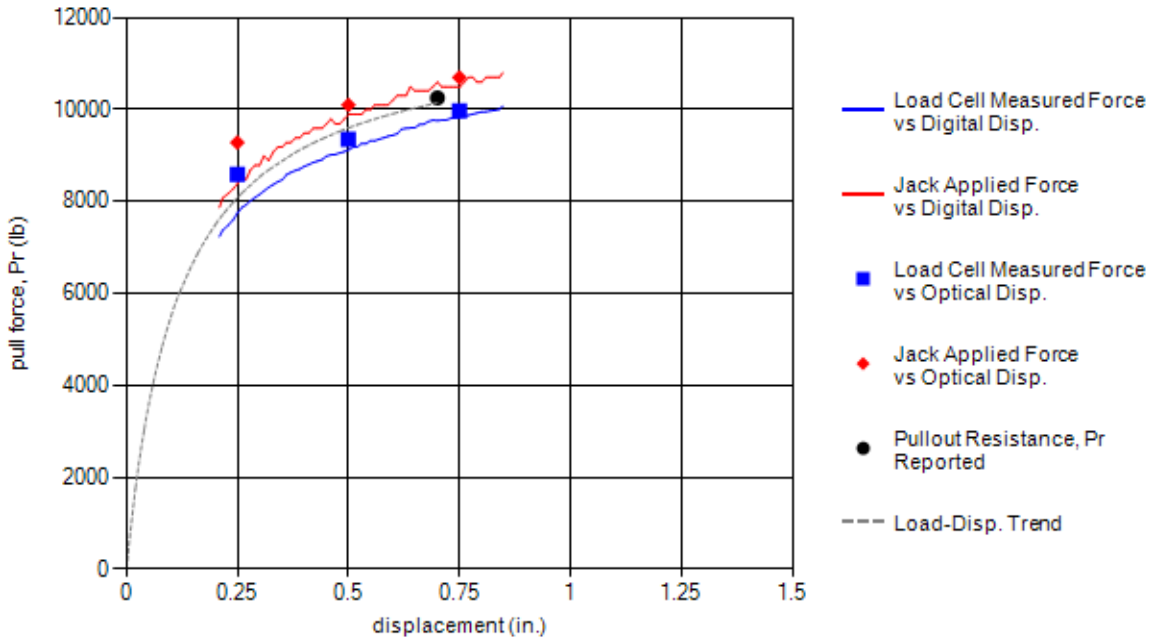
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	113.7	±2.6
Moisture Content, w (%):	7.4	±0.9%
Relative Compaction, C_R (%):	91.3	±2.1%

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	1493	10249	12.2	**2.58**

Load-Displacement Curve



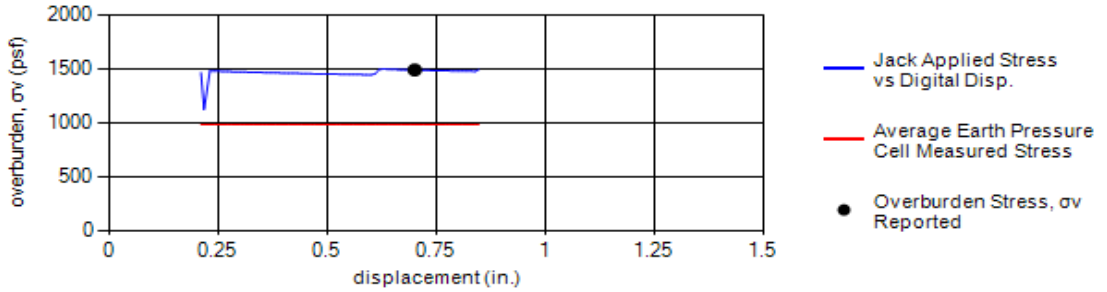
Comments

One inch displacement gage used.

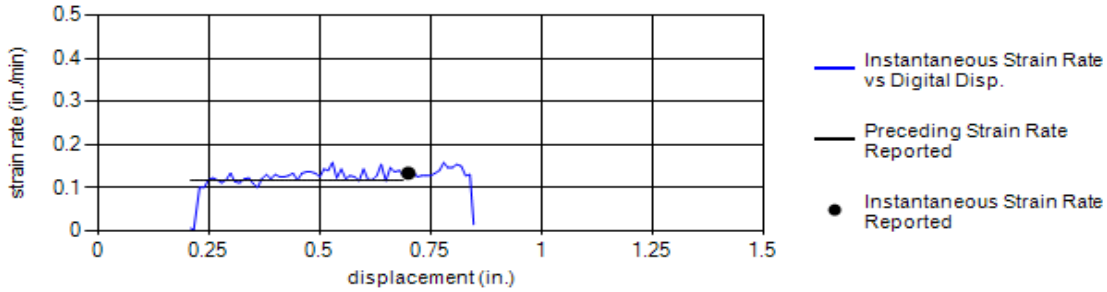
Personnel

Tested:	AS MB DH
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
971	769	929	1154	1106	986	1.53	1493



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

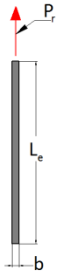
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	6/3/2010 11:20:00 AM
Test Identification:	TS02.02-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 B

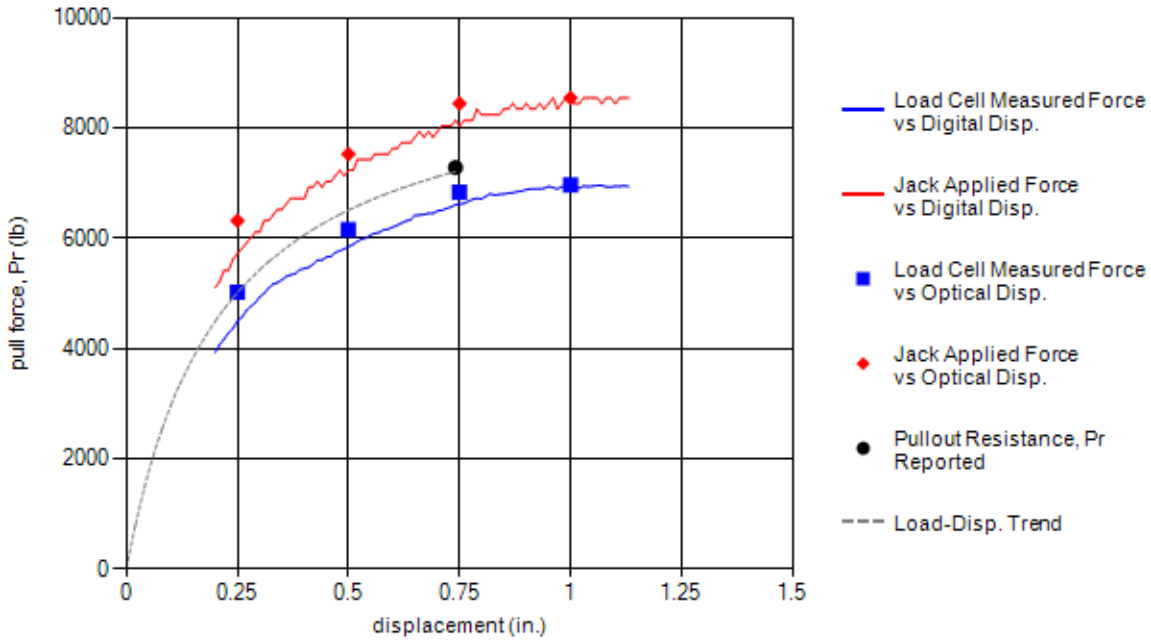
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	113.7	±2.6
Moisture Content, w (%):	7.4	±0.9%
Relative Compaction, C_R (%):	91.3	±2.1%

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	1479	7280	12.1	**1.23**

Load-Displacement Curve



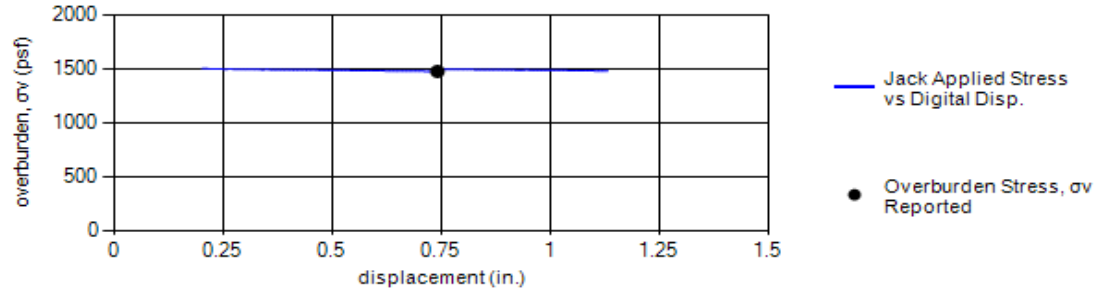
Comments

One inch displacement gage used. No earth pressure cell data.

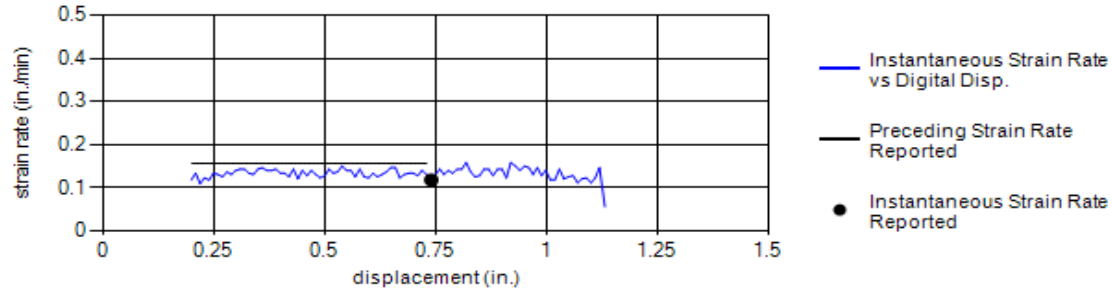
Personnel

Tested:	AS MB 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	1.01	1479



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

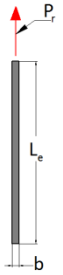
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	6/3/2010 11:45:00 AM
Test Identification:	TS02.03-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 B

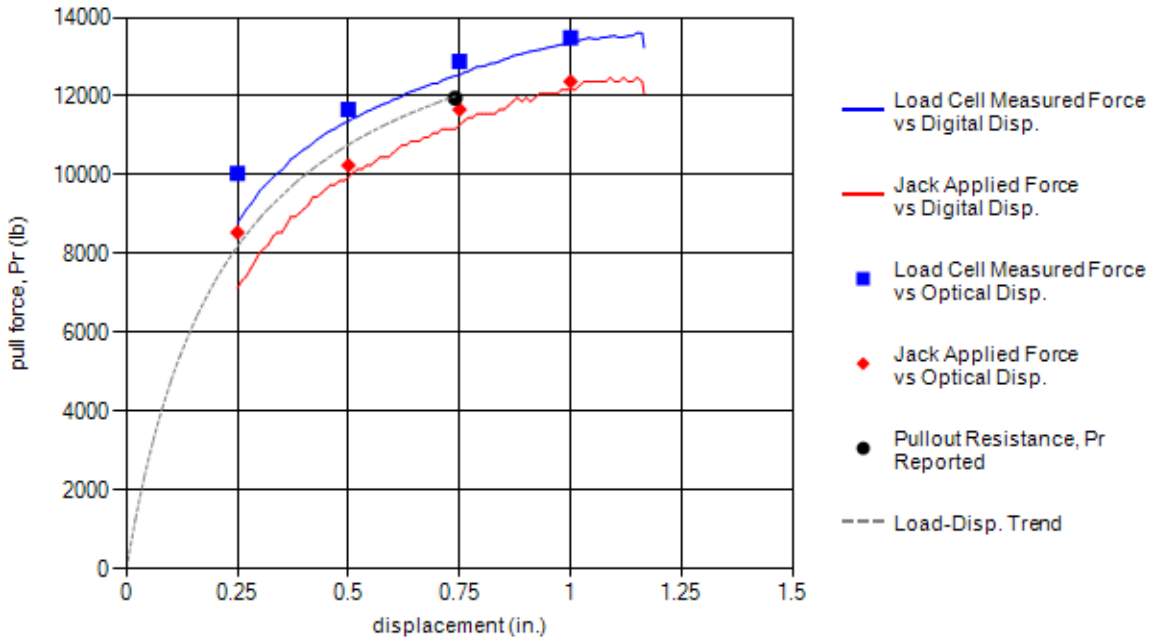
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	113.7	±2.6
Moisture Content, w (%):	7.4	±0.9%
Relative Compaction, C_R (%):	91.3	±2.1%

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	1473	11953	12.1	**2.03**

Load-Displacement Curve



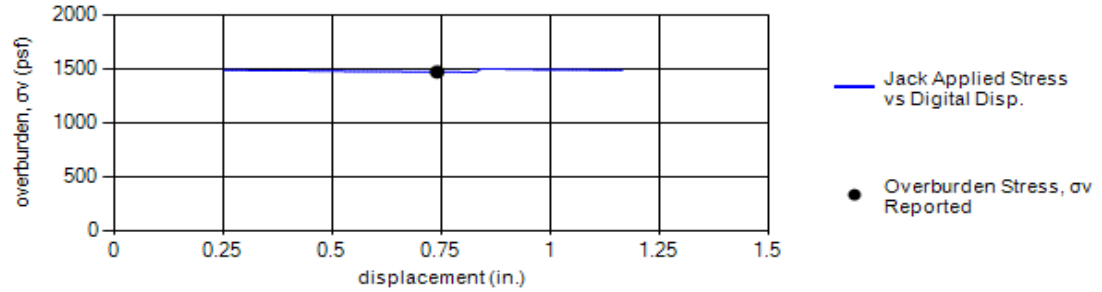
Comments

One inch displacement gage used. No earth pressure cell data.

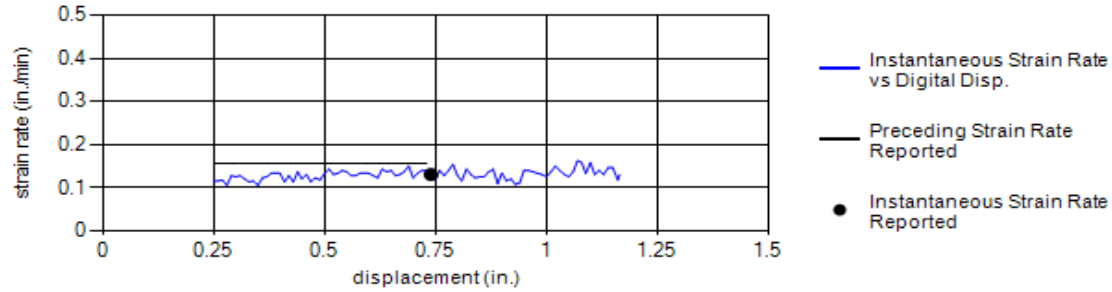
Personnel

Tested:	AS MB 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	1.01	1473



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

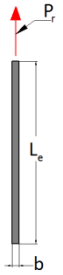
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	6/3/2010 12:03:00 PM
Test Identification:	TS02.04-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 B

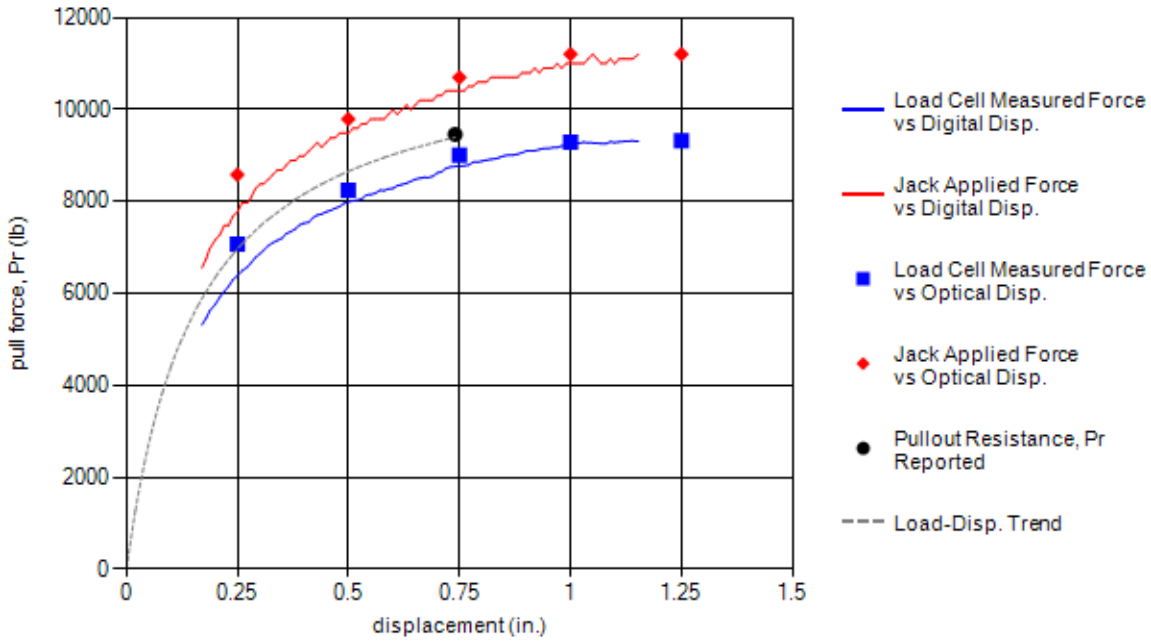
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	113.7	±2.6
Moisture Content, w (%):	7.4	±0.9%
Relative Compaction, C_R (%):	91.3	±2.1%

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	1494	9456	12.2	**1.58**

Load-Displacement Curve



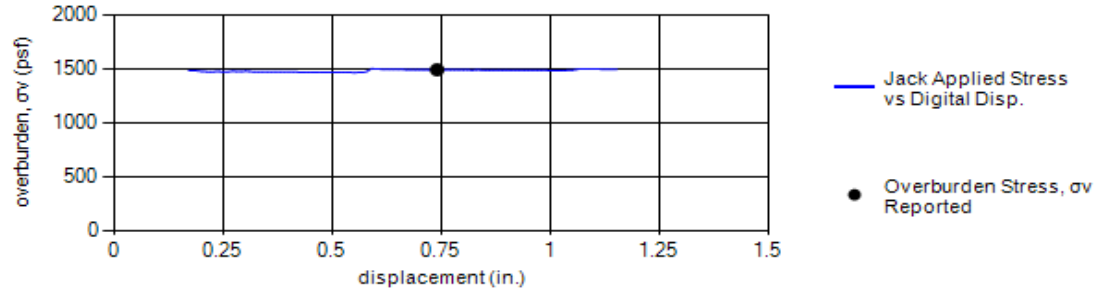
Comments

One inch displacement gage used. No earth pressure cell data.

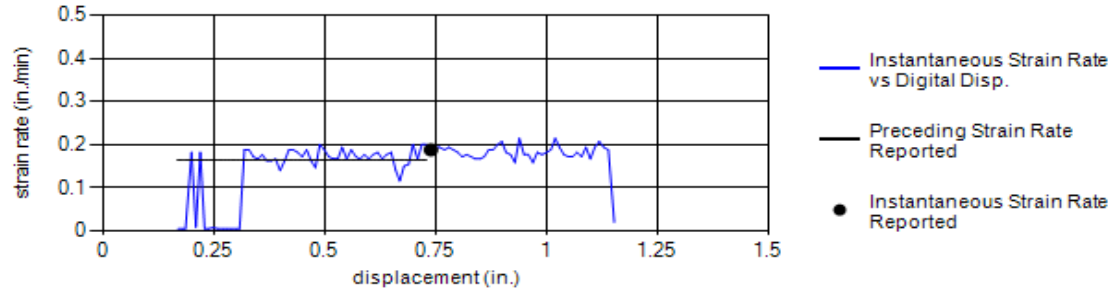
Personnel

Tested:	AS MB 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	1494



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.19	0.16	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

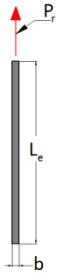
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	6/4/2010 11:00:00 AM
Test Identification:	TS02.05-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 B

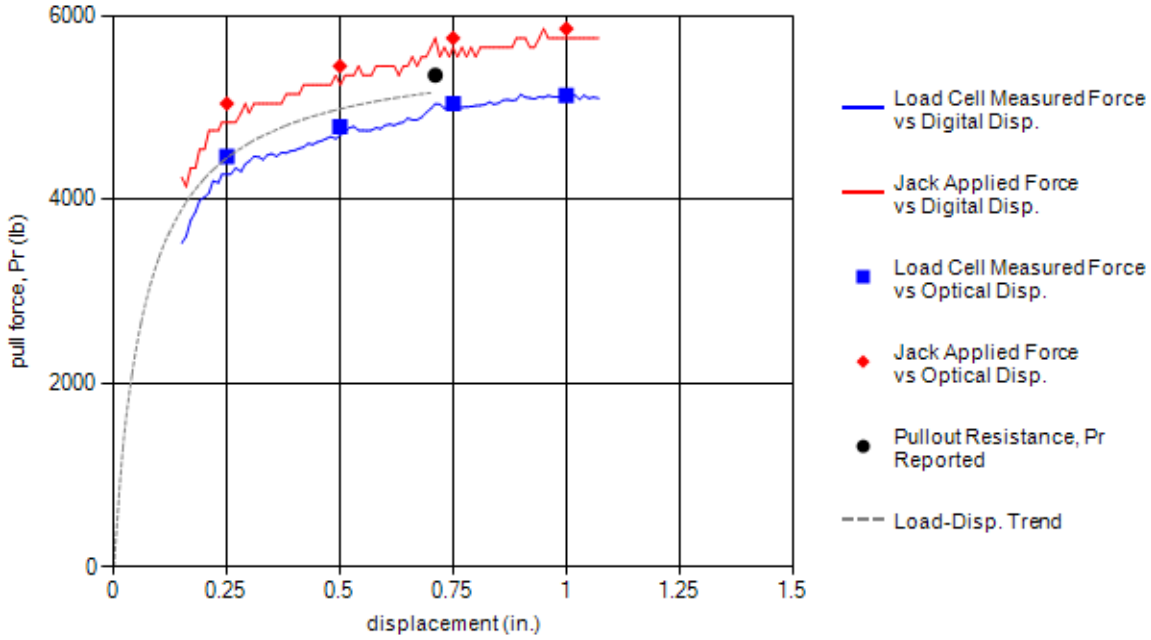
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	113.7	±2.6
Moisture Content, w (%):	7.4	±0.9%
Relative Compaction, C_R (%):	91.3	±2.1%

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	2498	5349	20.4	**1.61**

Load-Displacement Curve



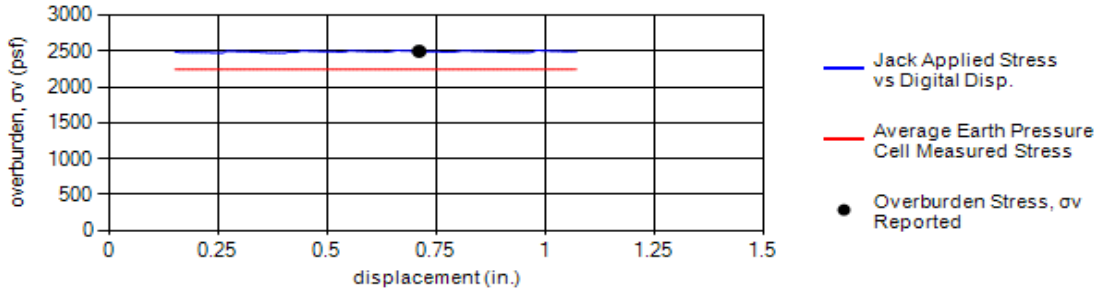
Comments

One inch displacement gage used.

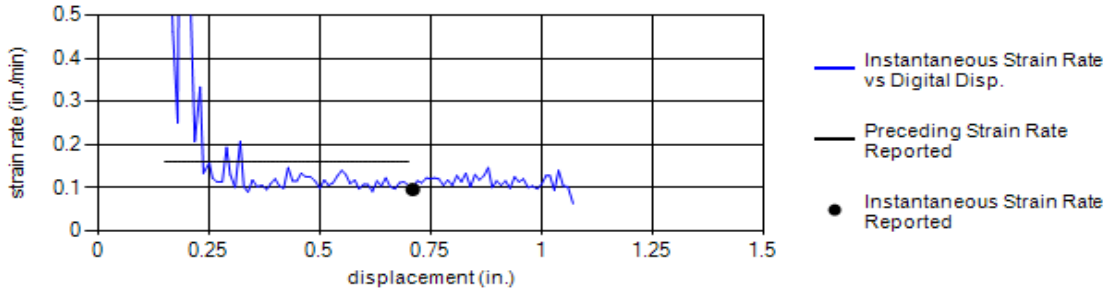
Personnel

Tested:	AS MB DH
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2280	1490	2159	2714	2589	2246	1.05	2498



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

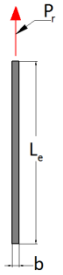
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	6/4/2010 10:35:00 AM
Test Identification:	TS02.06-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 B

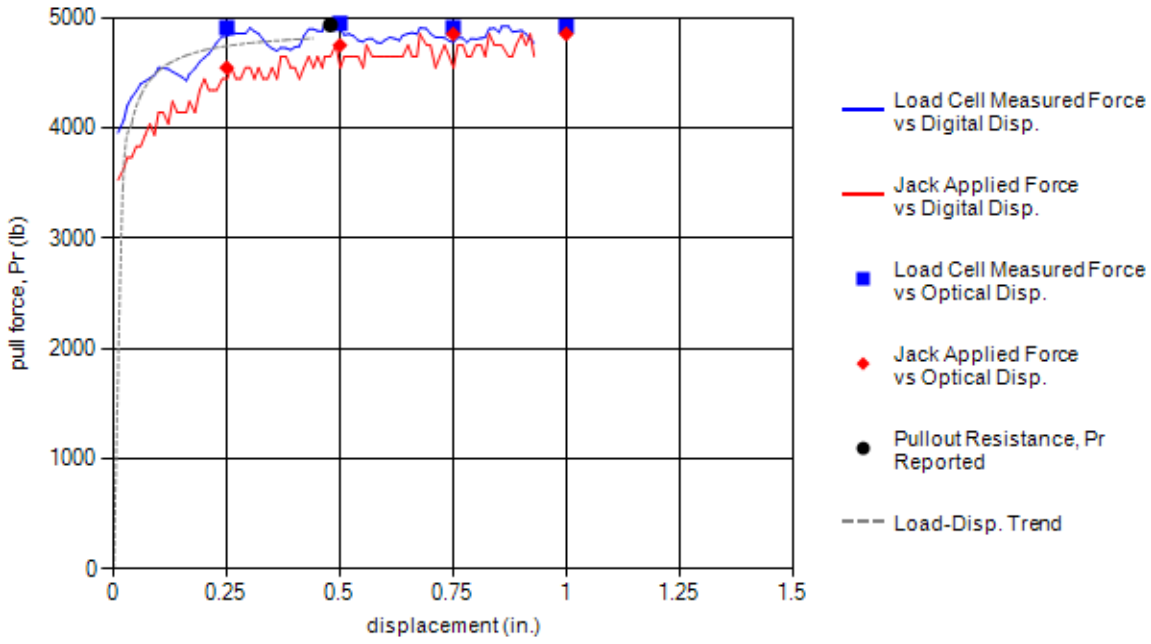
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	113.7	±2.6
Moisture Content, w (%):	7.4	±0.9%
Relative Compaction, C_R (%):	91.3	±2.1%

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	0.48	2474	4933	20.2	**1.50**

Load-Displacement Curve



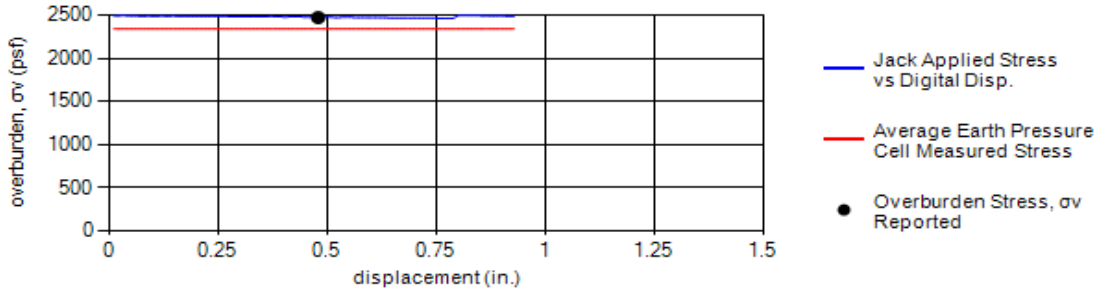
Comments

One inch displacement gage used.

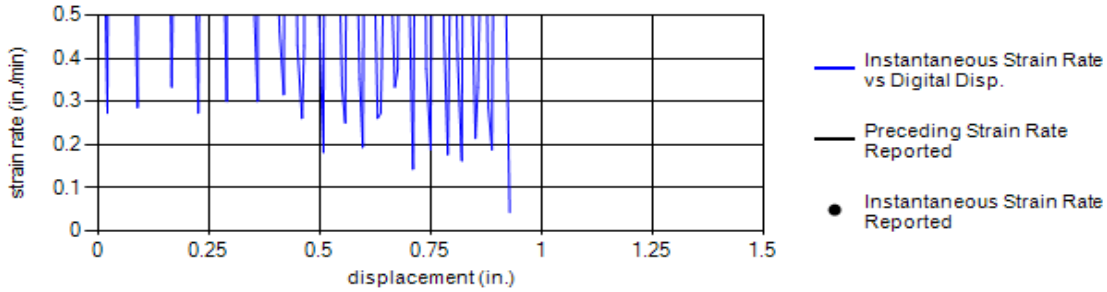
Personnel

Tested:	AS MB DH
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2286	1711	2227	2861	2628	2343	1.02	2479



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
6.00	0.62	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

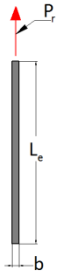
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	6/4/2010 10:25:00 AM
Test Identification:	TS02.07-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 B

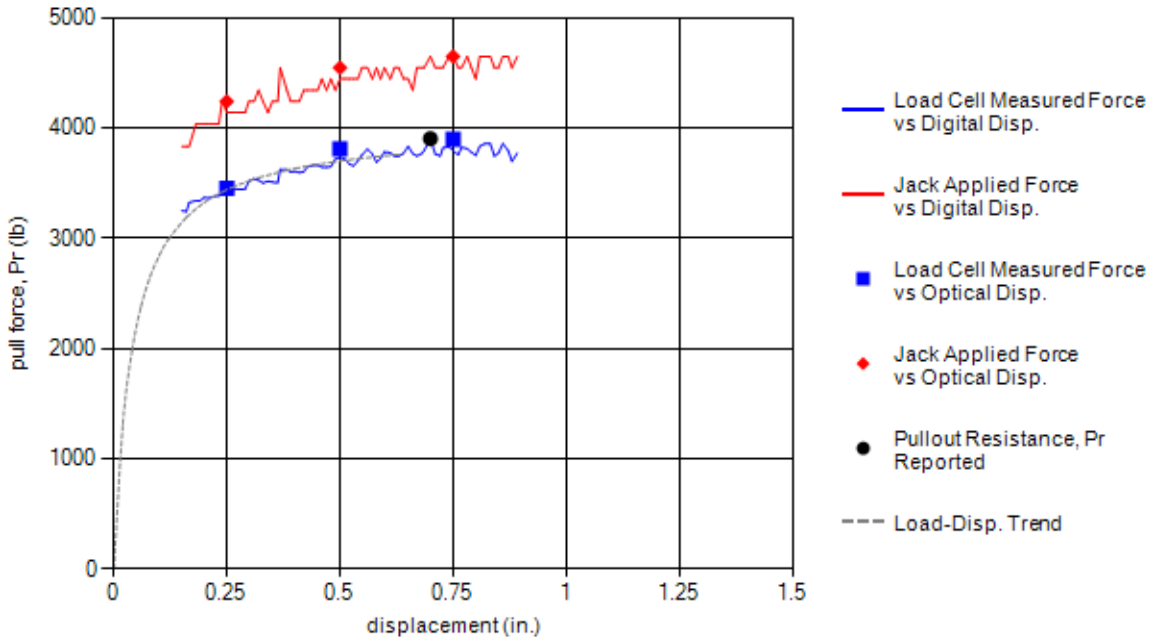
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	113.7	±2.6
Moisture Content, w (%):	7.4	±0.9%
Relative Compaction, C_R (%):	91.3	±2.1%

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	2458	3902	20.1	**1.19**

Load-Displacement Curve



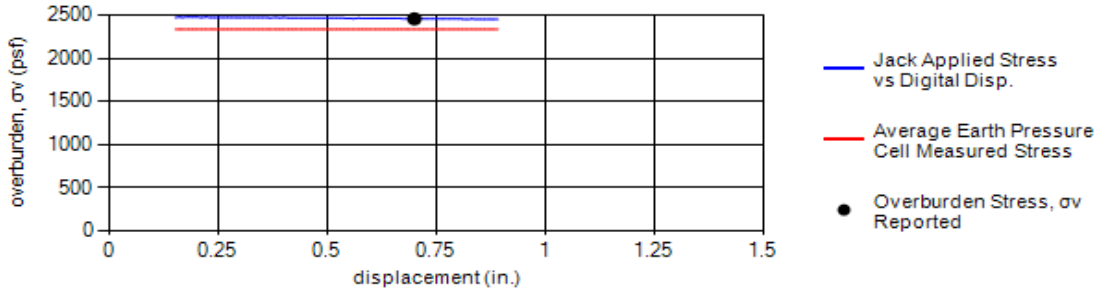
Comments

One inch displacement gage used.

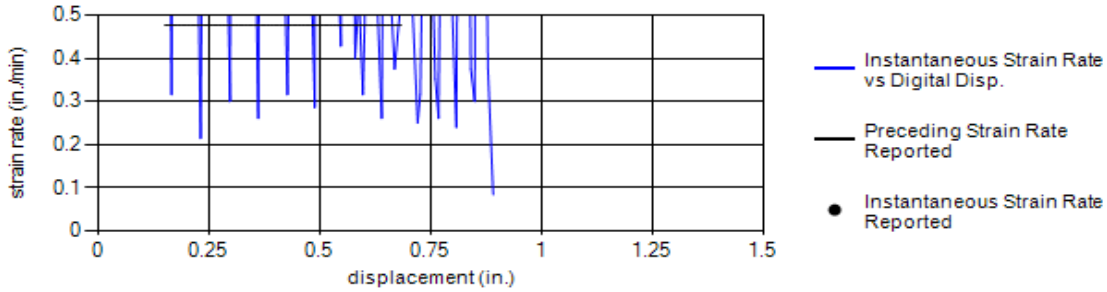
Personnel

Tested:	AS MB DH
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2281	1706	2216	2858	2631	2339	1.02	2462



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
3.00	0.48	0.42



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

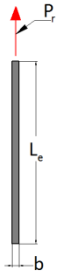
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	6/4/2010 9:50:00 AM
Test Identification:	TS02.08-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 B

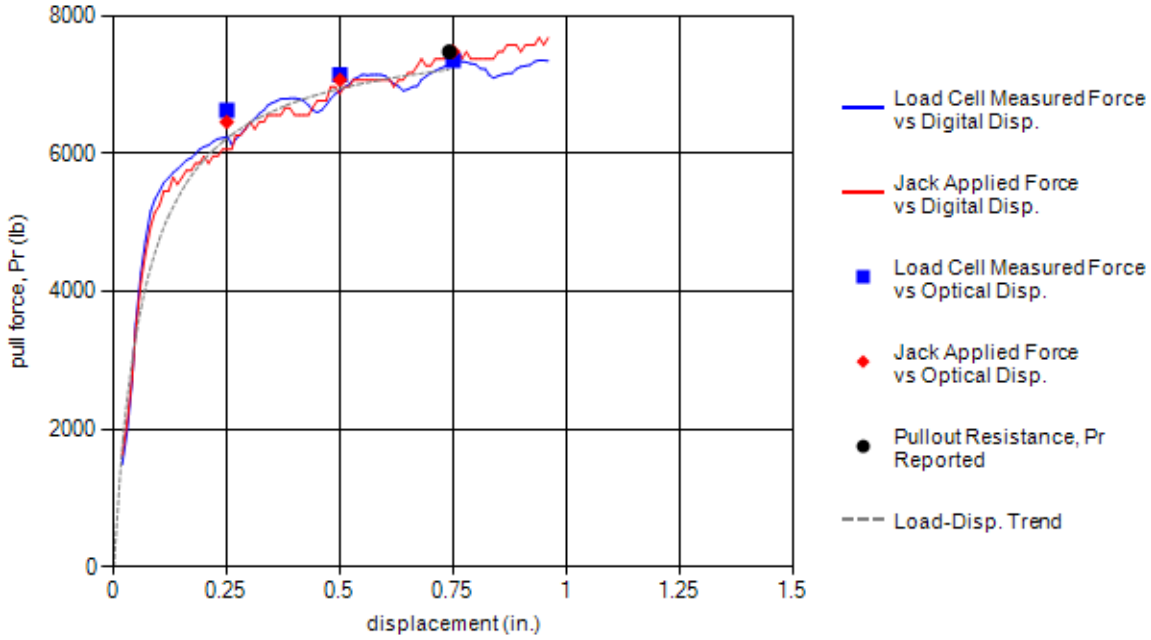
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	113.7	±2.6
Moisture Content, w (%):	7.4	±0.9%
Relative Compaction, C_R (%):	91.3	±2.1%

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	2340	7473	19.1	**1.20**

Load-Displacement Curve



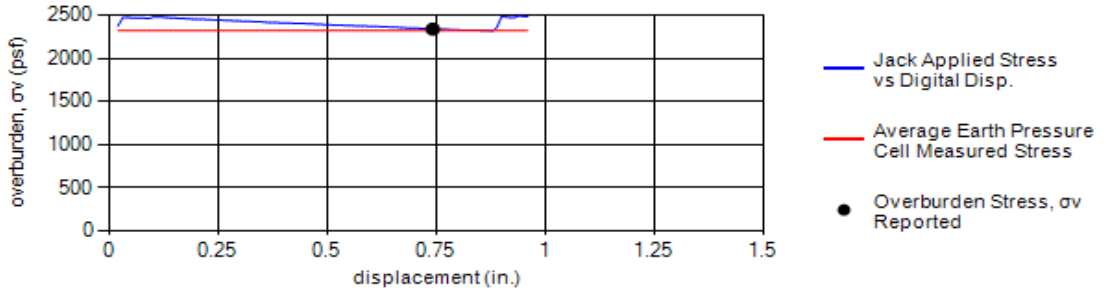
Comments

One inch displacement gage used.

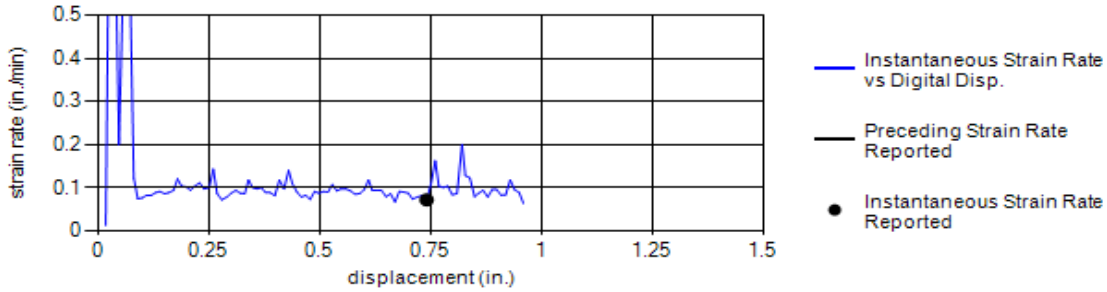
Personnel

Tested:	AS MB DH
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2266	1699	2211	2824	2615	2323	1.06	2340



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

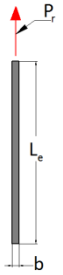
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	6/3/2010 3:45:00 PM
Test Identification:	TS02.09-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 B

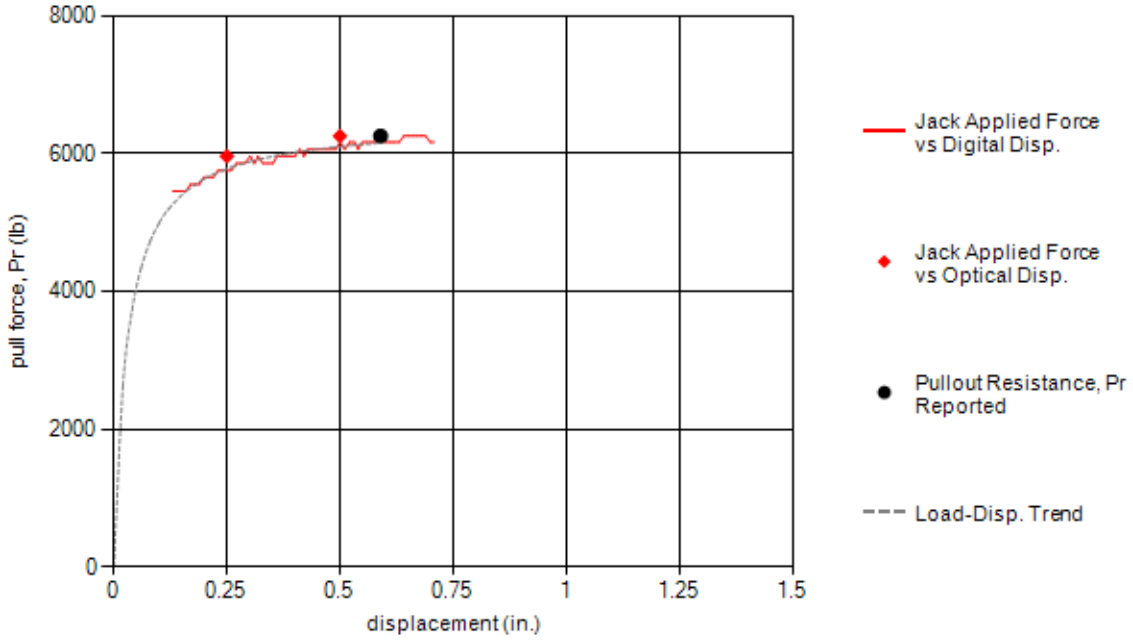
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	113.7	±2.6
Moisture Content, w (%):	7.4	±0.9%
Relative Compaction, C_R (%):	91.3	±2.1%

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	0.59	2485	6250	20.3	**0.94**

Load-Displacement Curve



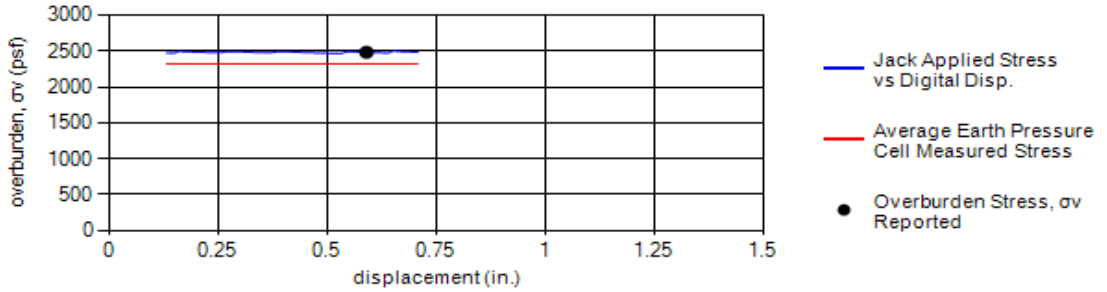
Comments

One inch displacement gage used. Load cell error; no load cell data.

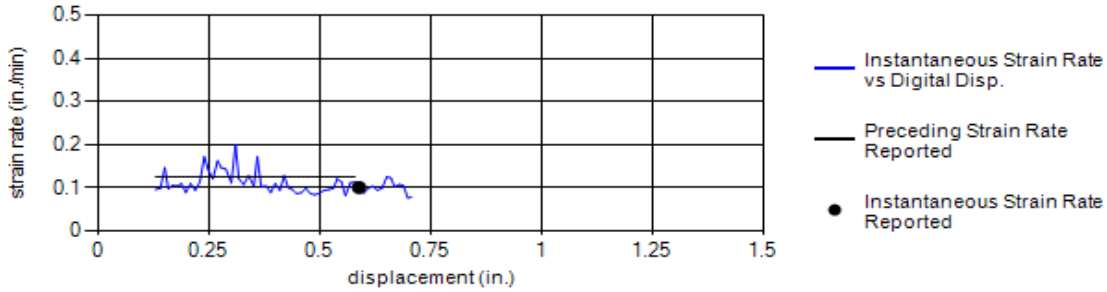
Personnel

Tested:	AS MB DH
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2168	1776	2137	2868	2667	2323	1.01	2485



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

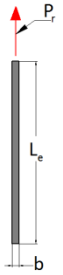
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	6/3/2010 2:00:00 PM
Test Identification:	TS02.10-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 B

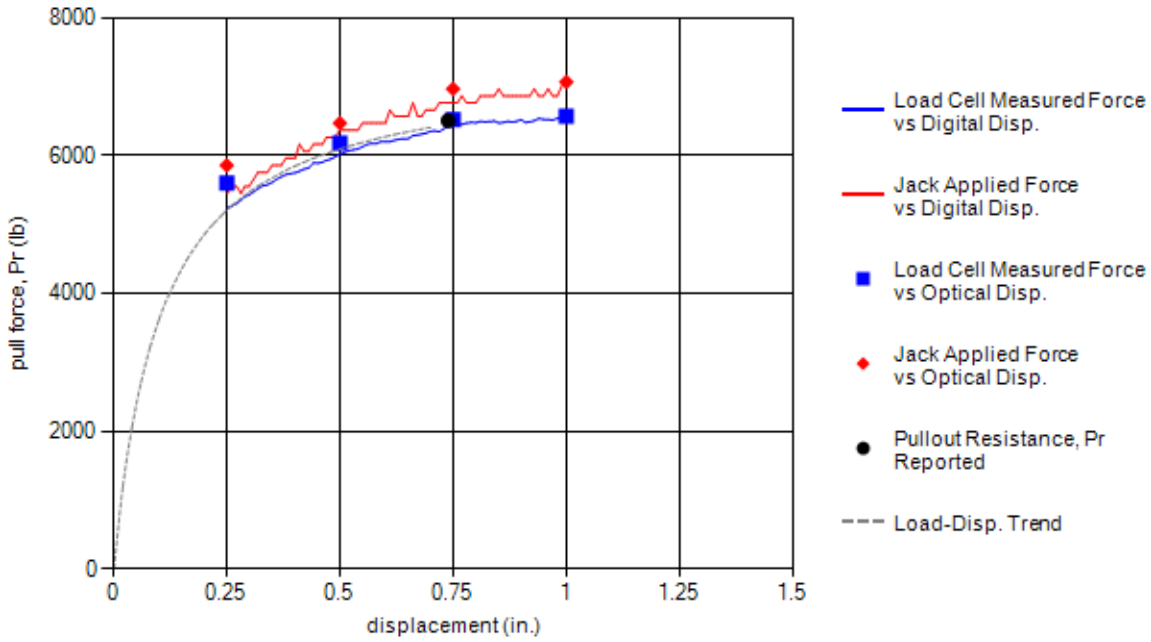
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	113.7	±2.6
Moisture Content, w (%):	7.4	±0.9%
Relative Compaction, C_R (%):	91.3	±2.1%

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	2376	6504	19.4	**1.03**

Load-Displacement Curve



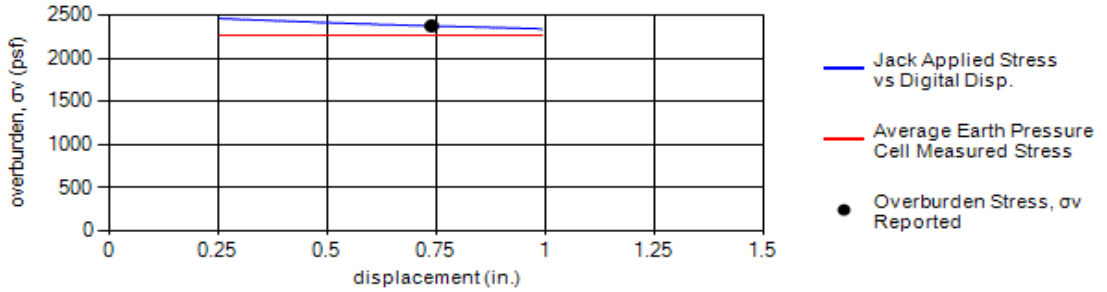
Comments

One inch displacement gage used.

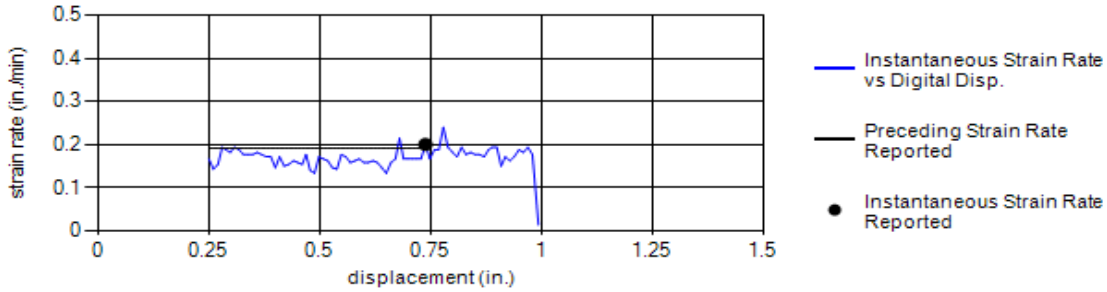
Personnel

Tested:	AS MB DH
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1908	1838	2326	2762	2512	2269	1.05	2376



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

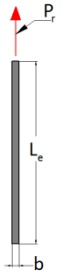
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	6/3/2010 2:15:00 PM
Test Identification:	TS02.11-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 B

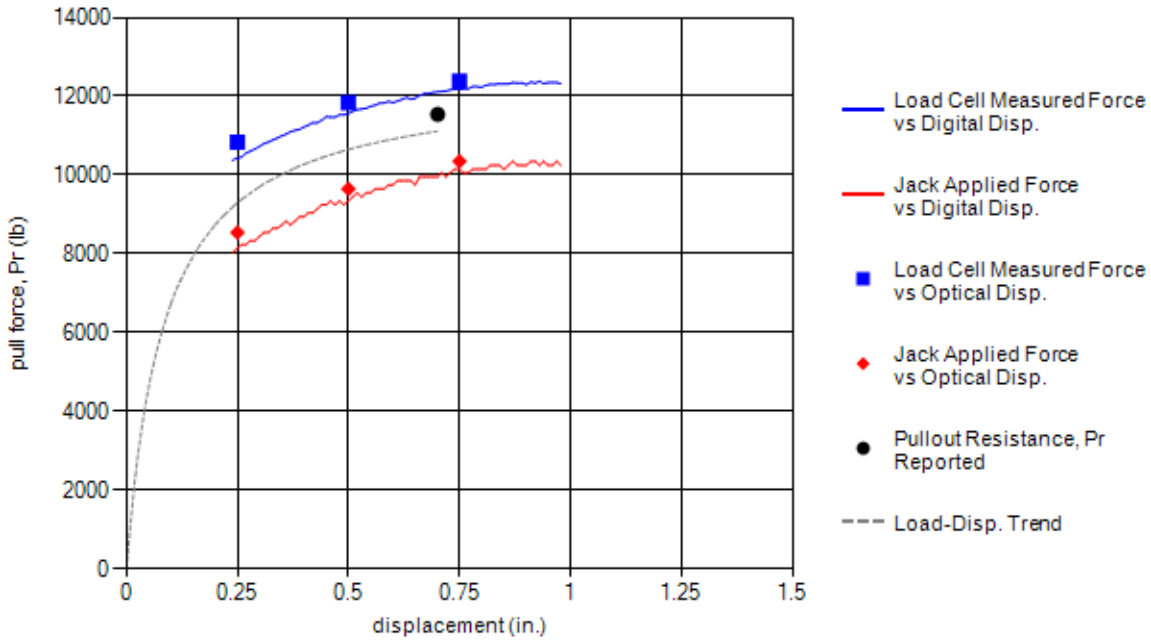
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	113.7	±2.6
Moisture Content, w (%):	7.4	±0.9%
Relative Compaction, C_R (%):	91.3	±2.1%

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	2478	11539	20.3	**1.16**

Load-Displacement Curve



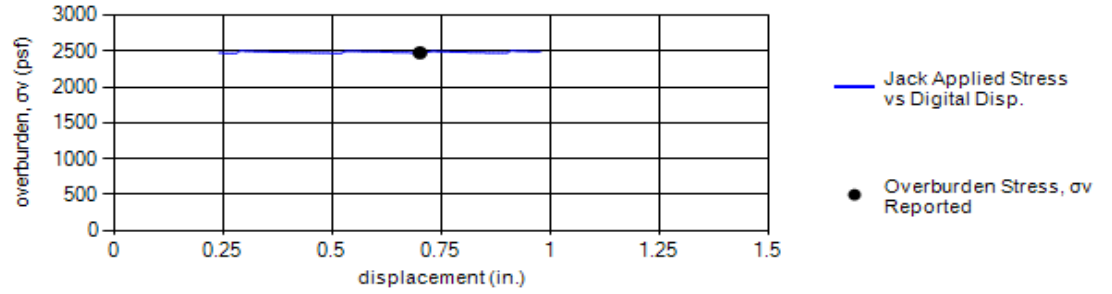
Comments

One inch displacement gage used. No earth pressure cell data.

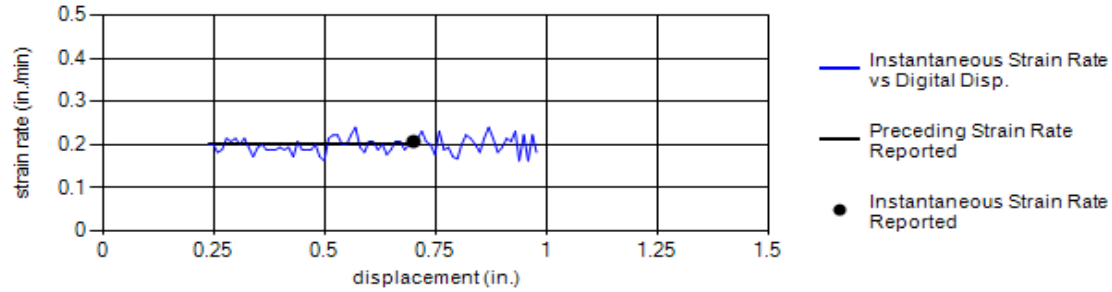
Personnel

Tested:	AS MB 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	2478



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.21	0.20	0.18



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

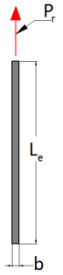
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	6/3/2010 2:37:00 PM
Test Identification:	TS02.12-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 B

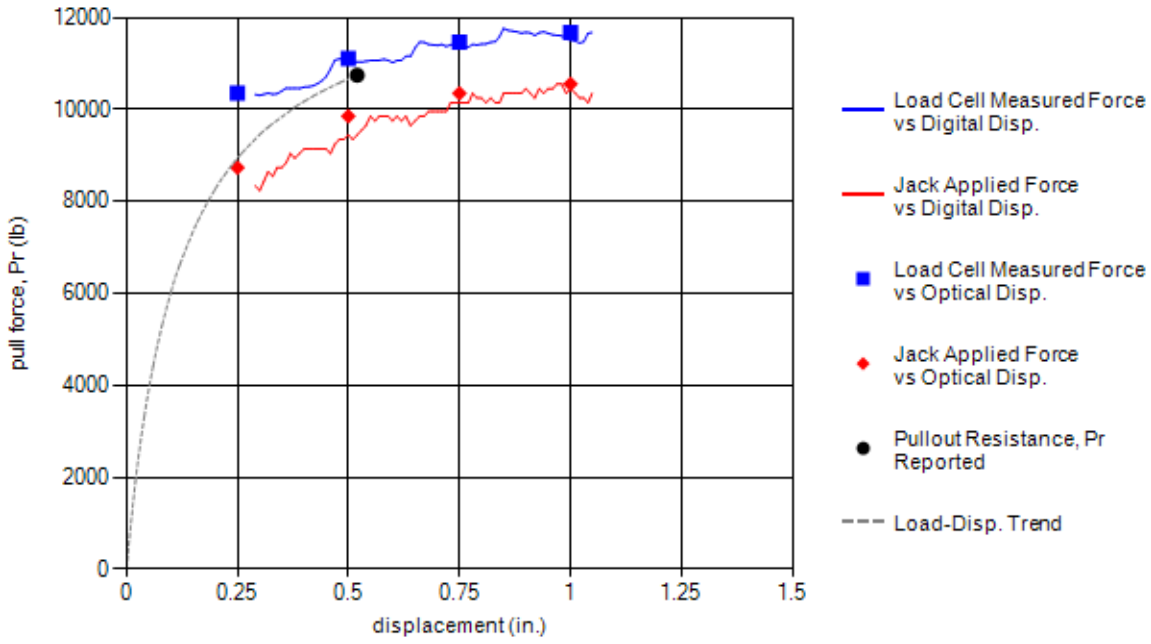
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	113.7	±2.6
Moisture Content, w (%):	7.4	±0.9%
Relative Compaction, C_R (%):	91.3	±2.1%

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	2506	10743	20.5	**1.07**

Load-Displacement Curve



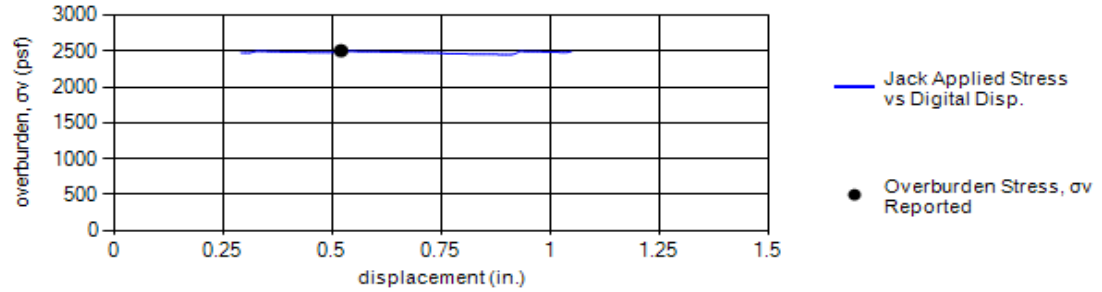
Comments

One inch displacement gage used. No earth pressure cell data.

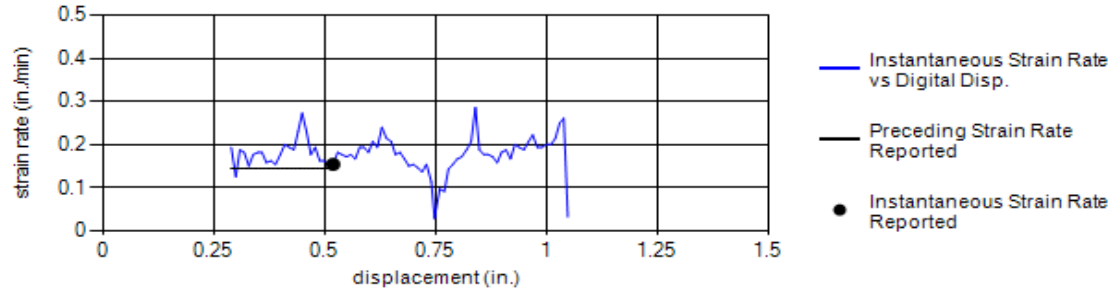
Personnel

Tested:	AS MB 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	2506



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

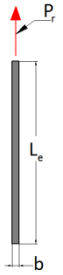
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	6/3/2010 2:50:00 PM
Test Identification:	TS02.13-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 B

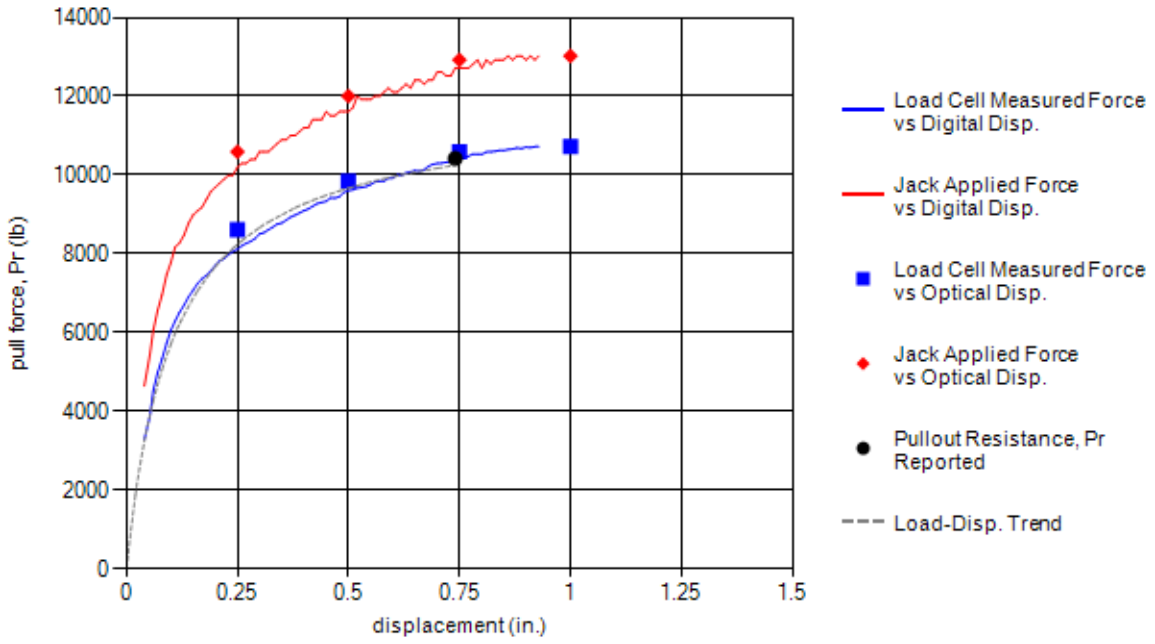
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	113.7	±2.6
Moisture Content, w (%):	7.4	±0.9%
Relative Compaction, C_R (%):	91.3	±2.1%

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	2483	10419	20.3	**1.05**

Load-Displacement Curve



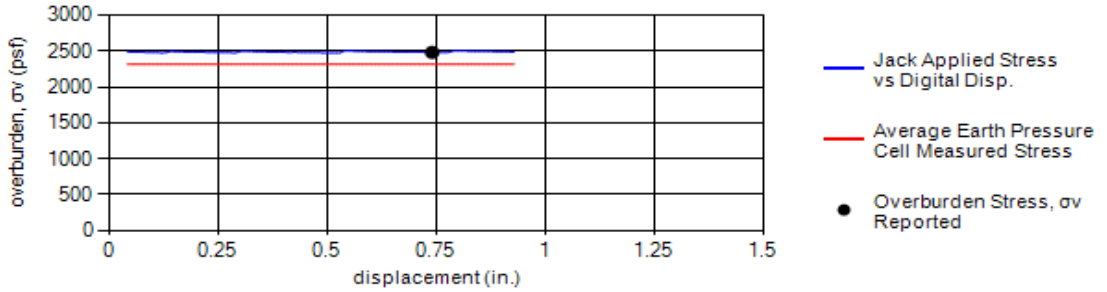
Comments

One inch displacement gage used.

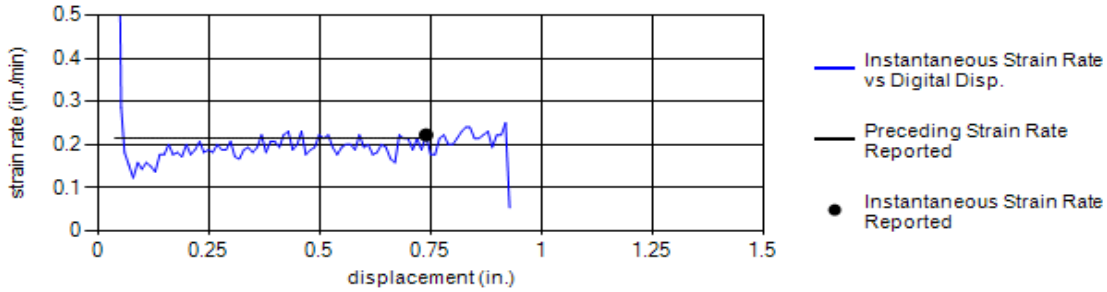
Personnel

Tested:	AS MB DH
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2109	1918	2094	2860	2603	2317	1.03	2484



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.22	0.21	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

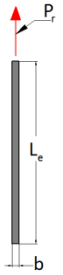
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	6/4/2010 11:43:00 AM
Test Identification:	TS02.14-S-L4-Z40-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 B

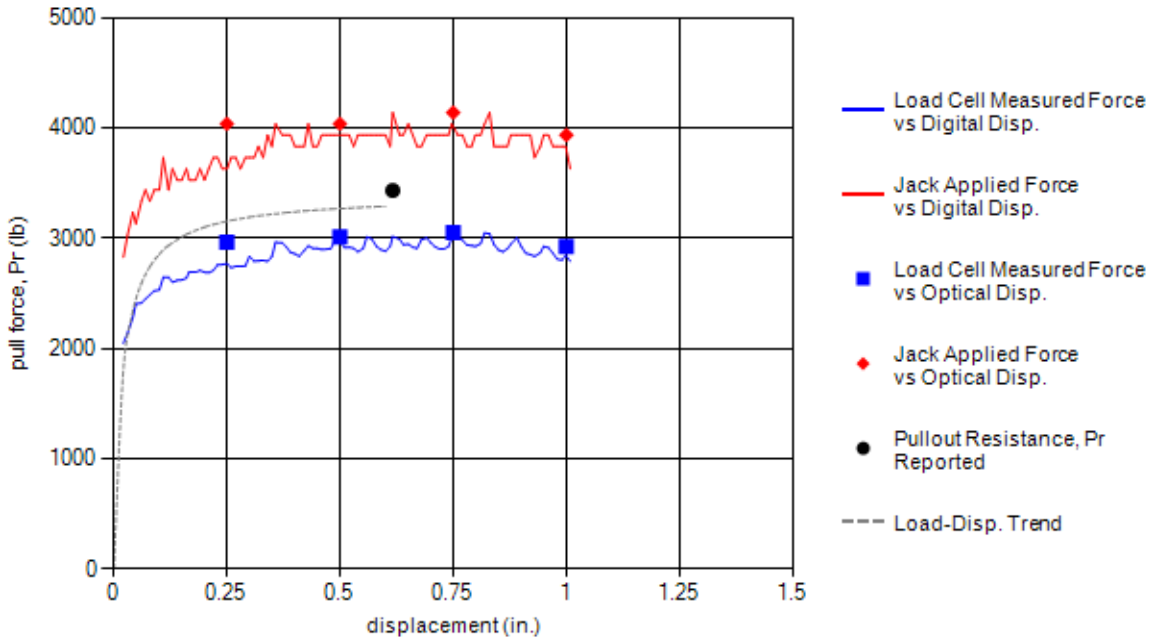
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	113.7	±2.6
Moisture Content, w (%):	7.4	±0.9%
Relative Compaction, C_R (%):	91.3	±2.1%

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	0.62	4852	3431	39.7	**0.53**

Load-Displacement Curve



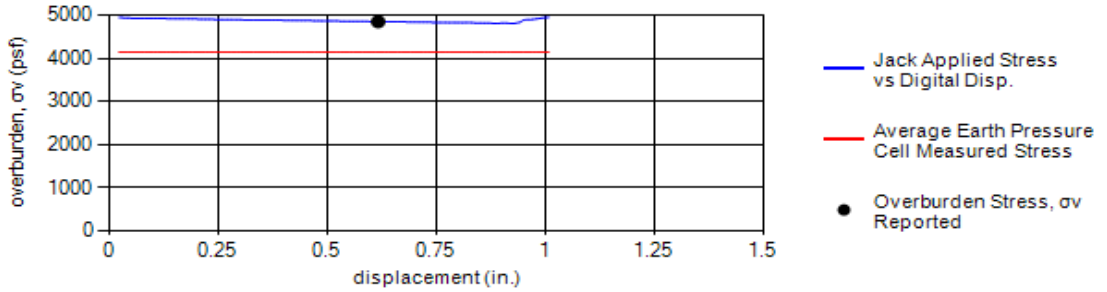
Comments

One inch displacement gage used.

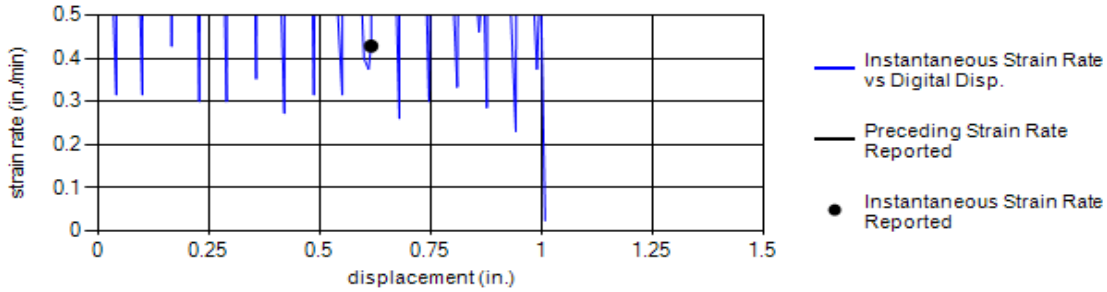
Personnel

Tested:	AS MB DH
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
4332	1843	4051	5446	5068	4148	1.03	4852



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.43	0.76	0.57



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

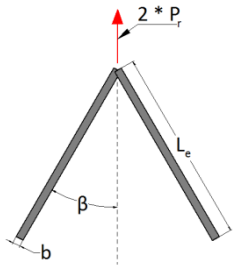
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	6/10/2010 11:47:00 AM
Test Identification:	TS03.01-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 B

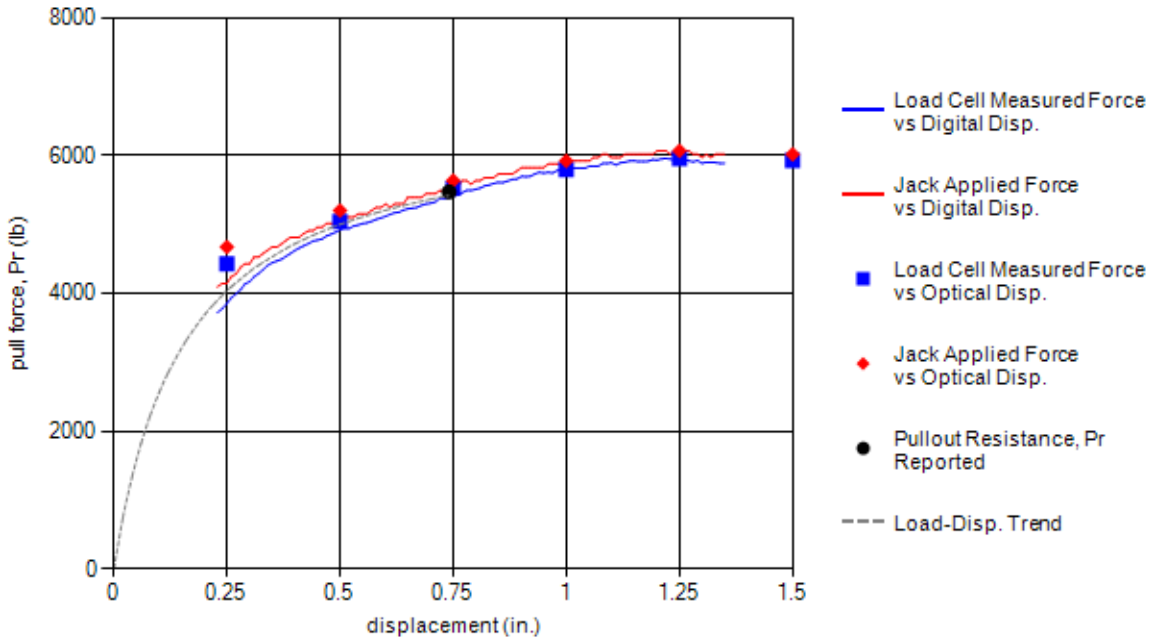
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	113.7	±2.6
Moisture Content, w (%):	7.4	±0.9%
Relative Compaction, C_R (%):	91.3	±2.1%

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	632	5469	5.2	**3.25**

Load-Displacement Curve



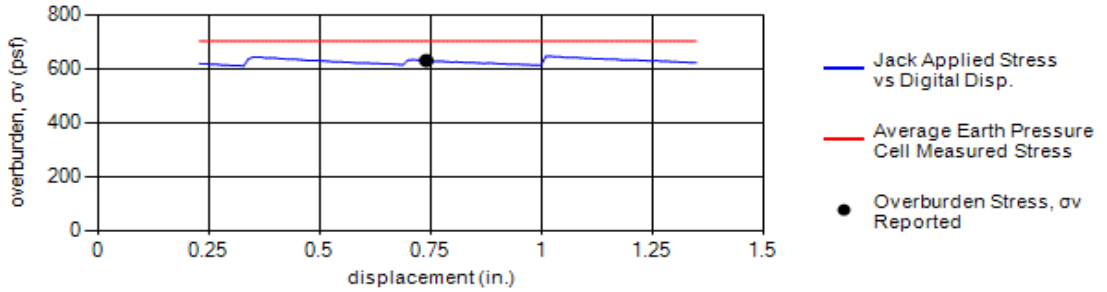
Comments

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.

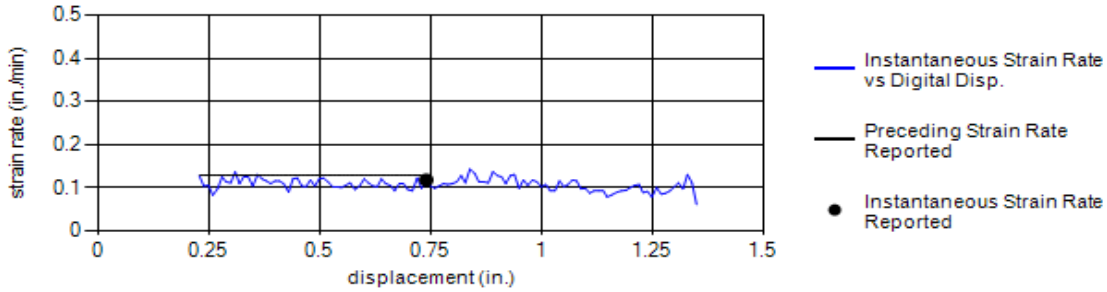
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
745	711	663	701	698	704	2.34	631



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

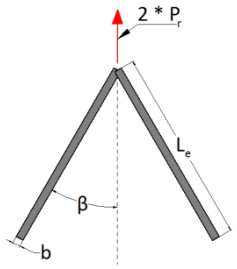
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	6/10/2010 11:22:00 AM
Test Identification:	TS03.03-S-L4.5-ß15°-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 (°):	15

Backfill Material

Specification:	TxDOT Item 423 - Type B

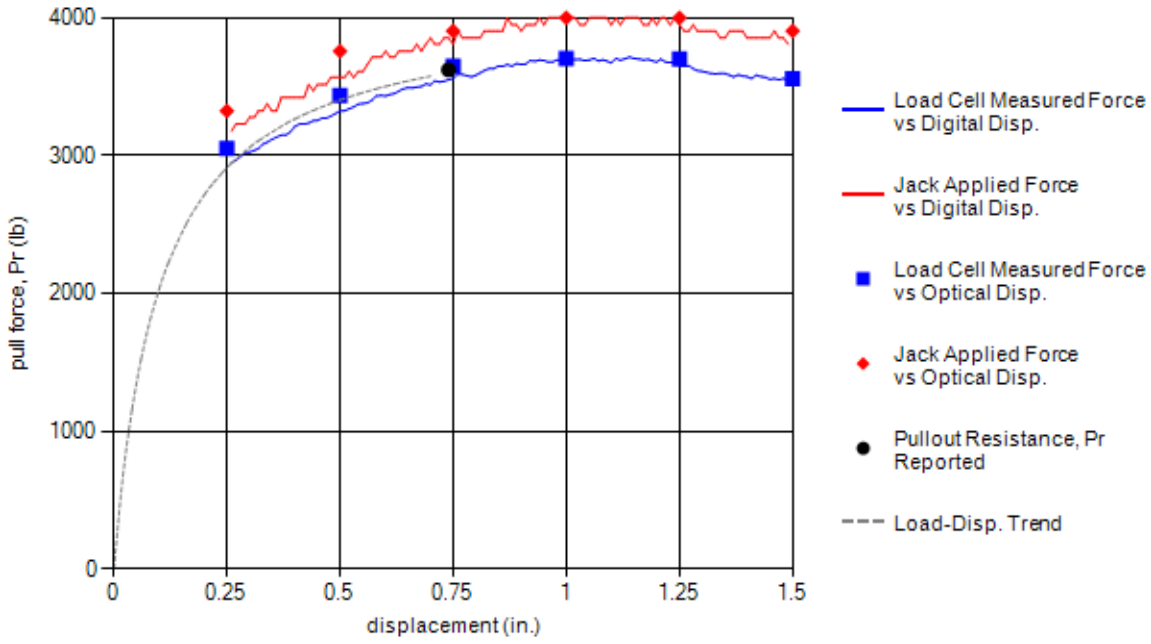
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	113.7	±2.6
Moisture Content, w (%):	7.4	±0.9%
Relative Compaction, C_R (%):	91.3	±2.1%

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	3620	12.1	**1.63**

Load-Displacement Curve



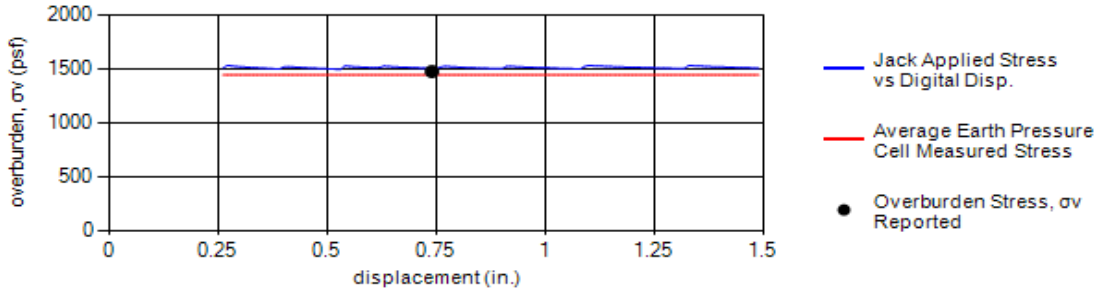
Comments

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.

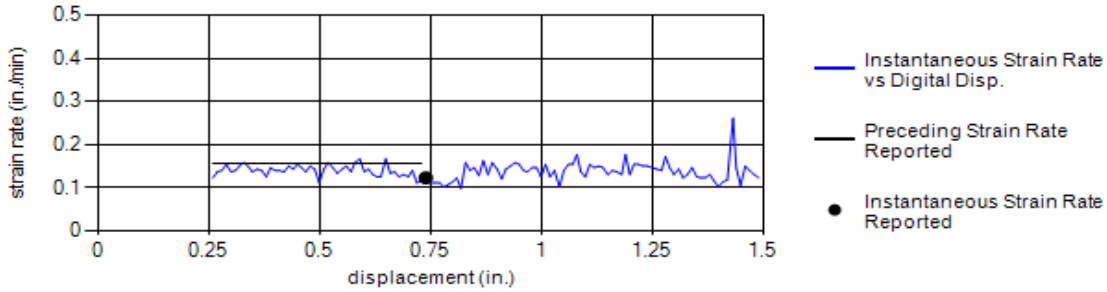
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1471	1437	1415	1449	1457	1446	1.12	1505



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.12	0.15	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

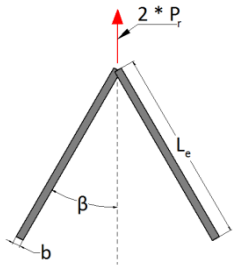
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	6/10/2010 12:18:00 PM
Test Identification:	TS03.05-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 B

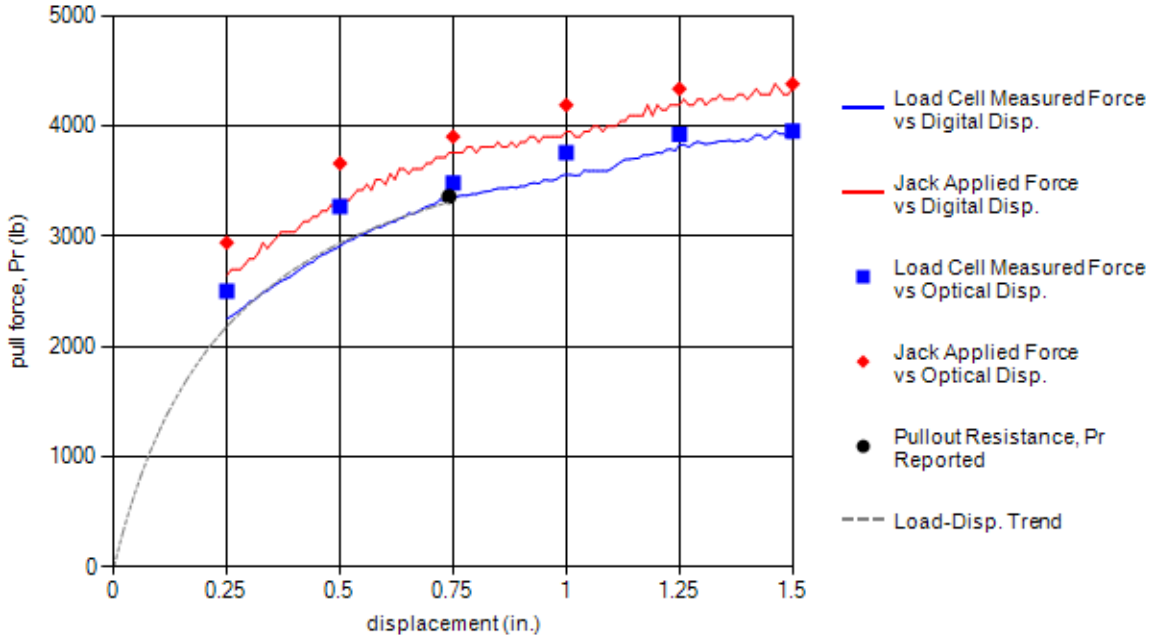
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	113.7	±2.6
Moisture Content, w (%):	7.4	±0.9%
Relative Compaction, C_R (%):	91.3	±2.1%

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	1516	3359	12.4	**1.48**

Load-Displacement Curve



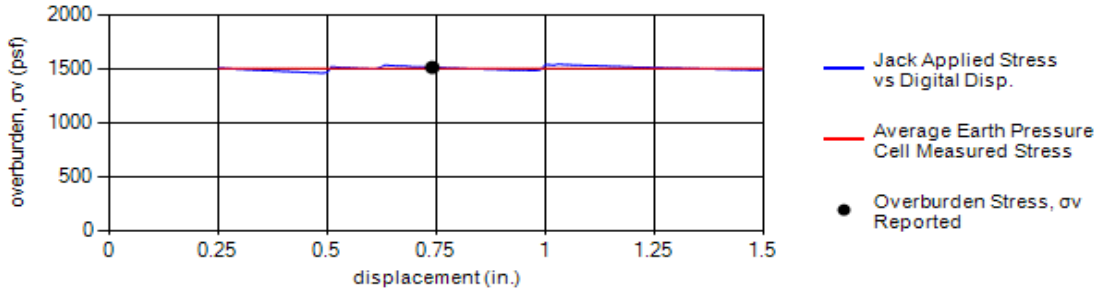
Comments

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.

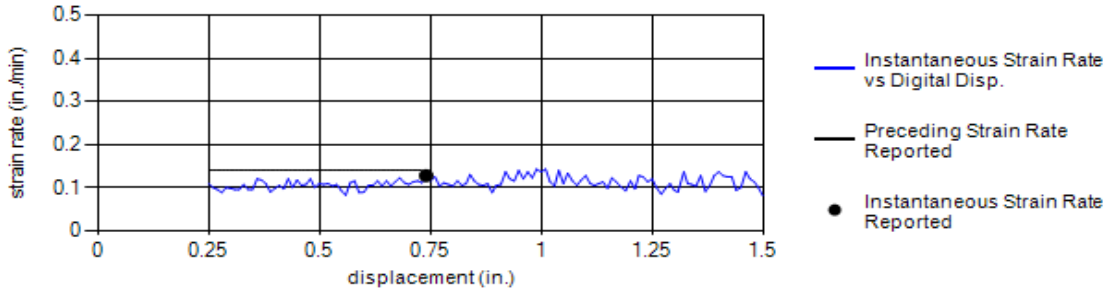
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1504	1497	1500	1530	1503	1507	1.14	1516



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.13	0.14	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

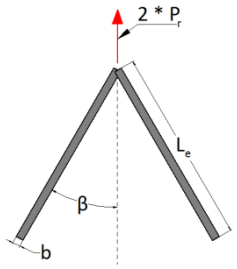
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	6/10/2010 9:54:00 AM
Test Identification:	TS03.07-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, ß (°):	15

Backfill Material

Specification:	TxDOT Item 423 - Type B

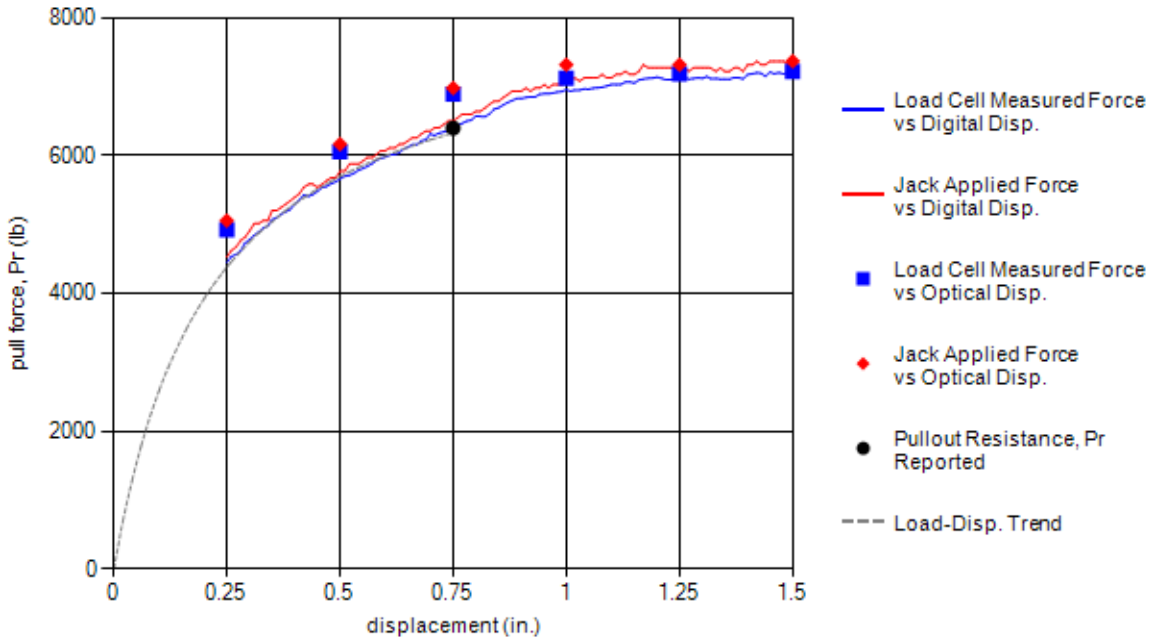
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	113.7	±2.6
Moisture Content, w (%):	7.4	±0.9%
Relative Compaction, C_R (%):	91.3	±2.1%

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	551	6396	4.5	**4.35**

Load-Displacement Curve



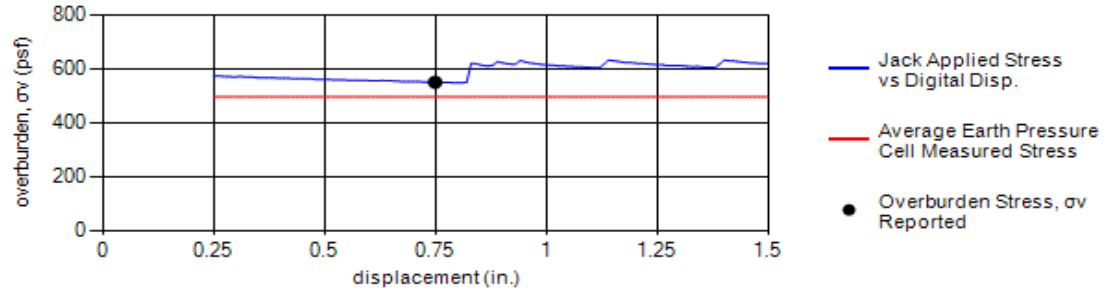
Comments

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.

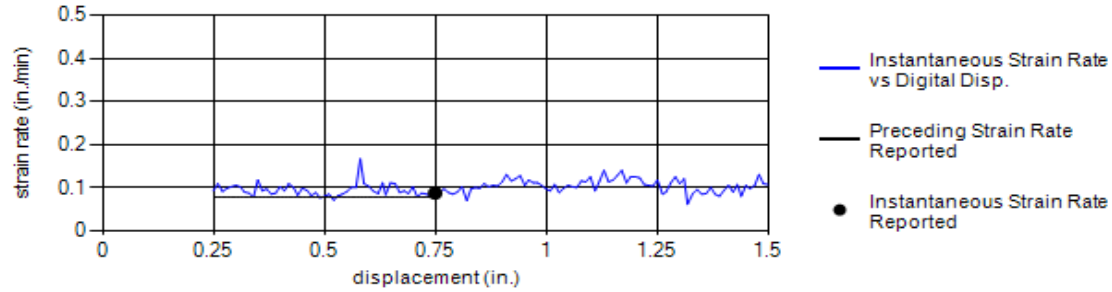
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
511	485	521	483	482	497	1.17	551



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*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

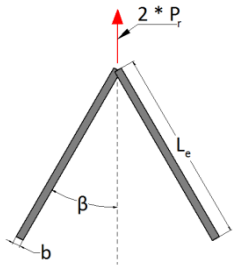
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	6/9/2010 11:04:00 AM
Test Identification:	TS03.09-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, ß (°):	30

Backfill Material

Specification:	TxDOT Item 423 - Type B

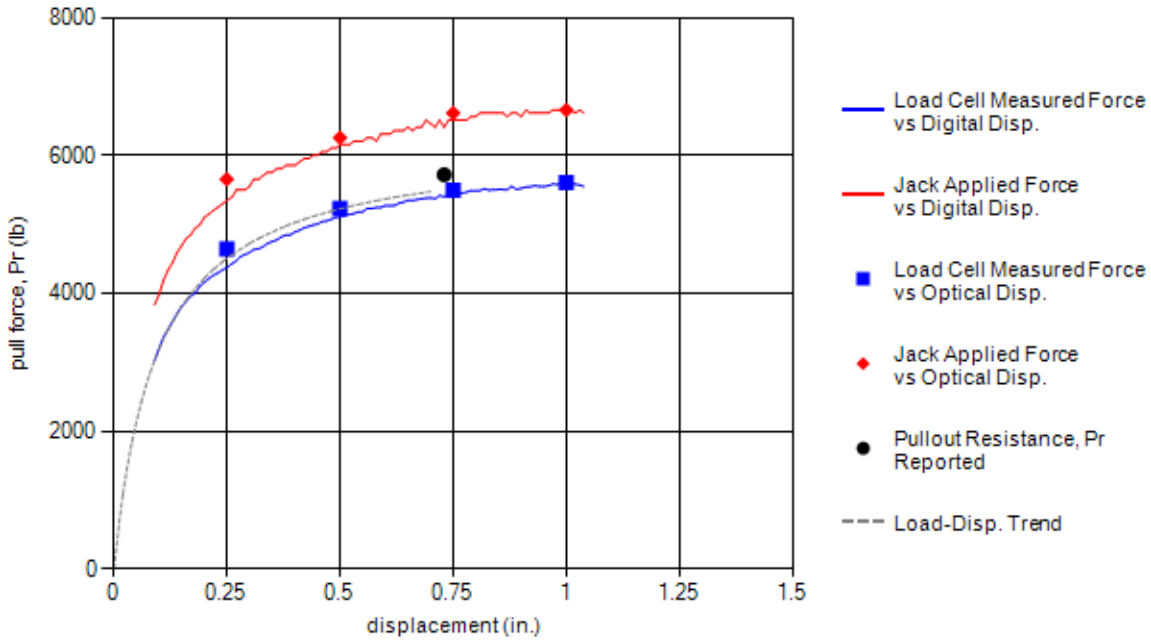
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	113.7	±2.6
Moisture Content, w (%):	7.4	±0.9%
Relative Compaction, C_R (%):	91.3	±2.1%

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	5720	5.1	**3.42**

Load-Displacement Curve



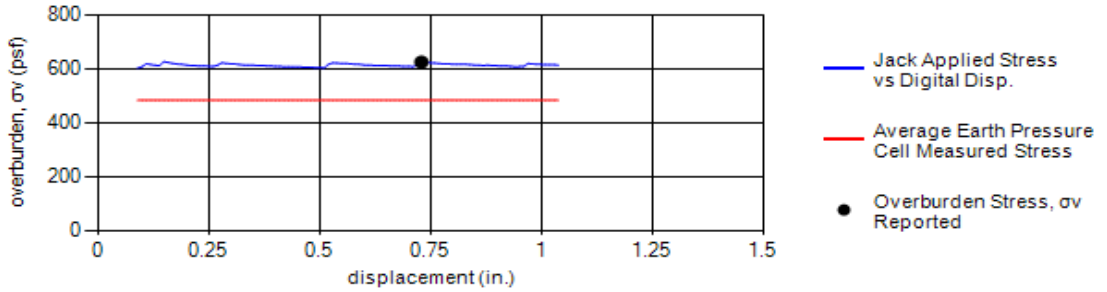
Comments

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.

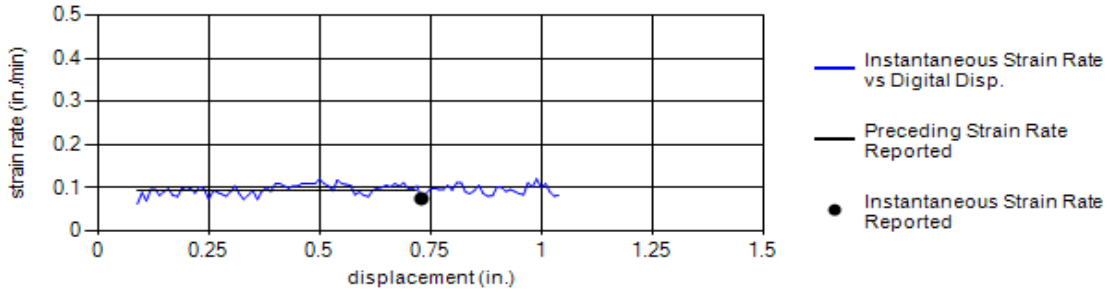
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
564	470	529	411	446	484	1.07	627



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

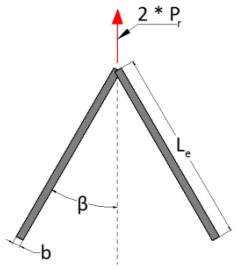
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	6/10/2010 10:43:00 AM
Test Identification:	TS03.11-S-L4.5-ß15°-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 (°):	15

Backfill Material

Specification:	TxDOT Item 423 - Type B

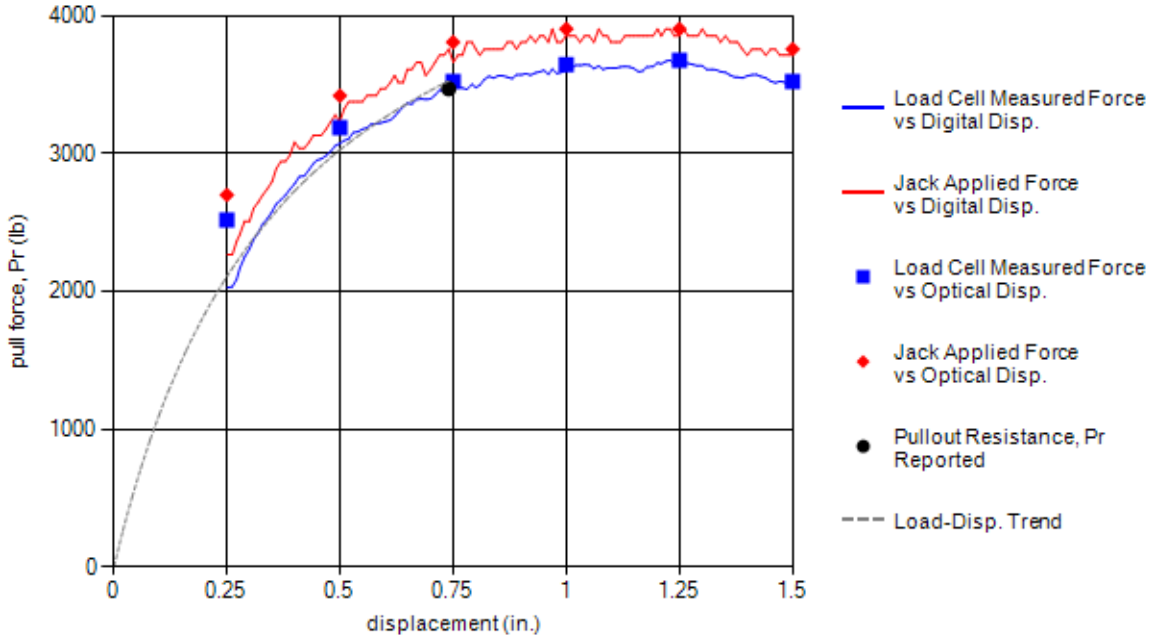
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	113.7	±2.6
Moisture Content, w (%):	7.4	±0.9%
Relative Compaction, C_R (%):	91.3	±2.1%

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	3468	12.3	**1.53**

Load-Displacement Curve



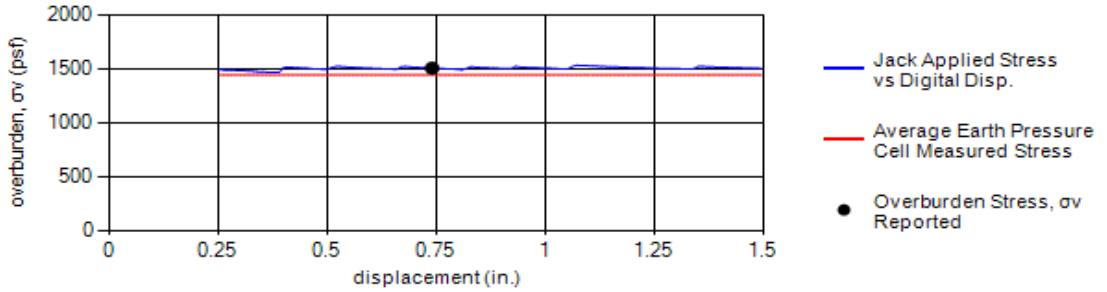
Comments

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.

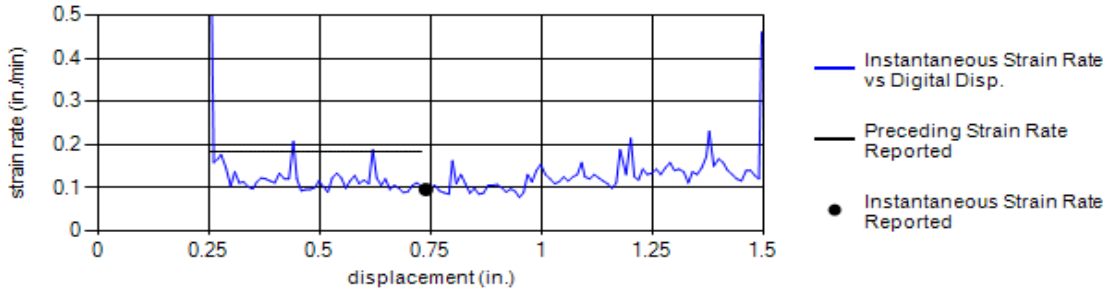
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1475	1472	1509	1387	1383	1445	1.03	1511



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

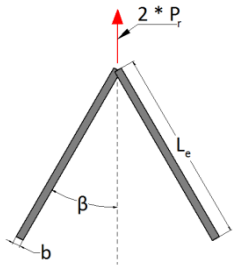
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	6/16/2010 10:45:00 AM
Test Identification:	TS04.01-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 B

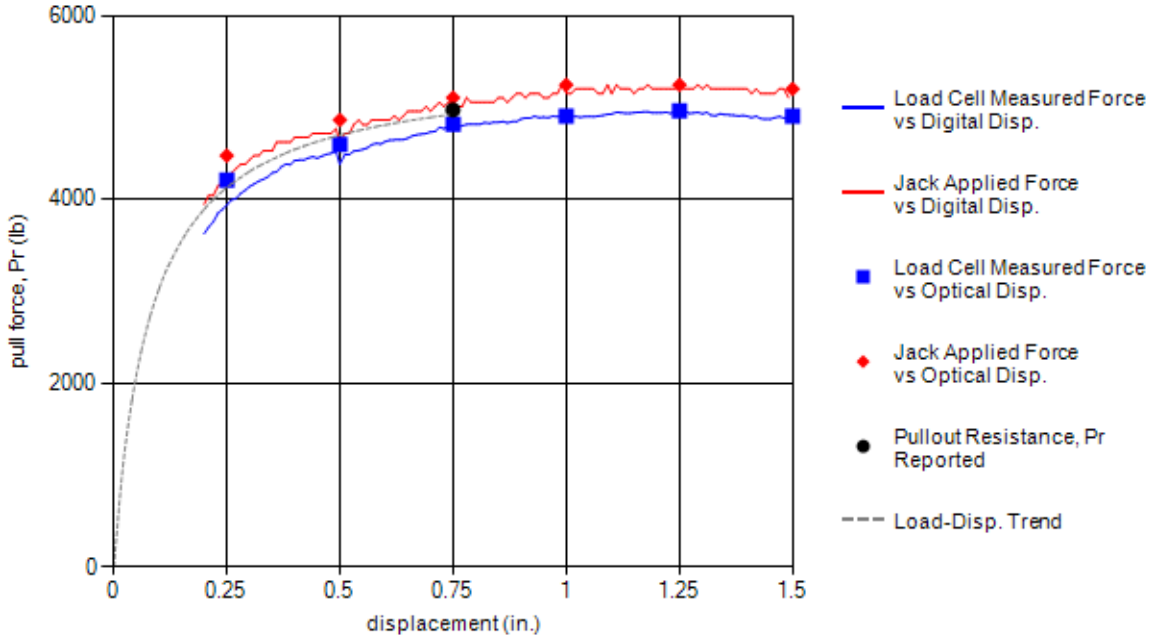
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	114.4	±0.9
Moisture Content, w (%):	6.7	±0.1%
Relative Compaction, C_R (%):	91.8	±0.7%

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	624	4972	5.1	**2.99**

Load-Displacement Curve



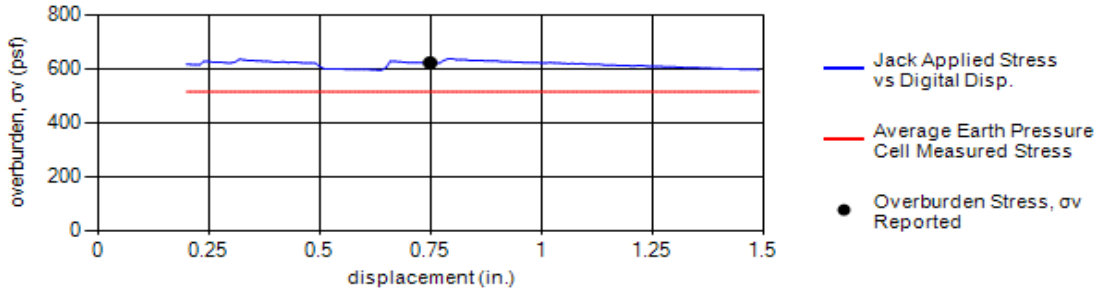
Comments

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.

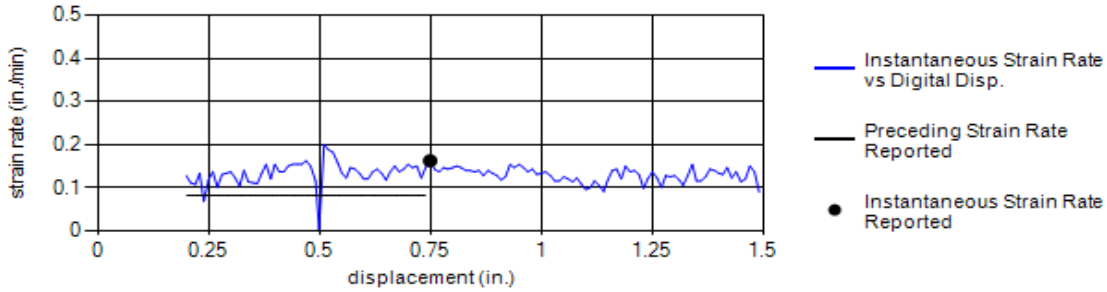
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
593	453	584	521	432	516	1.11	624



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

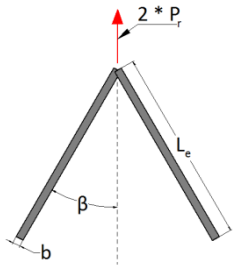
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	6/16/2010 12:40:00 PM
Test Identification:	TS04.03-S-L4.5-ß15°-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 (°):	15

Backfill Material

Specification:	TxDOT Item 423 - Type B

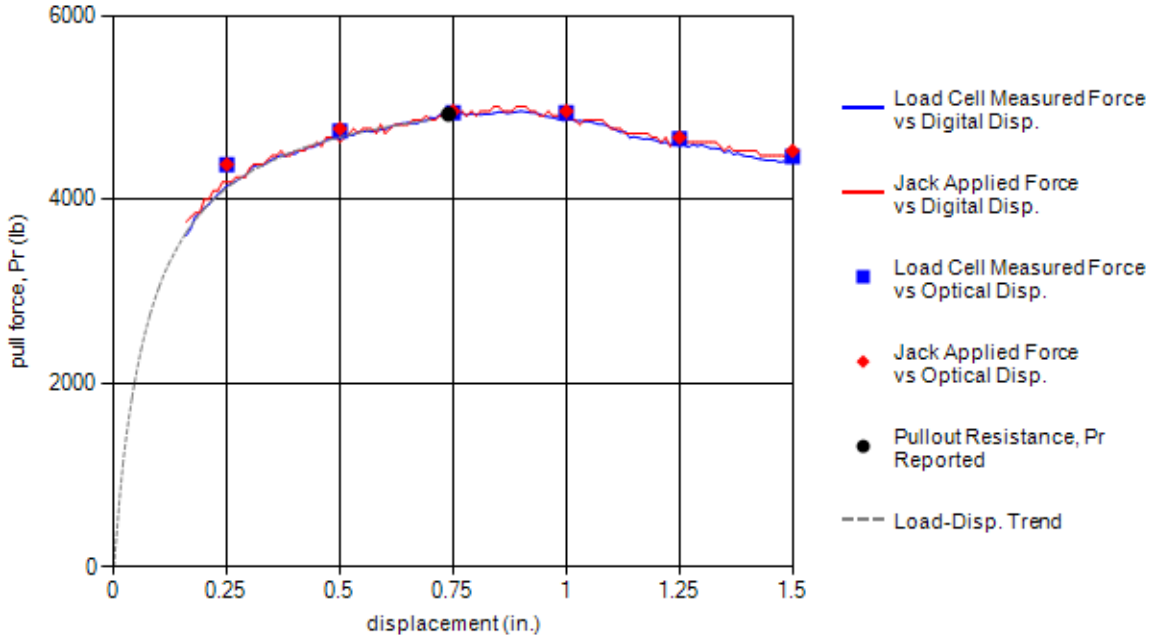
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	114.4	±0.9
Moisture Content, w (%):	6.7	±0.1%
Relative Compaction, C_R (%):	91.8	±0.7%

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	1521	4926	12.5	**2.16**

Load-Displacement Curve



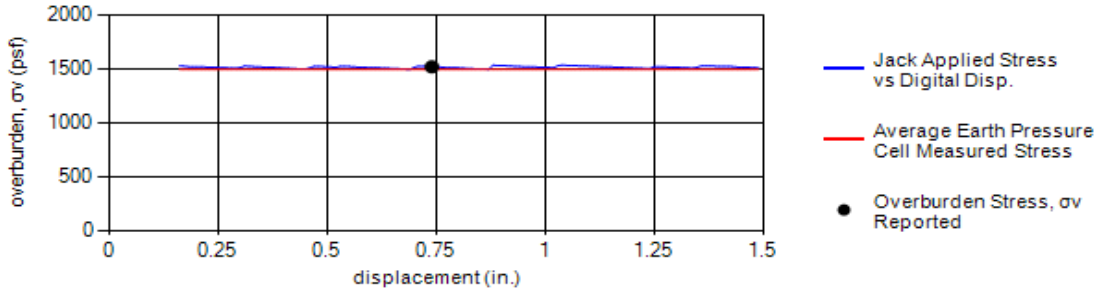
Comments

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.

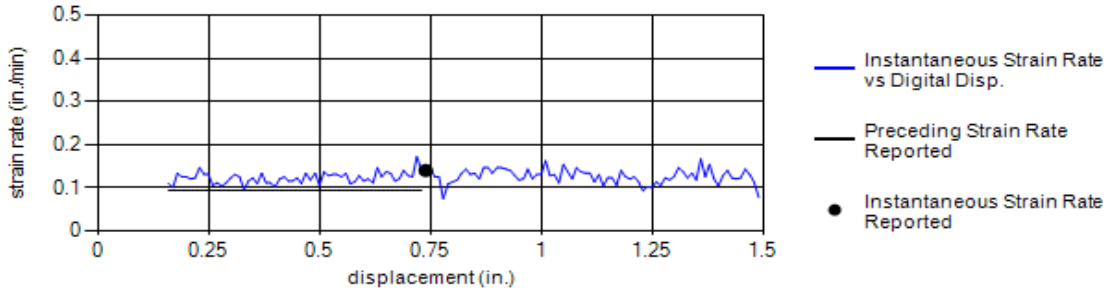
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1654	1164	1526	1542	1605	1498	1.02	1522



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.14	0.09	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

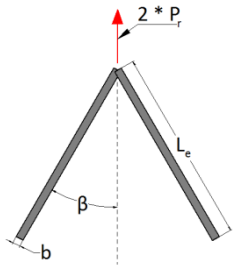
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	6/16/2010 12:00:00 PM
Test Identification:	TS04.05-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 B

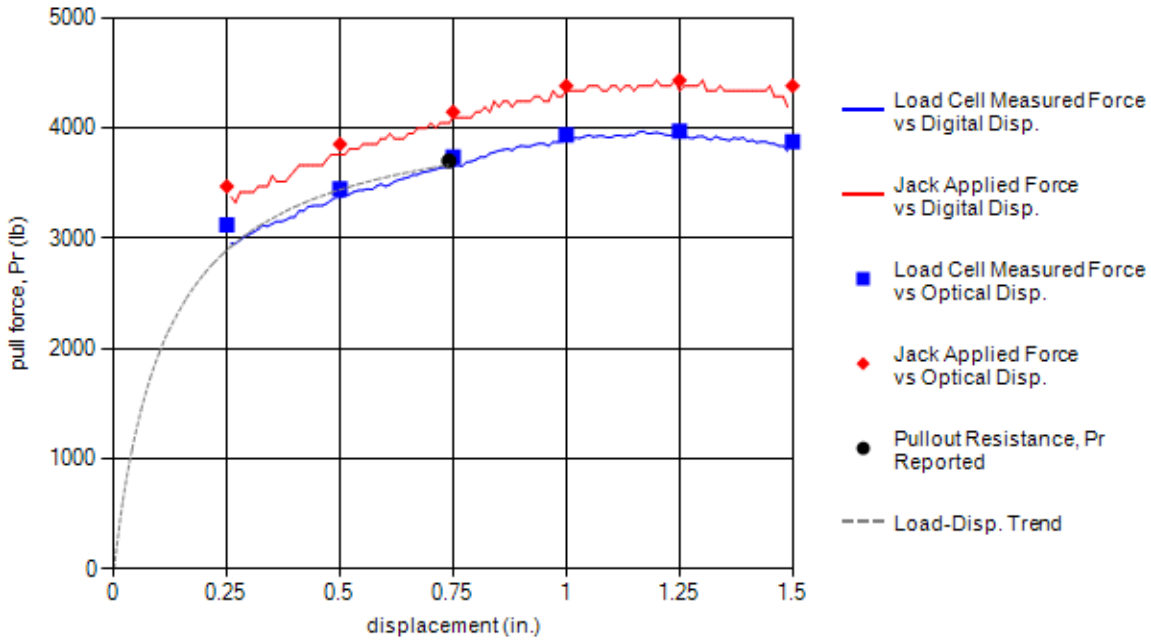
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	114.4	±0.9
Moisture Content, w (%):	6.7	±0.1%
Relative Compaction, C_R (%):	91.8	±0.7%

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	1503	3700	12.3	**1.64**

Load-Displacement Curve



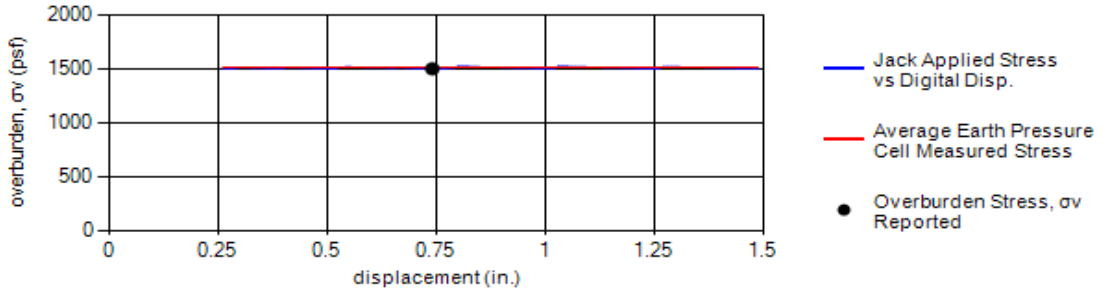
Comments

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.

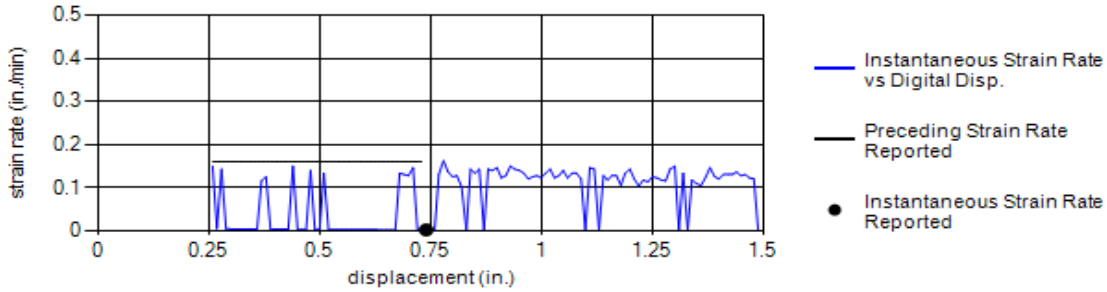
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1659	1215	1575	1566	1574	1518	1.04	1503



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.00	0.16	0.32



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

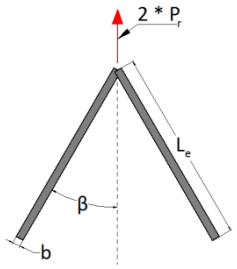
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	6/16/2010 10:01:00 AM
Test Identification:	TS04.07-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, ß (°):	15

Backfill Material

Specification:	TxDOT Item 423 - Type B

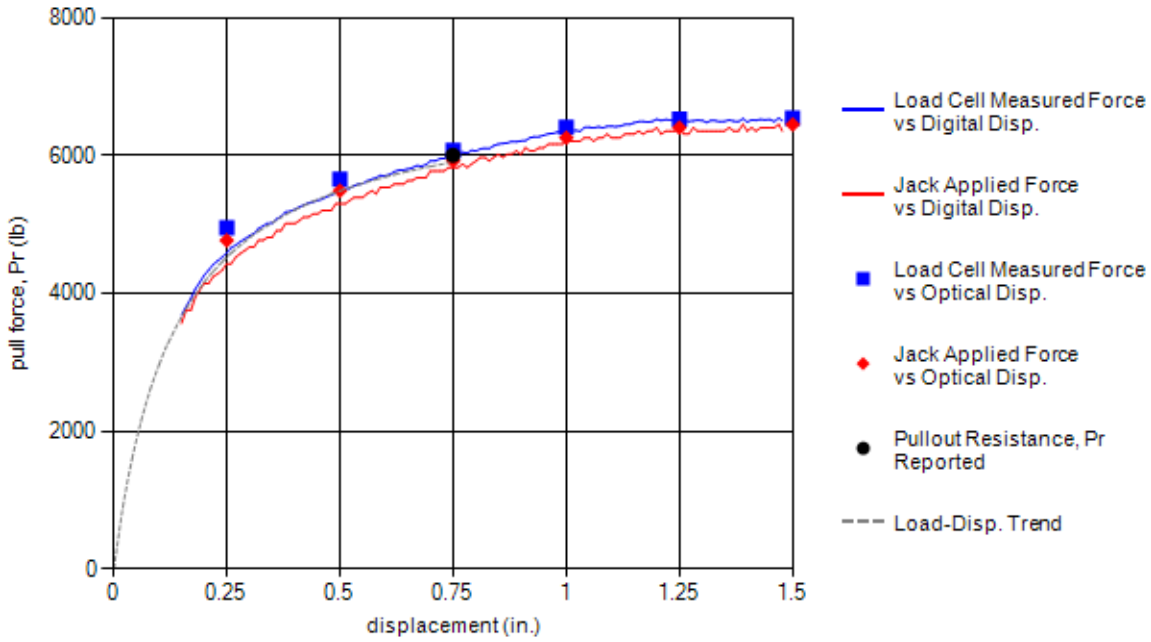
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	114.4	±0.9
Moisture Content, w (%):	6.7	±0.1%
Relative Compaction, C_R (%):	91.8	±0.7%

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	608	6001	5.0	**3.70**

Load-Displacement Curve



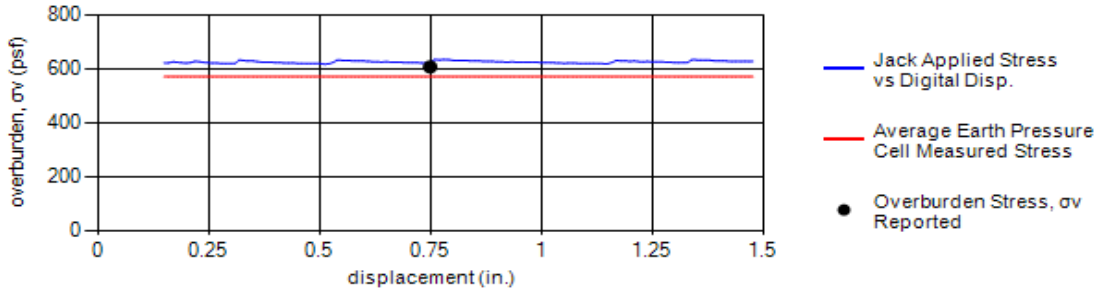
Comments

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.

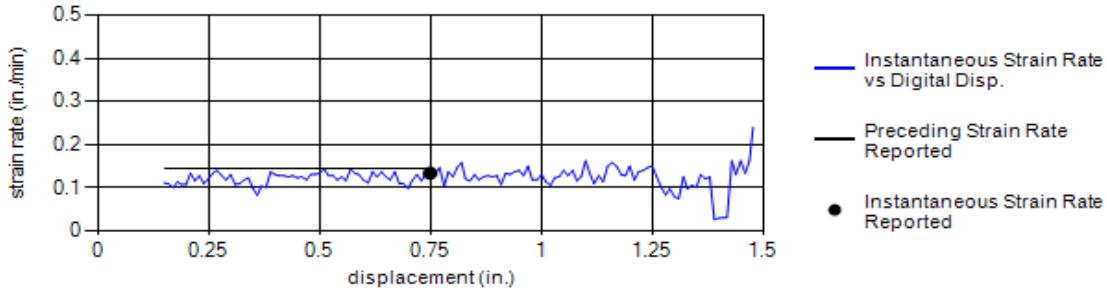
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
608	489	670	572	519	572	1.06	624



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.13	0.14	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

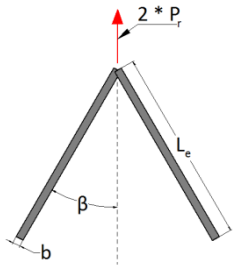
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	6/16/2010 11:25:00 AM
Test Identification:	TS04.09-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 B

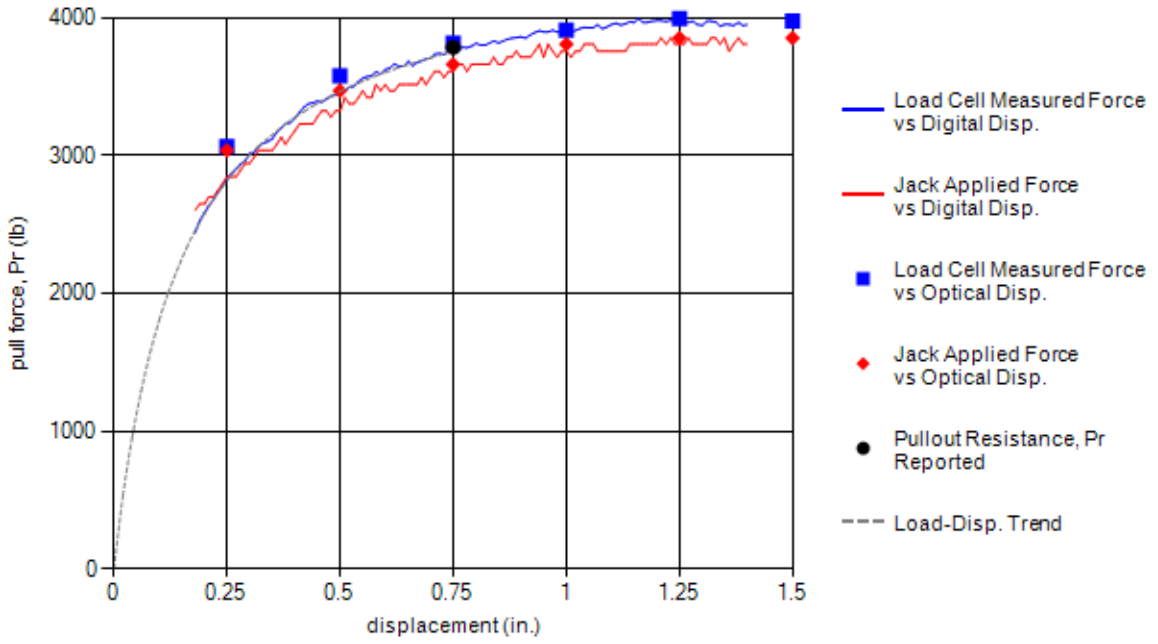
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	114.4	±0.9
Moisture Content, w (%):	6.7	±0.1%
Relative Compaction, C_R (%):	91.8	±0.7%

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	1506	3782	12.3	**1.67**

Load-Displacement Curve



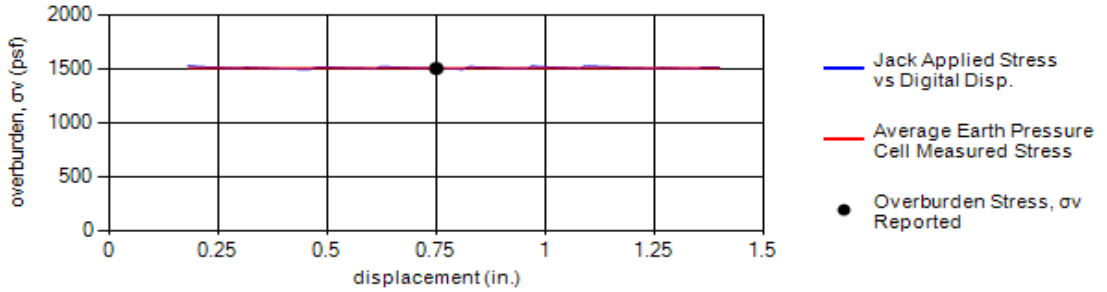
Comments

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.

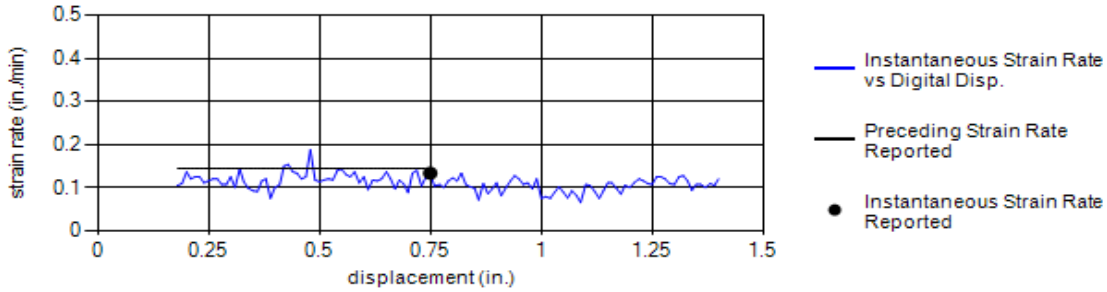
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1663	1237	1636	1549	1461	1509	1.03	1504



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.13	0.14	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

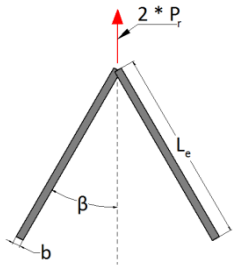
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	6/15/2010 3:39:00 PM
Test Identification:	TS04.11-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, β (°):	15

Backfill Material

Specification:	TxDOT Item 423 - Type B

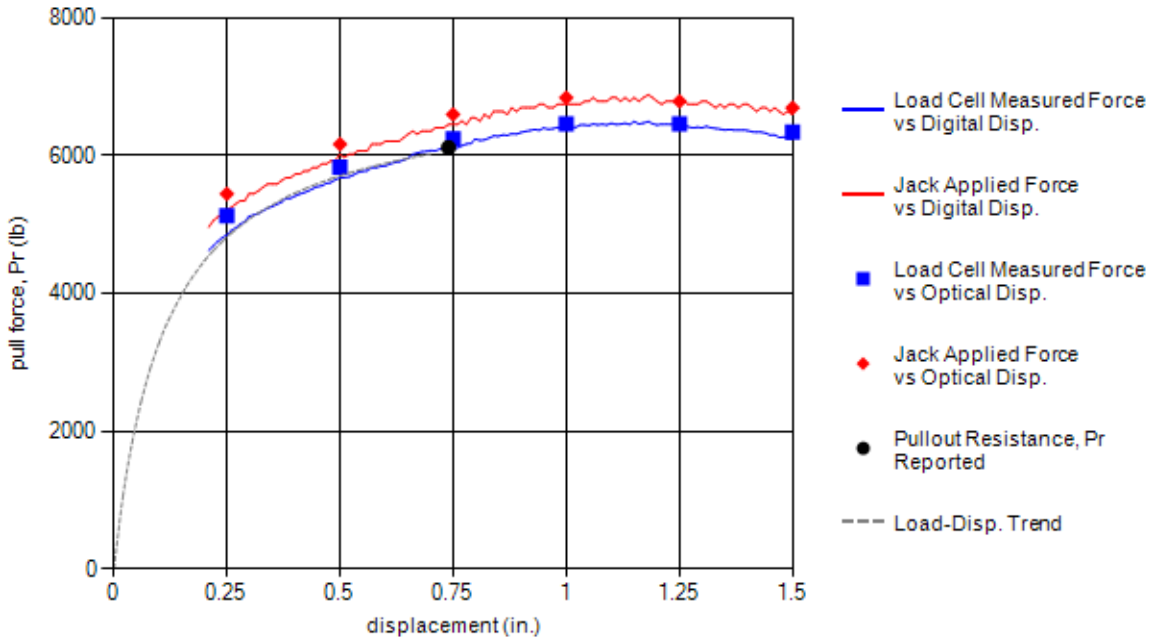
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	114.4	±0.9
Moisture Content, w (%):	6.7	±0.1%
Relative Compaction, C_R (%):	91.8	±0.7%

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	628	6113	5.1	**3.65**

Load-Displacement Curve



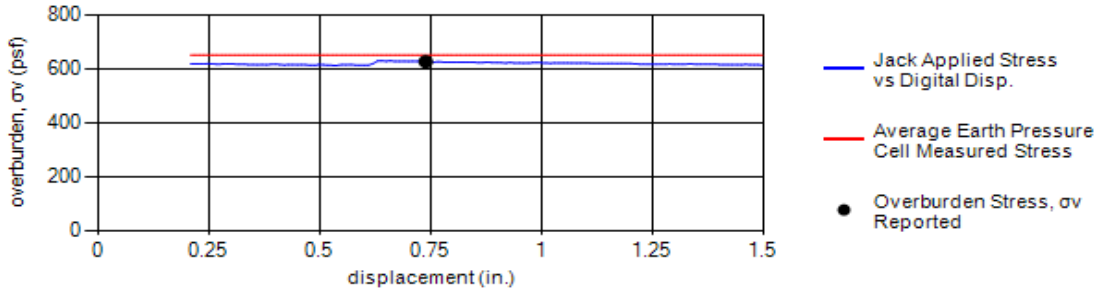
Comments

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.

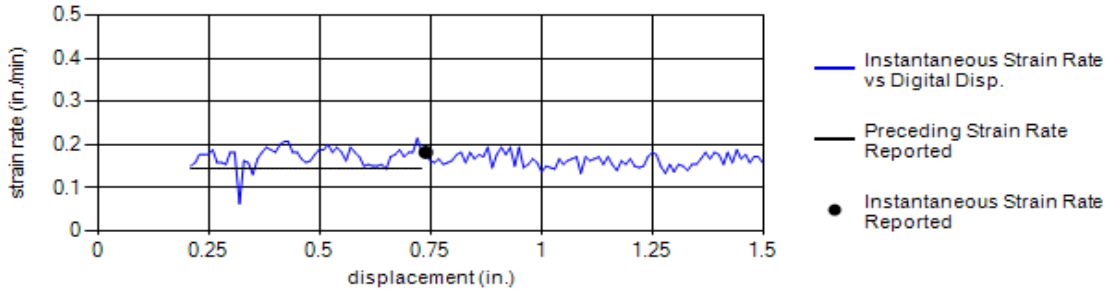
Personnel

Tested:	AS MB DH
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
652	619	854	650	492	653	1.09	628



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

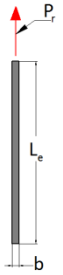
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	6/23/2010 3:19:00 PM
Test Identification:	TS05.01-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 B

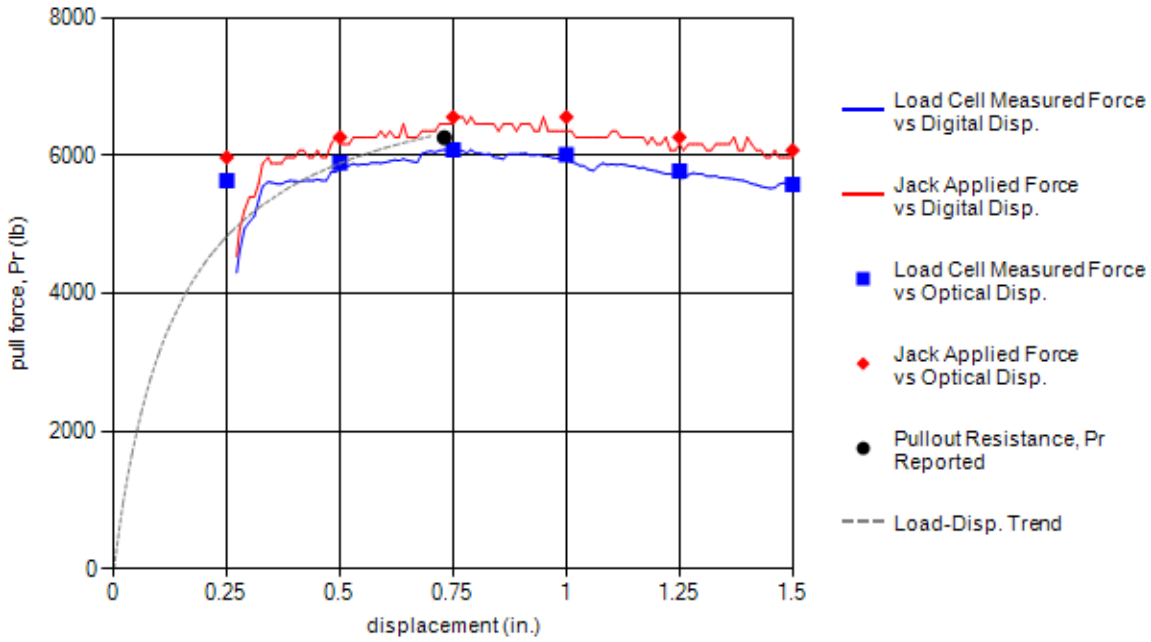
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	114.4	±0.9
Moisture Content, w (%):	6.7	±0.1%
Relative Compaction, C_R (%):	91.8	±0.7%

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	5070	6256	41.6	**0.93**

Load-Displacement Curve

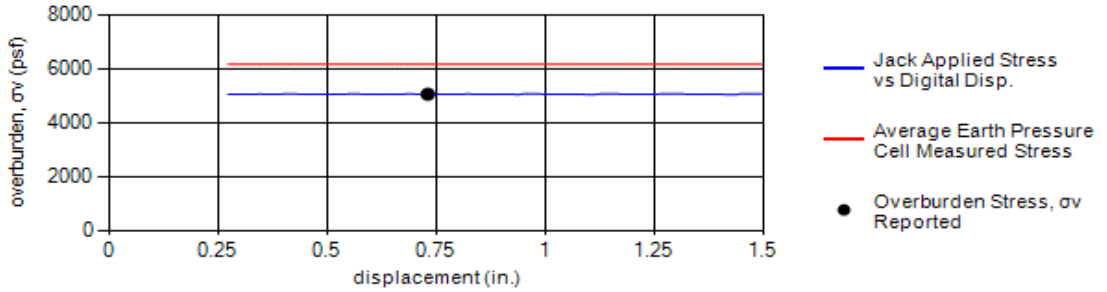


Comments

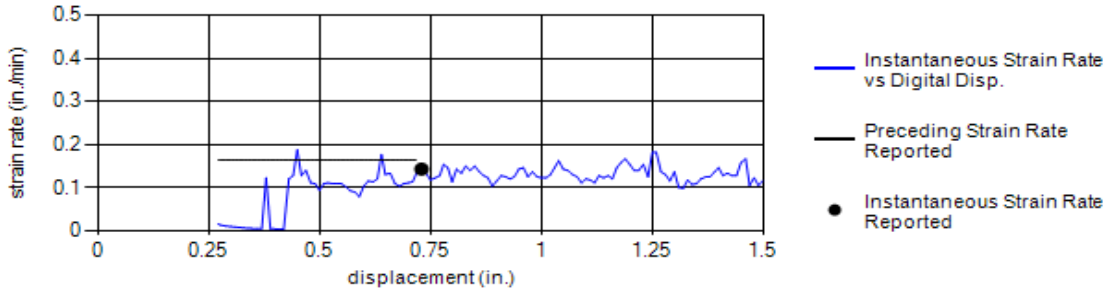
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
6424	7191	4504	6724	6033	6175	1.01	5070



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

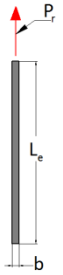
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	6/23/2010 3:39:00 PM
Test Identification:	TS05.02-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 B

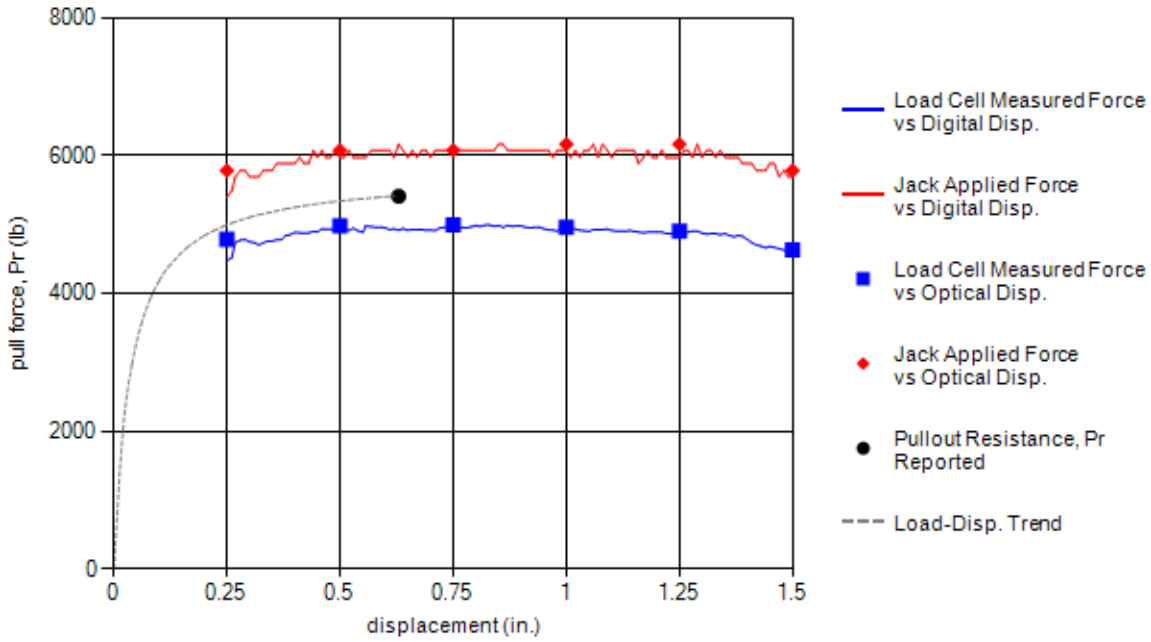
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	114.4	±0.9
Moisture Content, w (%):	6.7	±0.1%
Relative Compaction, C_R (%):	91.8	±0.7%

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	0.63	5019	5406	41.1	**0.81**

Load-Displacement Curve



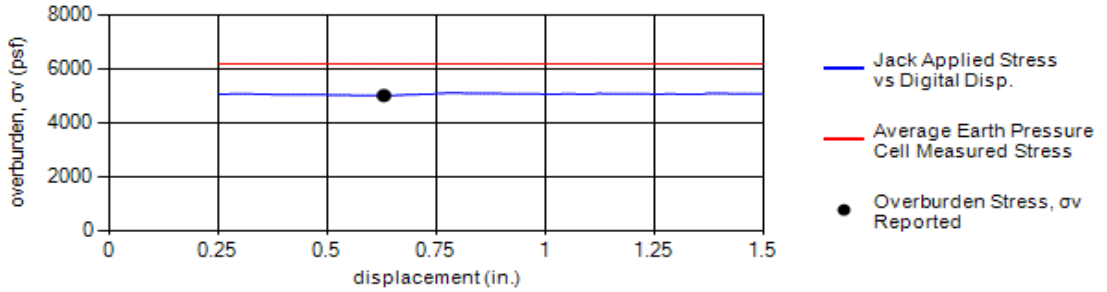
Comments

Personnel

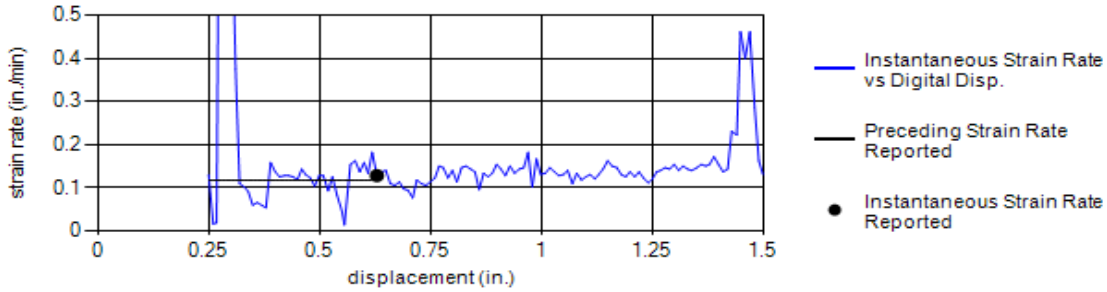
Tested:	AS MB AS
Prepared:	SB TW
Checked:	WL PJ

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
6435	7237	4506	6739	6050	6194	1.01	5016



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

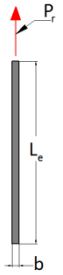
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	6/23/2010 4:01:00 PM
Test Identification:	TS05.03-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 B

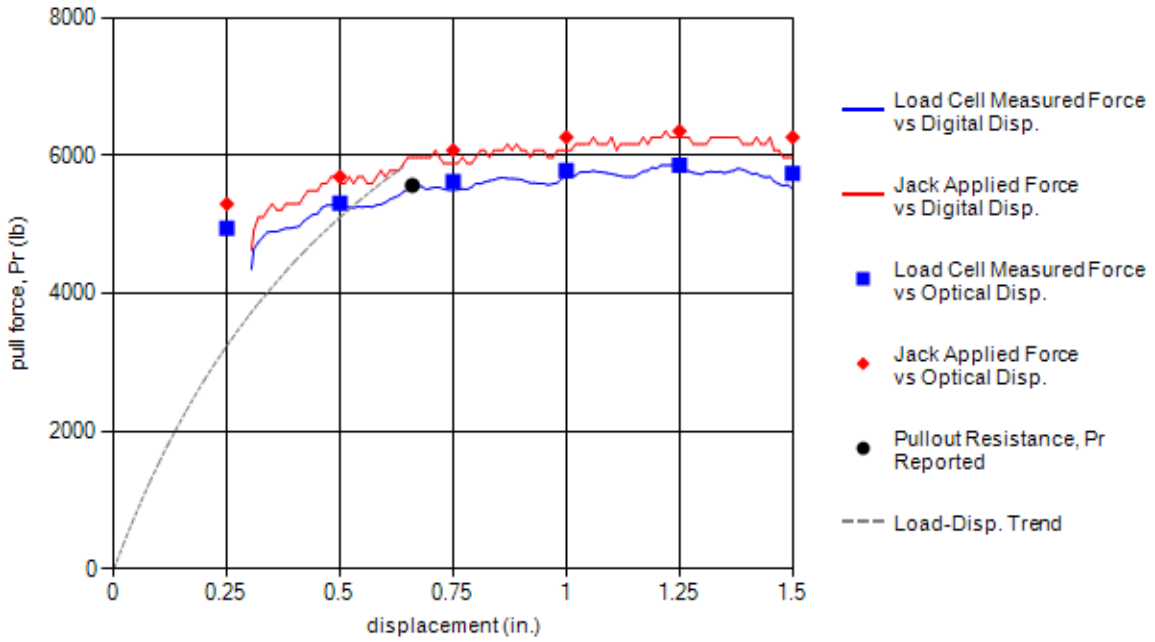
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	114.4	±0.9
Moisture Content, w (%):	6.7	±0.1%
Relative Compaction, C_R (%):	91.8	±0.7%

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	5074	5564	41.6	**0.82**

Load-Displacement Curve

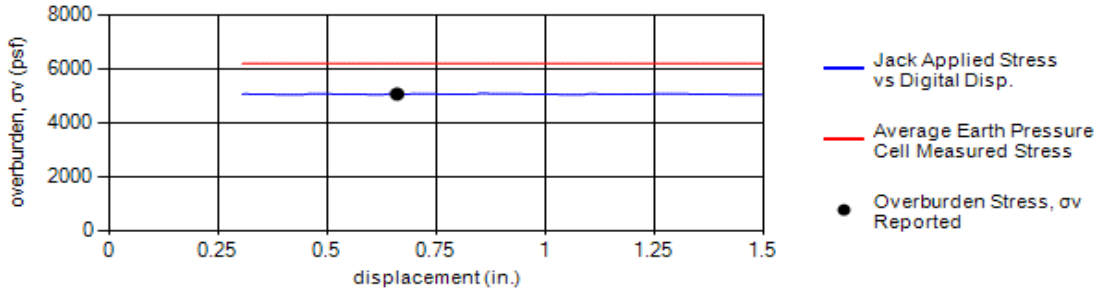


Comments

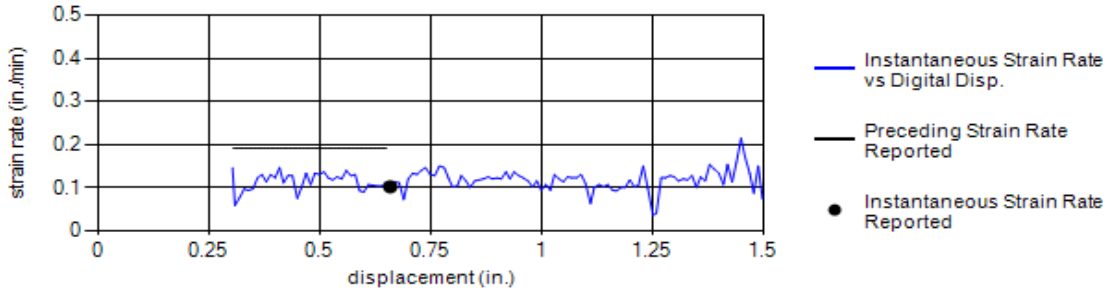
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
6483	7274	4499	6740	6043	6208	1.01	5074



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

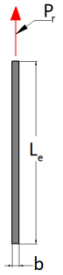
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	6/23/2010 4:22:00 PM
Test Identification:	TS05.04-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 B

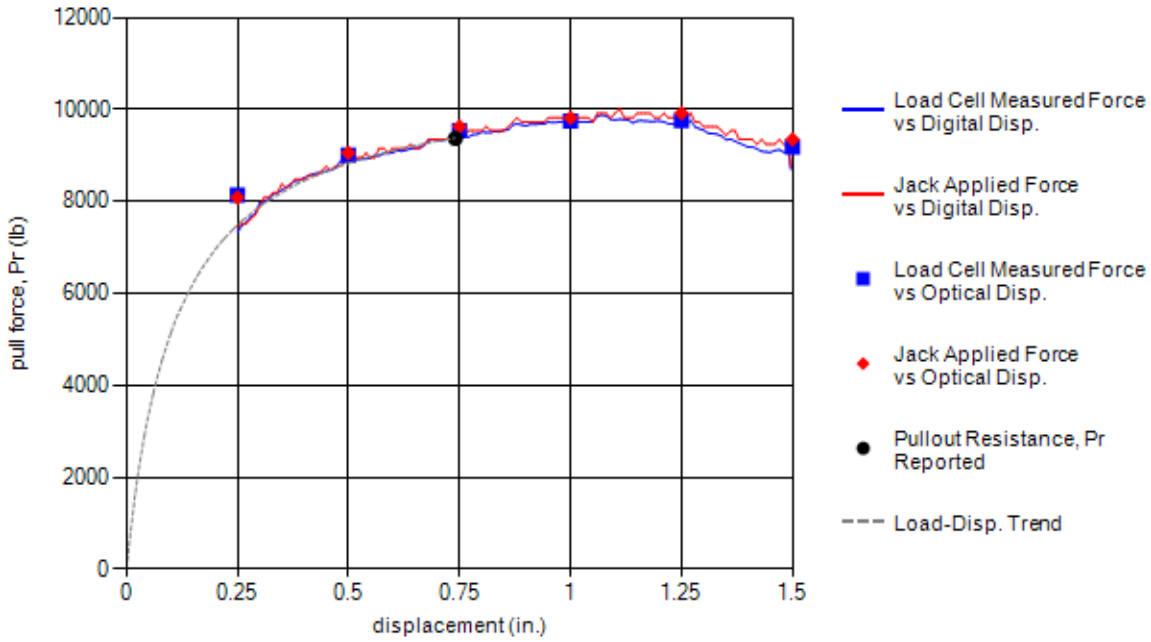
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	114.4	±0.9
Moisture Content, w (%):	6.7	±0.1%
Relative Compaction, C_R (%):	91.8	±0.7%

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	5059	9365	41.5	**1.39**

Load-Displacement Curve

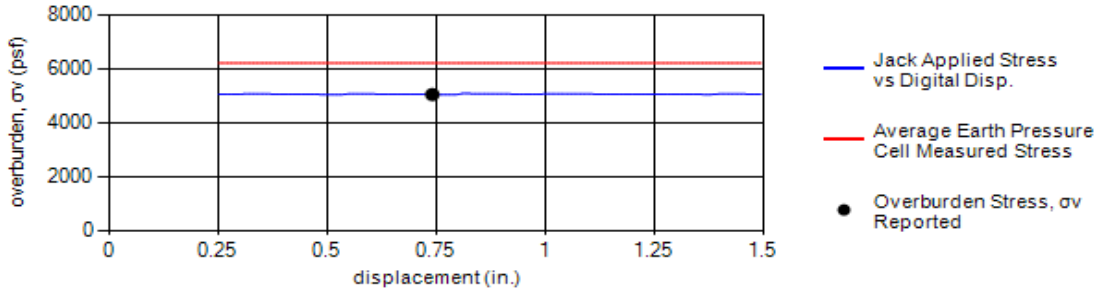


Comments

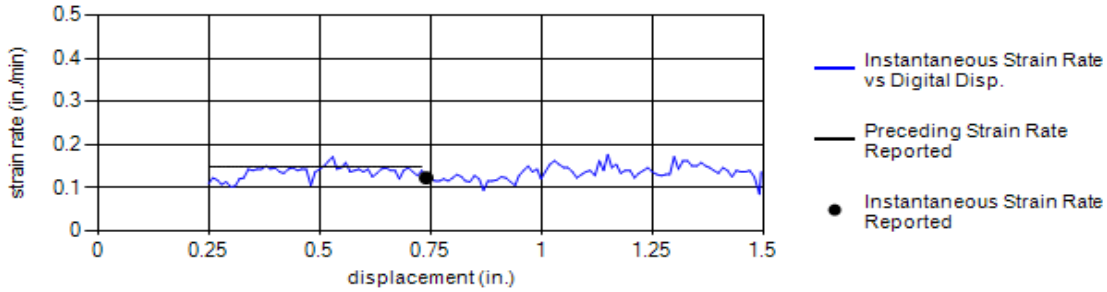
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
6521	7314	4504	6746	6050	6227	1.01	5059



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.12	0.15	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

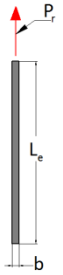
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	6/23/2010 4:41:00 PM
Test Identification:	TS05.05-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 B

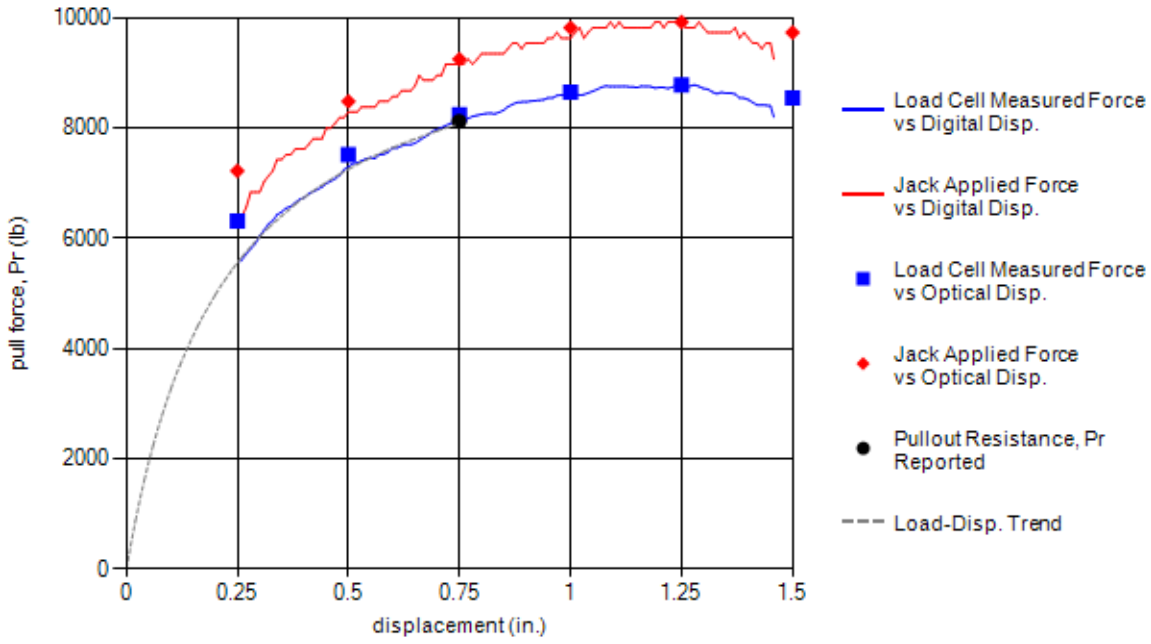
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	114.4	±0.9
Moisture Content, w (%):	6.7	±0.1%
Relative Compaction, C_R (%):	91.8	±0.7%

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	5058	8113	41.5	**0.80**

Load-Displacement Curve

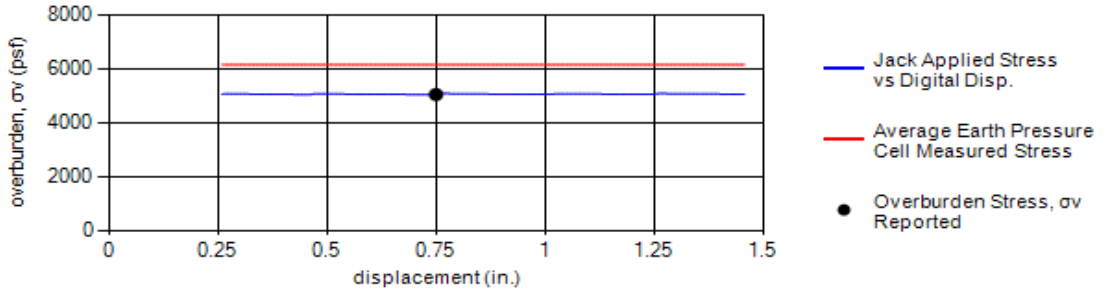


Comments

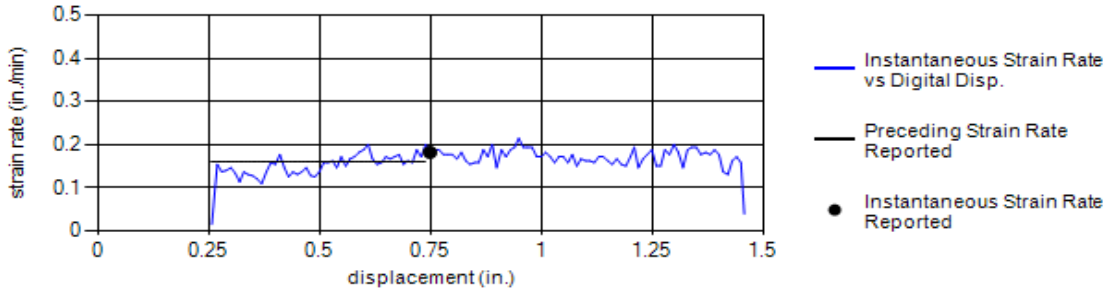
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
6496	7079	4503	6733	6037	6170	1.02	5055



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.18	0.16	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

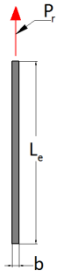
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	6/23/2010 1:45:00 PM
Test Identification:	TS05.06-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 B

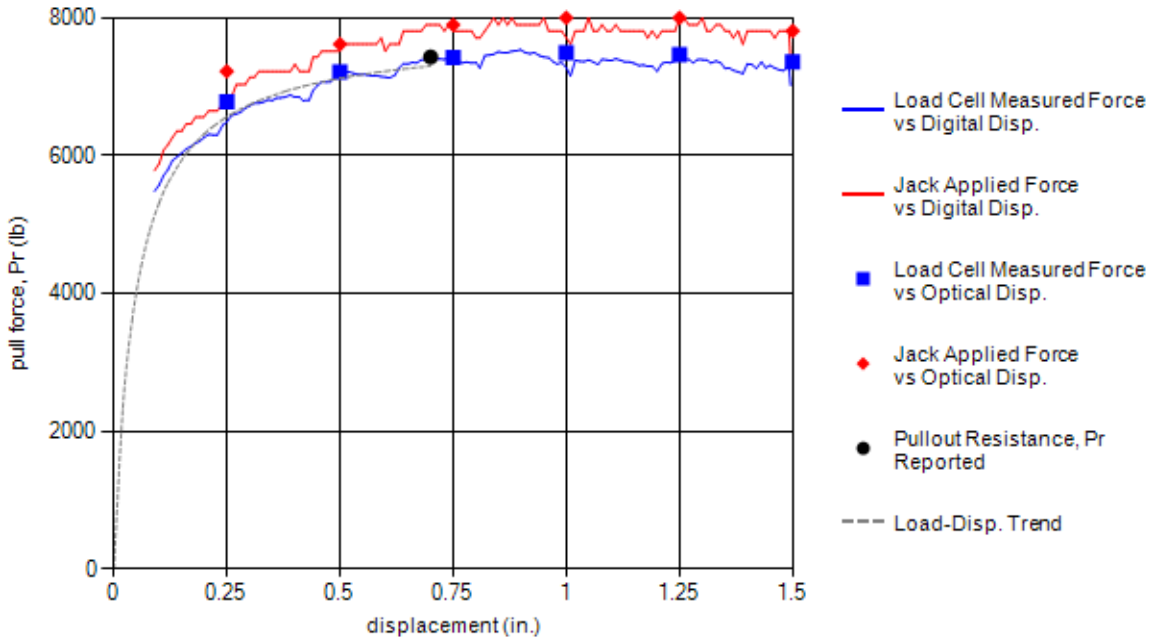
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	114.4	±0.9
Moisture Content, w (%):	6.7	±0.1%
Relative Compaction, C_R (%):	91.8	±0.7%

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	5084	7426	41.7	**0.73**

Load-Displacement Curve

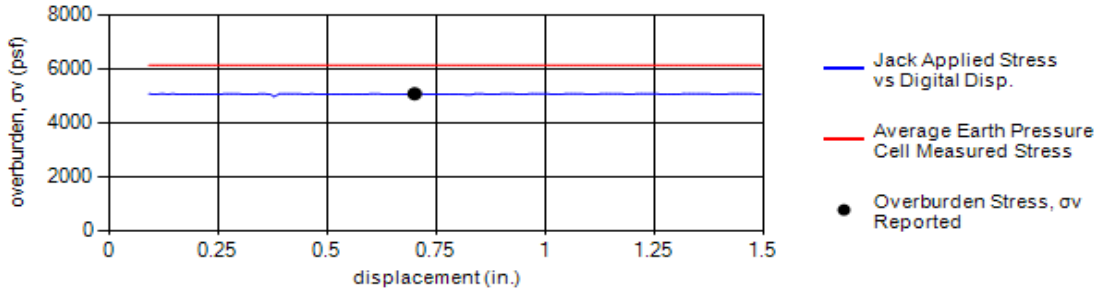


Comments

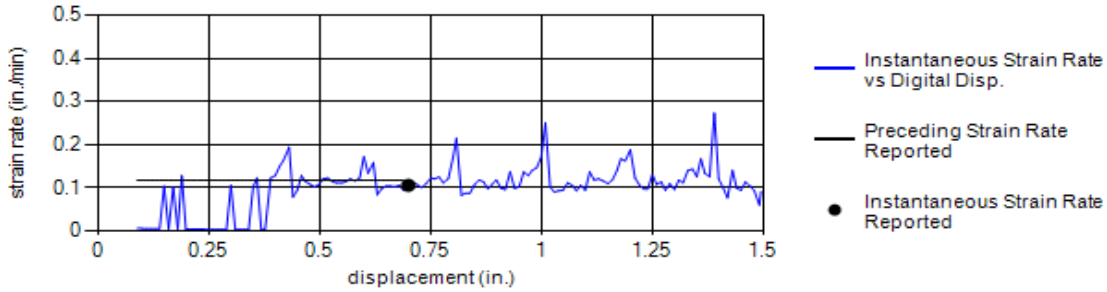
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
6586	6993	4447	6669	6018	6143	1.00	5083



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

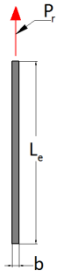
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	6/23/2010 2:07:00 PM
Test Identification:	TS05.07-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 B

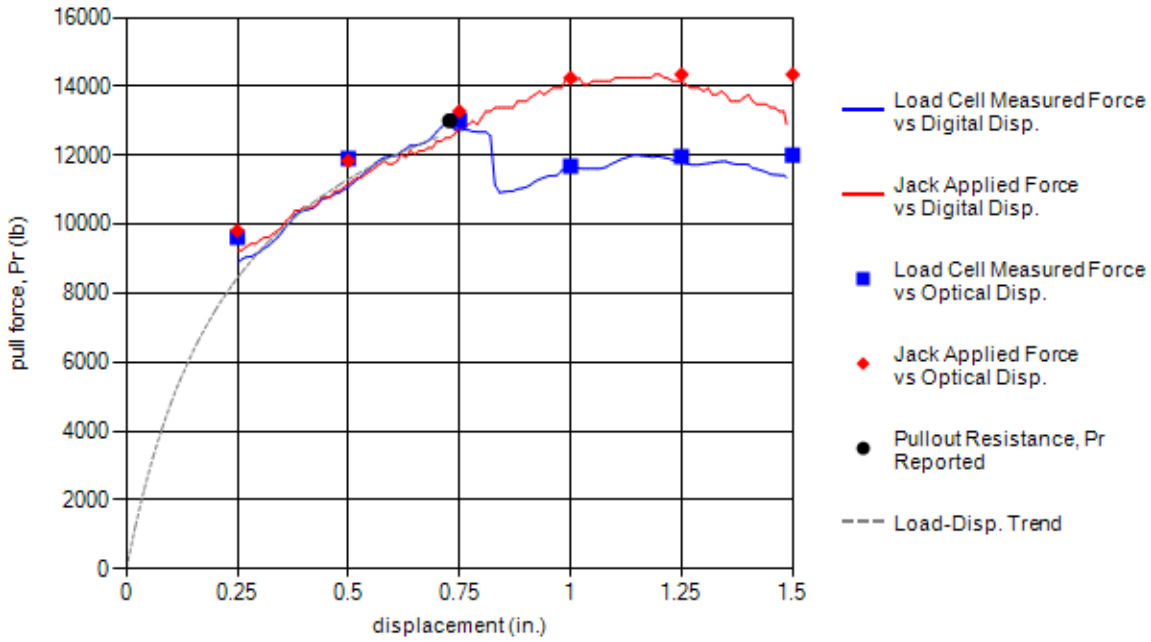
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	114.4	±0.9
Moisture Content, w (%):	6.7	±0.1%
Relative Compaction, C_R (%):	91.8	±0.7%

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	5070	13003	41.6	**0.96**

Load-Displacement Curve



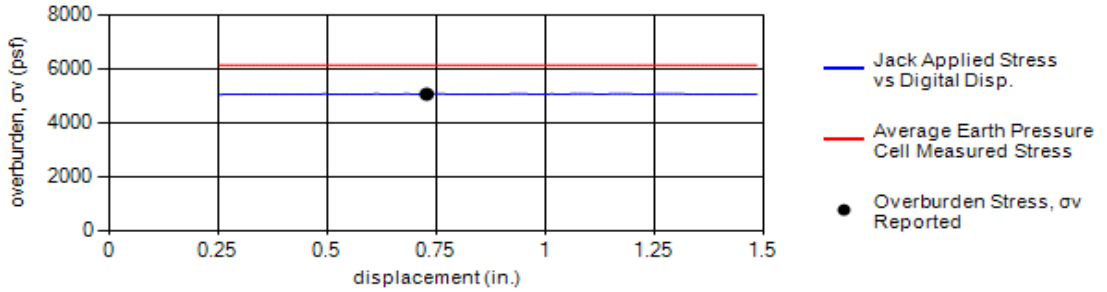
Comments

Load cell error at displacements greater than 0.75in.

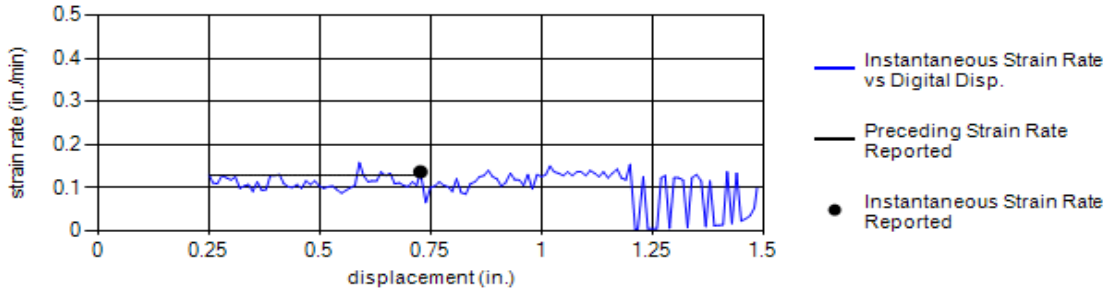
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
6570	7047	4451	6669	6012	6150	1.00	5066



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.14	0.13	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

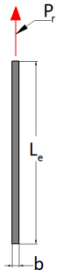
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	6/23/2010 2:38:00 PM
Test Identification:	TS05.08-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 B

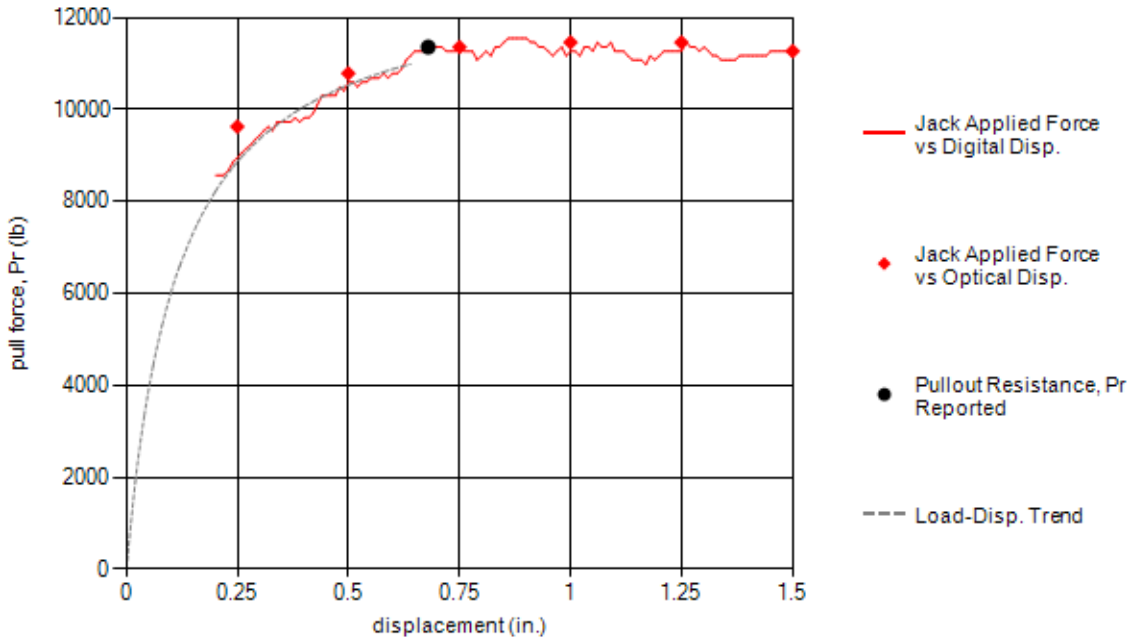
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	114.4	±0.9
Moisture Content, w (%):	6.7	±0.1%
Relative Compaction, C_R (%):	91.8	±0.7%

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	0.68	5064	11355	41.5	**0.84**

Load-Displacement Curve



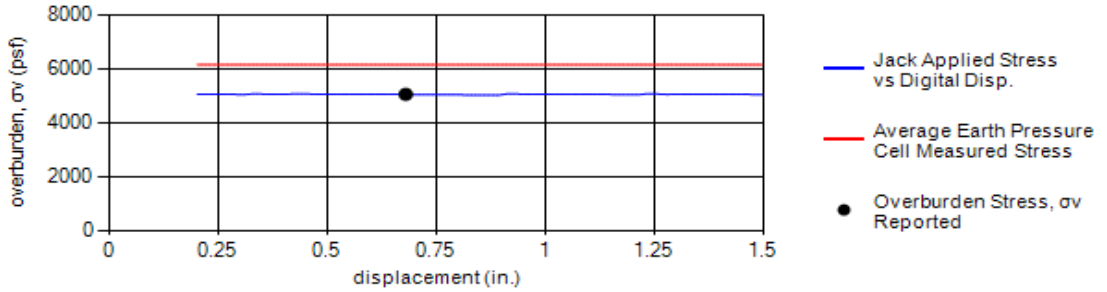
Comments

Load cell error; no load cell data.

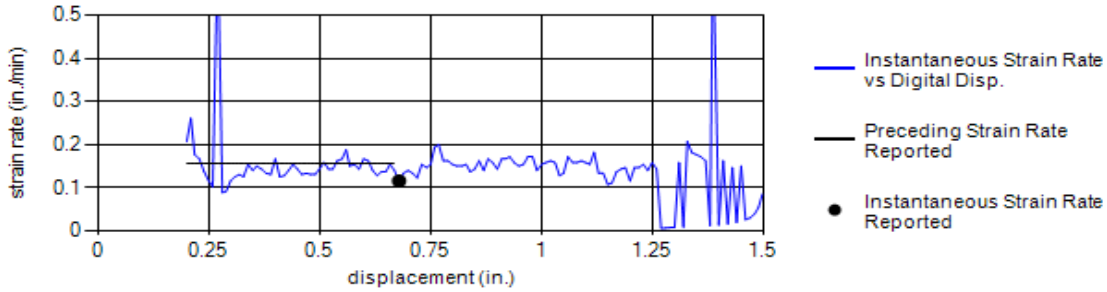
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
6558	7097	4467	6659	6068	6170	1.00	5058



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.12	0.15	0.26



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

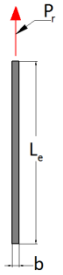
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	6/23/2010 2:55:00 PM
Test Identification:	TS05.09-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 B

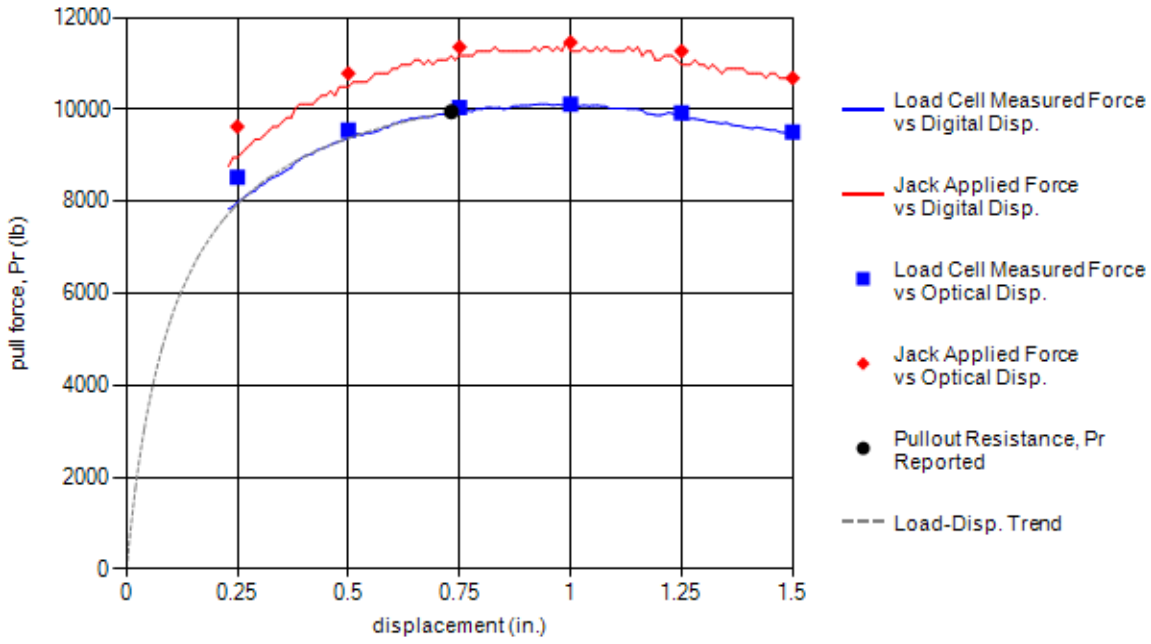
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	114.4	±0.9
Moisture Content, w (%):	6.7	±0.1%
Relative Compaction, C_R (%):	91.8	±0.7%

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	5038	9949	41.3	**0.74**

Load-Displacement Curve

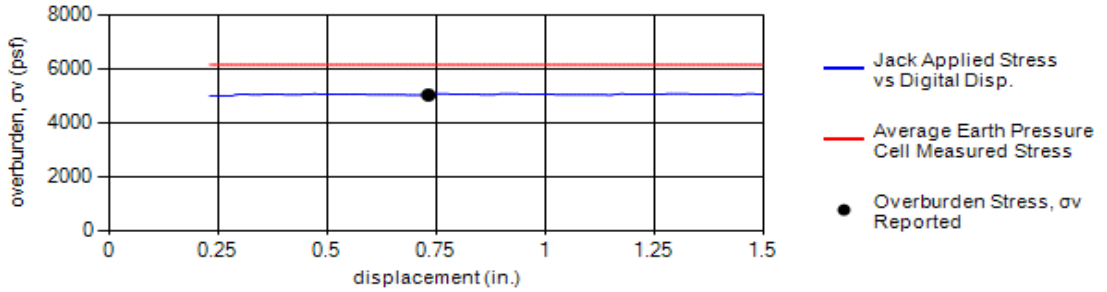


Comments

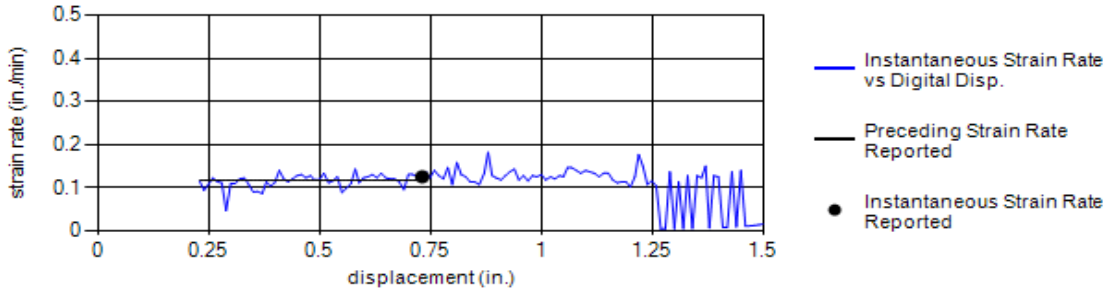
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
6544	7103	4483	6656	6048	6167	1.01	5035



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

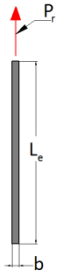
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	6/23/2010 10:13:00 AM
Test Identification:	TS05.10-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 B

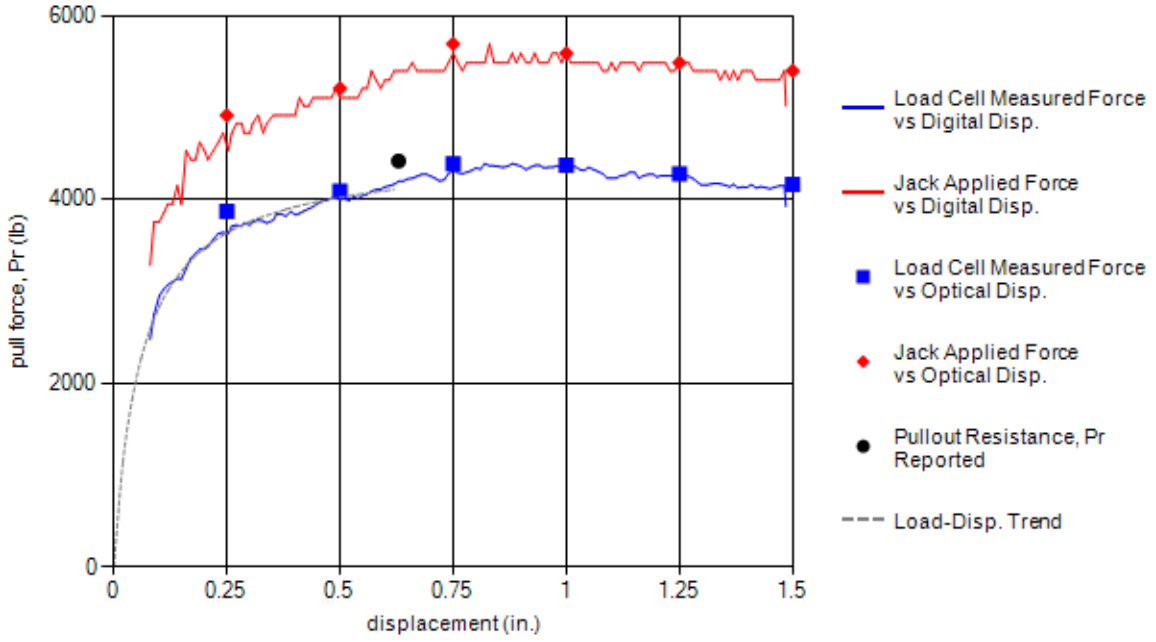
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	114.4	±0.9
Moisture Content, w (%):	6.7	±0.1%
Relative Compaction, C_R (%):	91.8	±0.7%

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	0.63	616	4416	5.1	**2.69**

Load-Displacement Curve

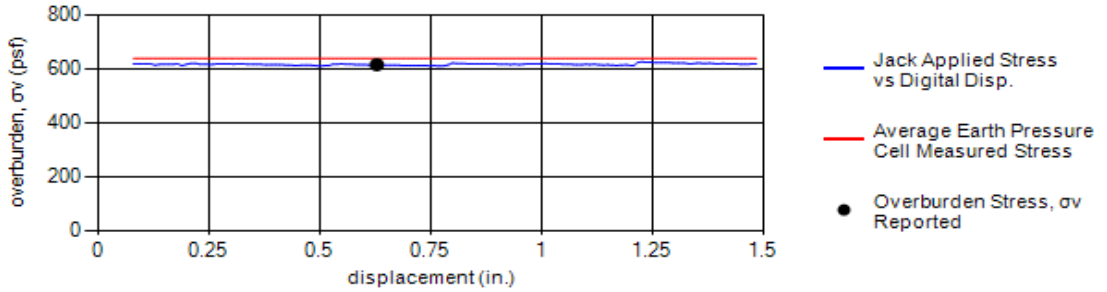


Comments

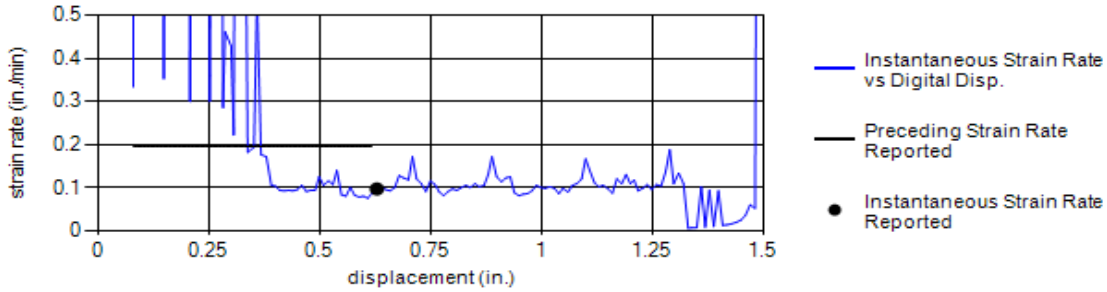
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
866	550	668	581	529	639	1.04	616



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.10	0.20	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

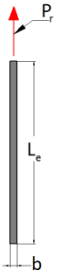
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	6/23/2010 10:36:00 AM
Test Identification:	TS05.11-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 B

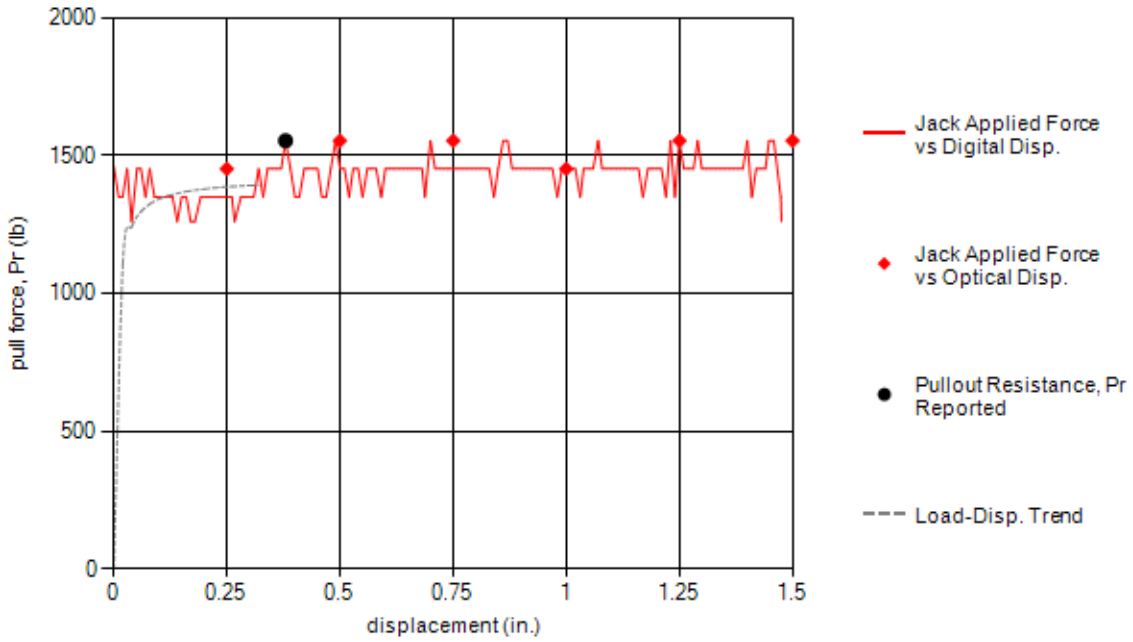
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	114.4	±0.9
Moisture Content, w (%):	6.7	±0.1%
Relative Compaction, C_R (%):	91.8	±0.7%

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	0.38	1507	1553	12.4	**0.77**

Load-Displacement Curve



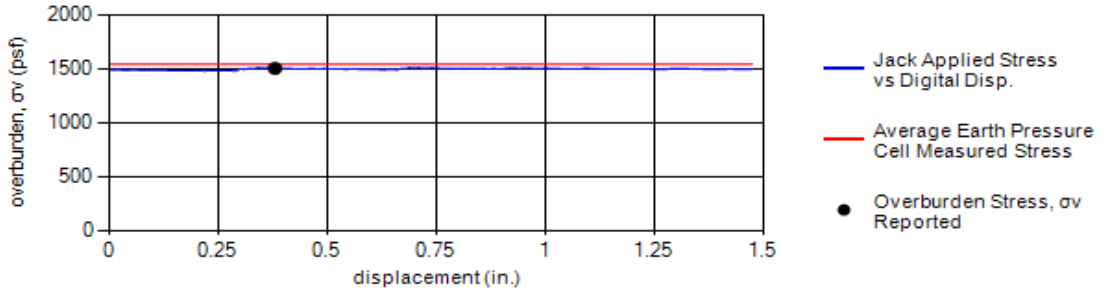
Comments

Load cell error; no load cell data.

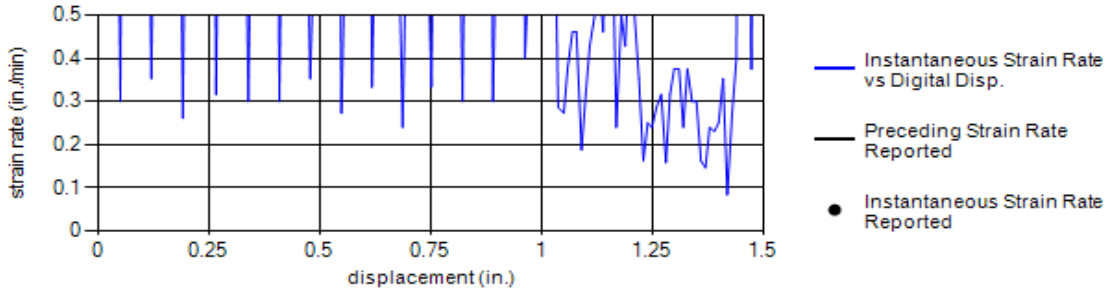
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1633	1540	1517	1630	1407	1545	1.01	1507



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
1.50	0.77	0.86



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

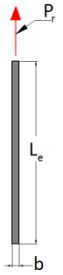
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	6/23/2010 10:50:00 AM
Test Identification:	TS05.12-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 B

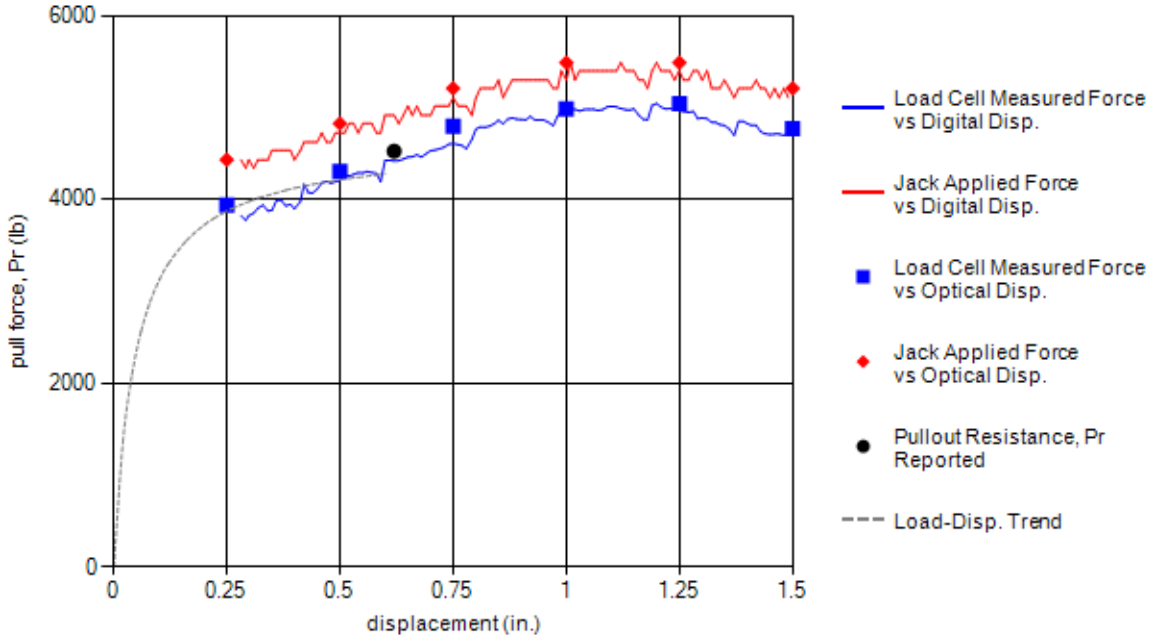
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	114.4	±0.9
Moisture Content, w (%):	6.7	±0.1%
Relative Compaction, C_R (%):	91.8	±0.7%

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	0.62	1507	4523	12.3	**1.13**

Load-Displacement Curve

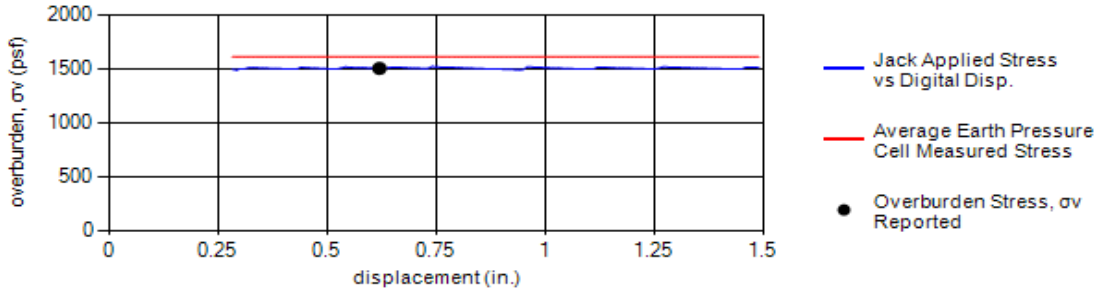


Comments

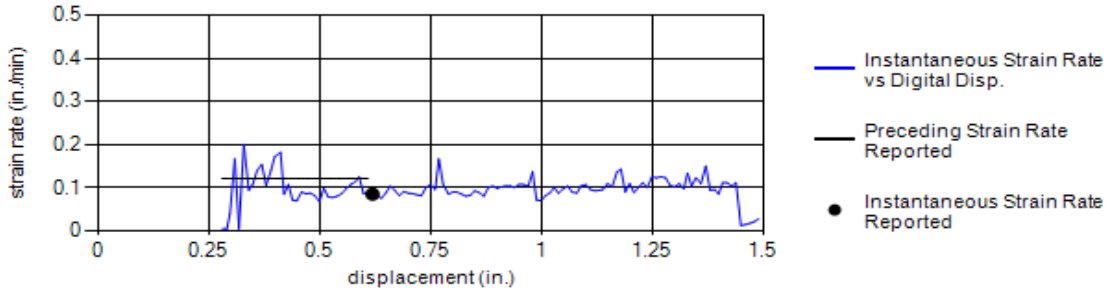
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1661	1572	1745	1661	1429	1614	1.02	1506



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

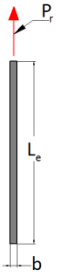
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	6/23/2010 11:09:00 AM
Test Identification:	TS05.13-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 B

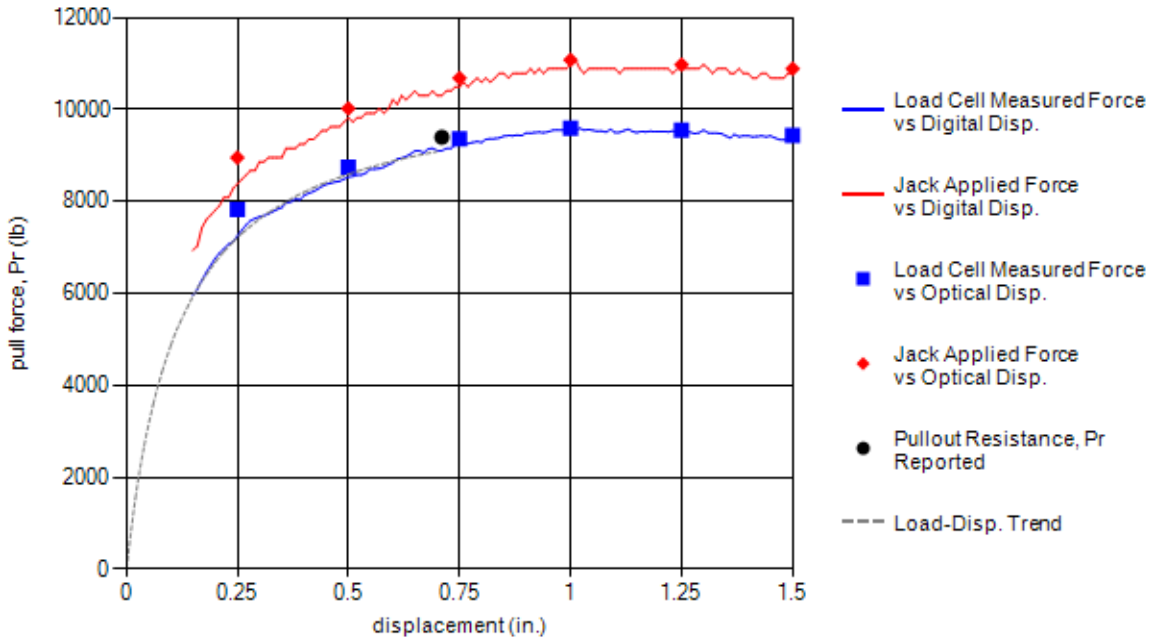
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	114.4	±0.9
Moisture Content, w (%):	6.7	±0.1%
Relative Compaction, C_R (%):	91.8	±0.7%

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	1508	9394	12.4	**1.56**

Load-Displacement Curve

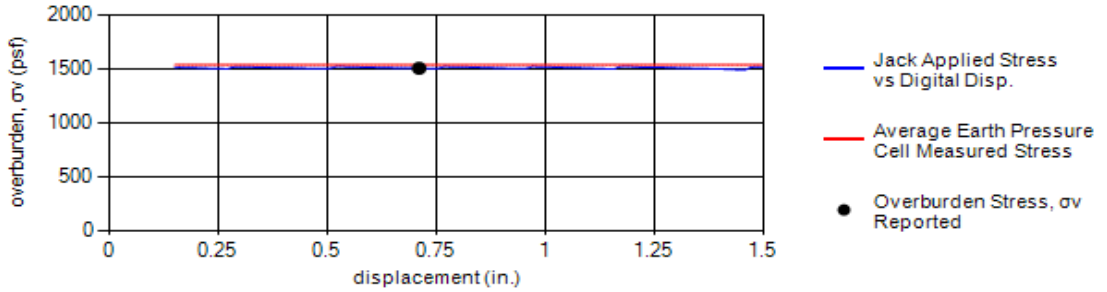


Comments

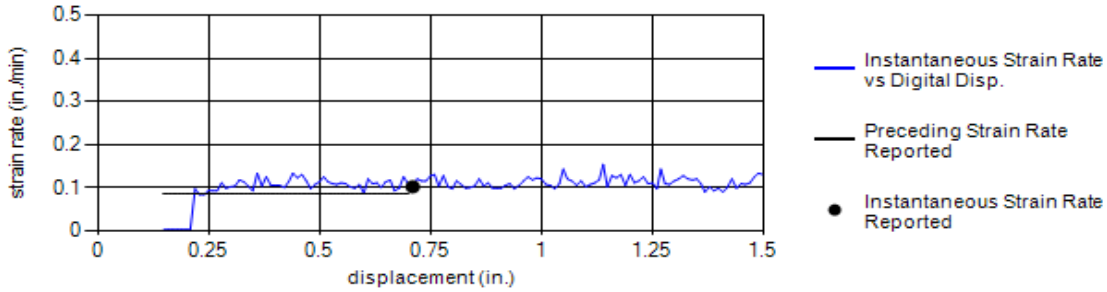
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1667	1567	1355	1673	1434	1539	1.07	1507



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

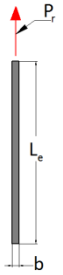
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	6/23/2010 11:34:00 AM
Test Identification:	TS05.14-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 B

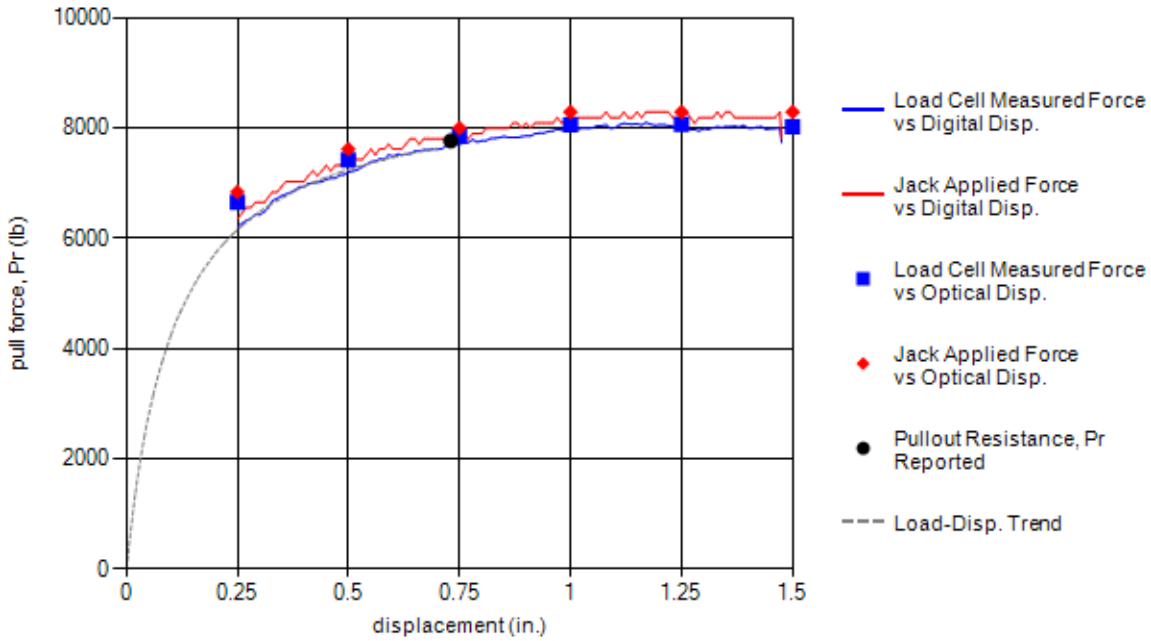
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	114.4	±0.9
Moisture Content, w (%):	6.7	±0.1%
Relative Compaction, C_R (%):	91.8	±0.7%

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	2527	7761	20.7	**1.15**

Load-Displacement Curve

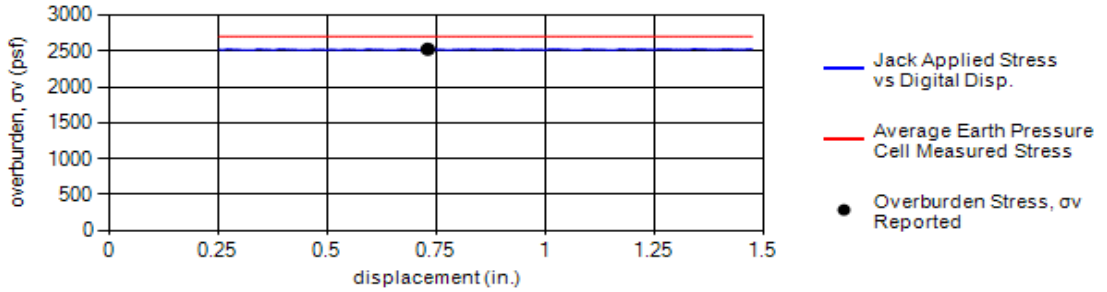


Comments

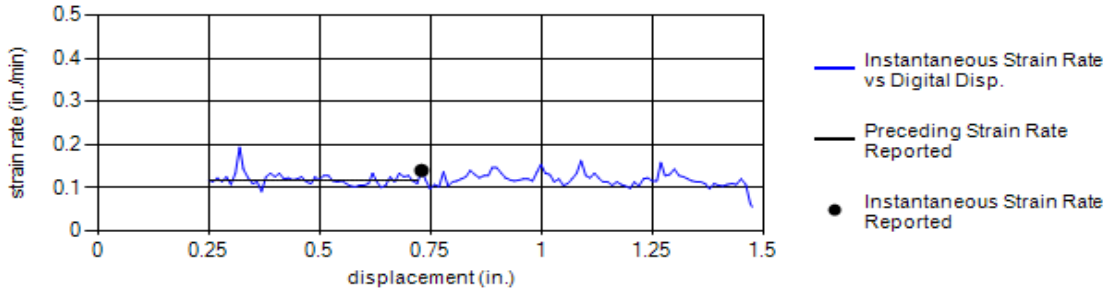
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2949	2539	2334	3049	2638	2702	1.03	2516



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.14	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 (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

Appendix H

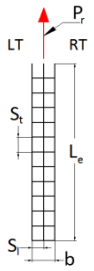
MSE Reinforcement Pullout Test Reports: Welded Steel Grids in Type B Backfill

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/10/2010 3:15:00 PM
Test Identification:	TS09.01-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

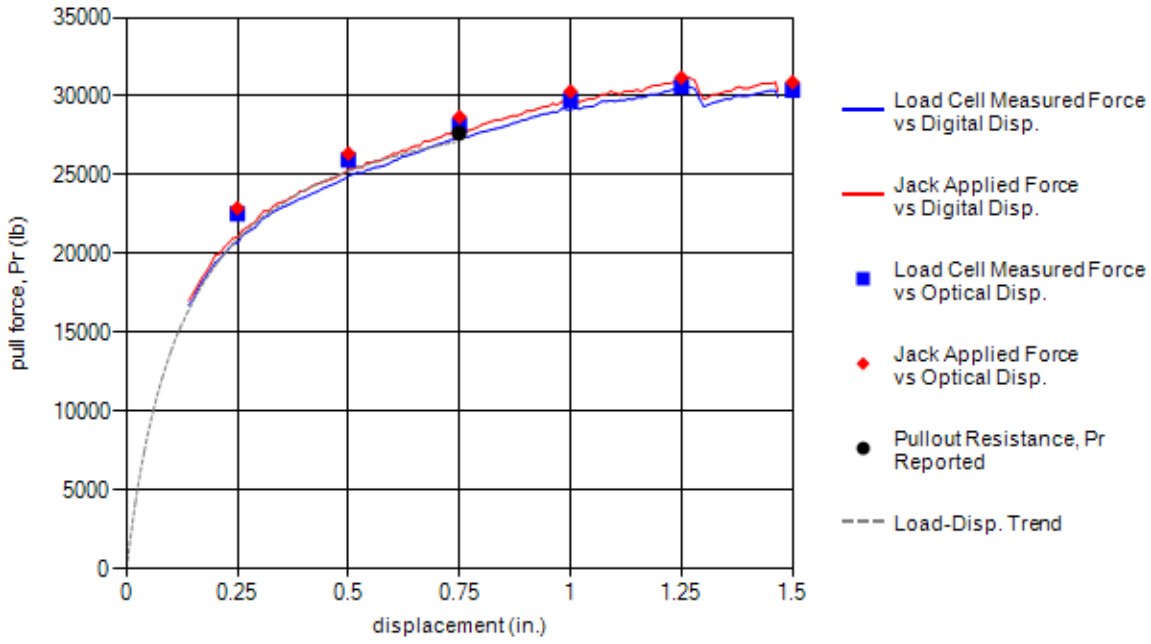
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	116.4	±2.8
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	6.8	±0.7%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	93.5	±2.3%

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	630	27653	5.1	**1.22**

Load-Displacement Curve



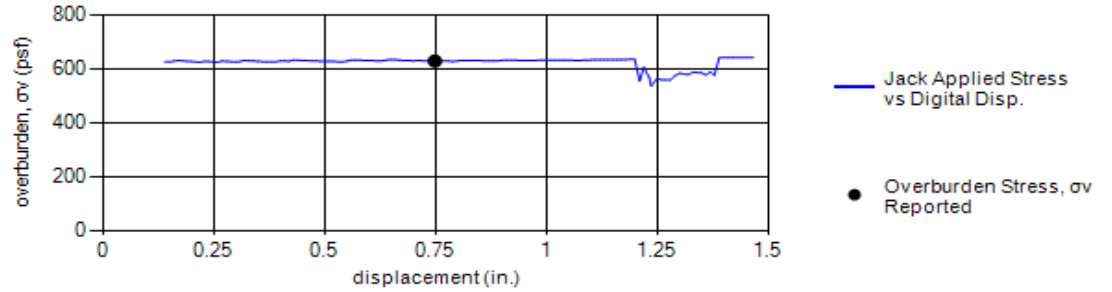
Comments

No earth pressure cell data. No incidental skew data.

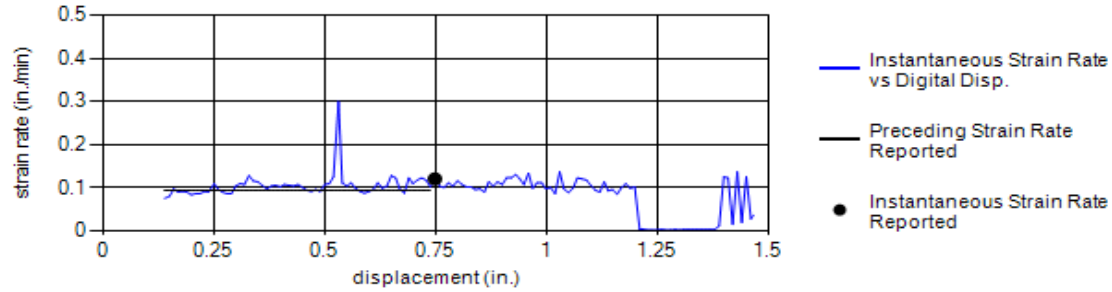
Personnel

Tested:	TW AS 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	7.64	630



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*
No Data	No Data	No Data	No Data	No Data	No Data

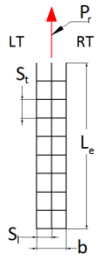
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/9/2010 10:05:00 AM
Test Identification:	TS09.02-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

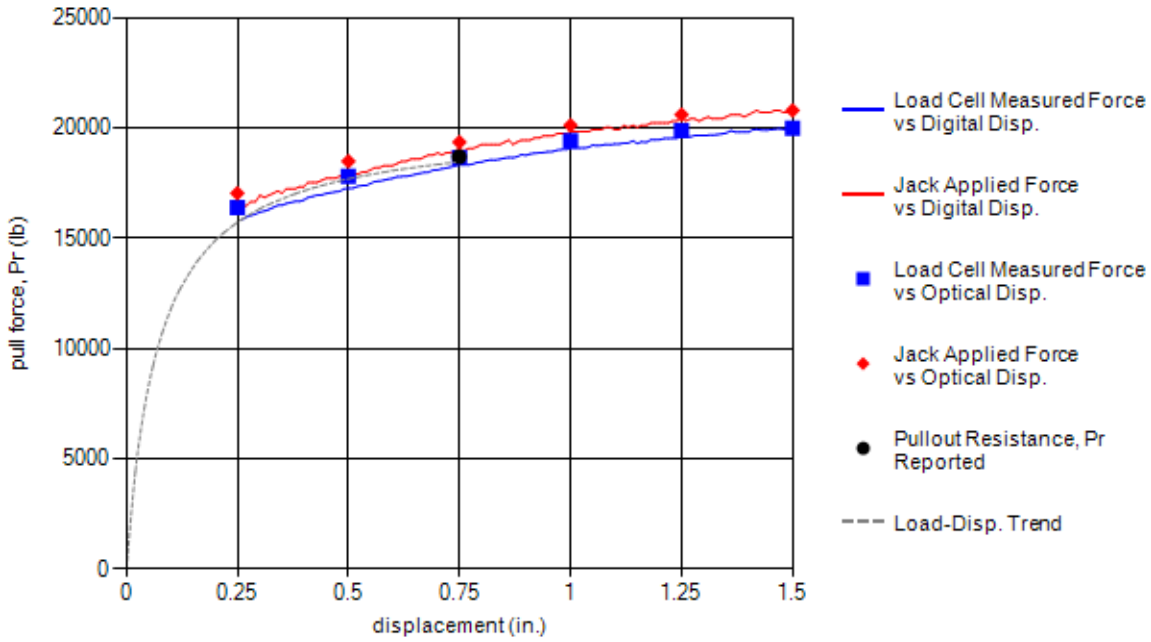
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	116.4	±2.8
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	6.8	±0.7%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	93.5	±2.3%

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****
Pullout	0.75	633	18682	5.1	**1.09**

Load-Displacement Curve



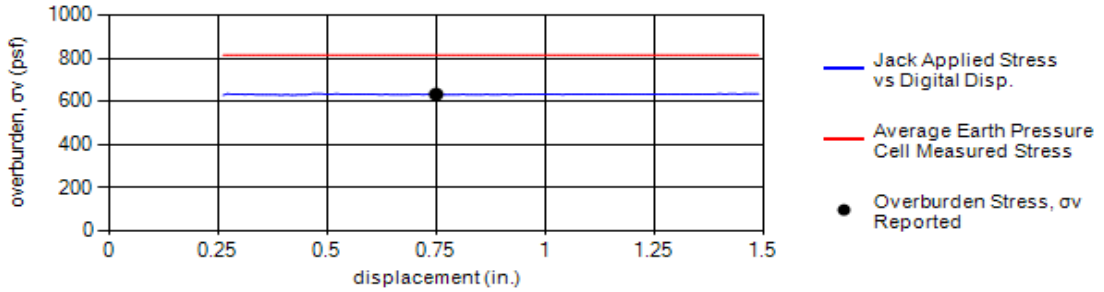
Comments

No incidental skew data.

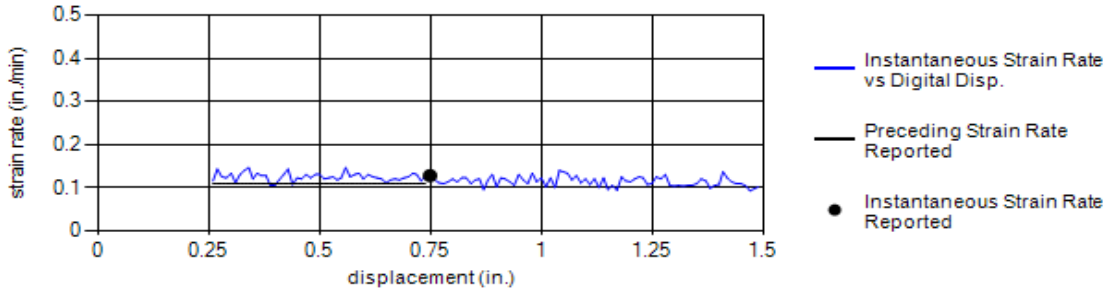
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
955	781	705	879	753	815	1.03	633



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*
No Data	No Data	No Data	No Data	No Data	No Data

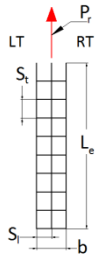
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/9/2010 10:46:00 AM
Test Identification:	TS09.03-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

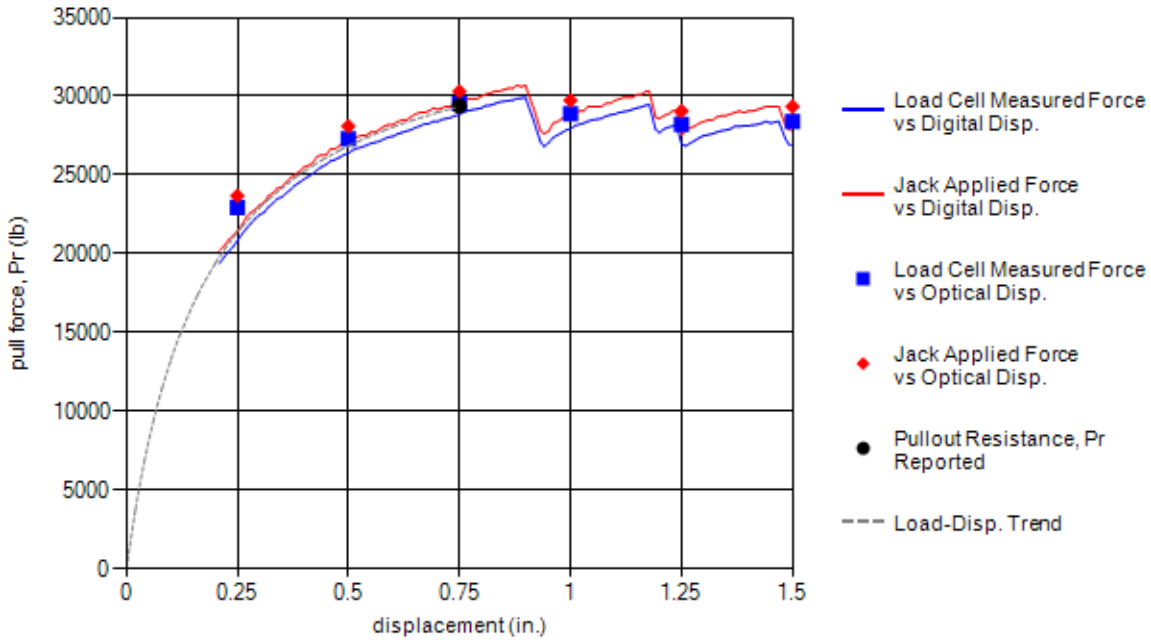
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	116.4	±2.8
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	6.8	±0.7%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	93.5	±2.3%

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	1515	29385	12.2	**0.72**

Load-Displacement Curve



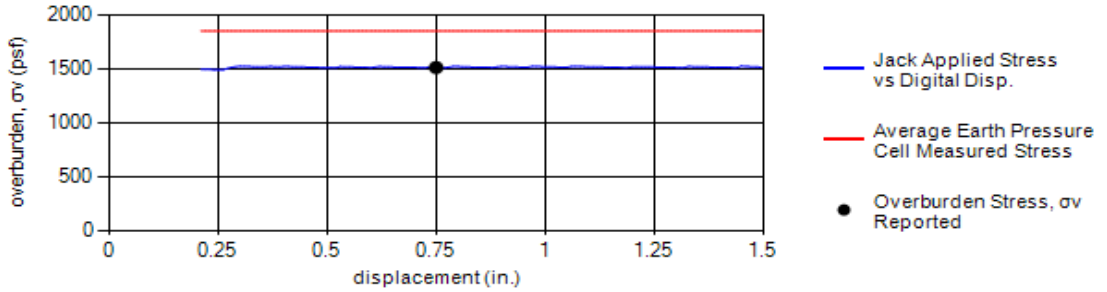
Comments

No incidental skew data.

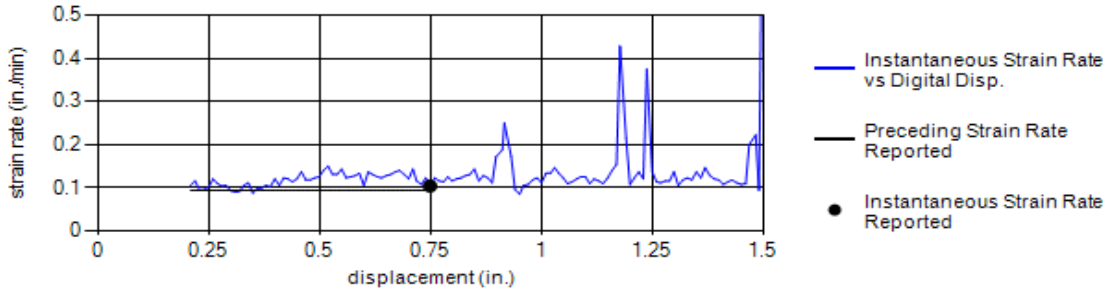
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2046	1831	1634	2037	1730	1855	1.03	1514



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

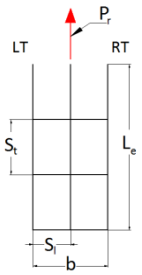
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/9/2010 11:20:00 AM
Test Identification:	TS09.04-G-9x12-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:*	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

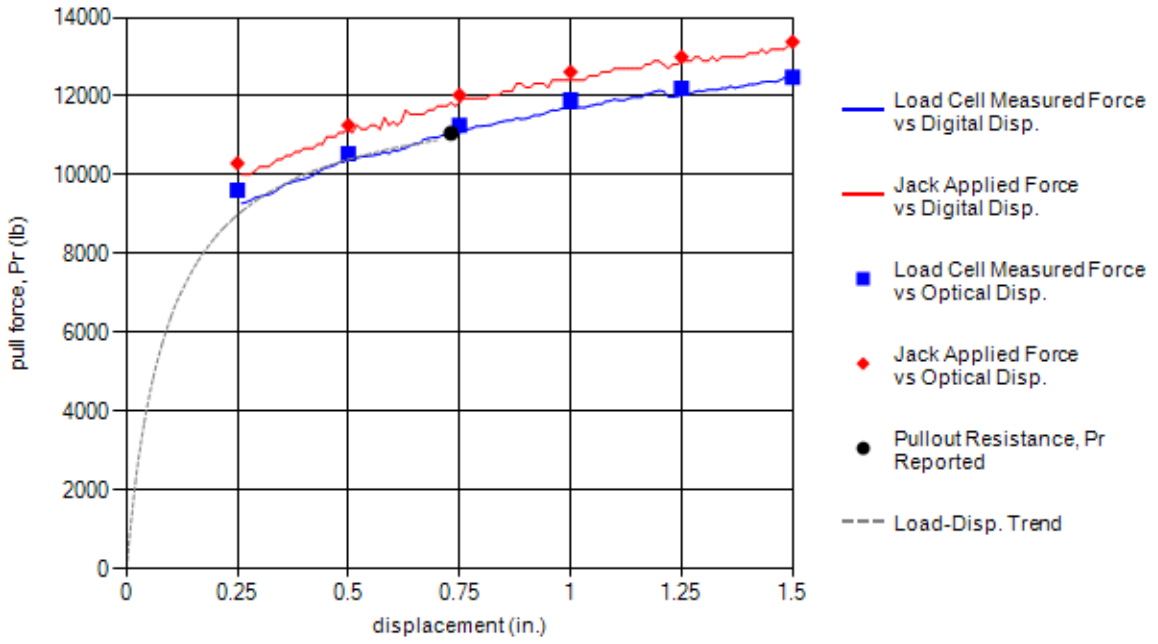
Specification:	TxDOT Item 423 - Type B

Moisture Density Relationship (TEX-114-E)		In-Place Density (TEX-115-E)		
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Dry Unit Weight, γ_d (pcf):*	116.4	±2.8
Optimum Moisture Content, OMC (%):	7.8%	*Moisture Content, w (%):*	6.8	±0.7%
		Relative Compaction, C_R (%):	93.5	±2.3%

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	1542	11061	12.4	**0.80**

Load-Displacement Curve



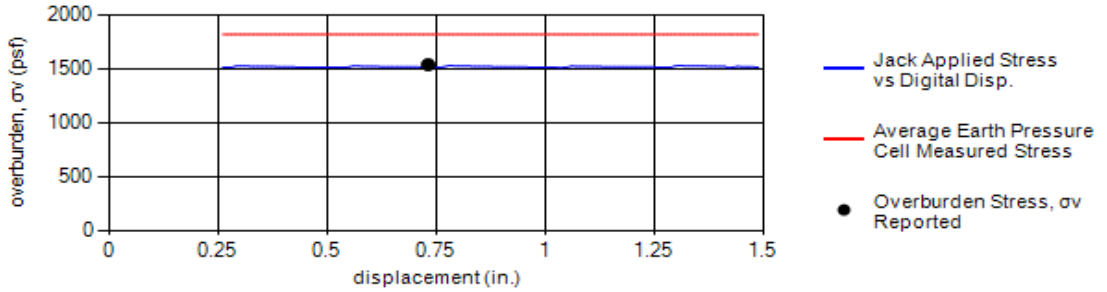
Comments

No incidental skew data.

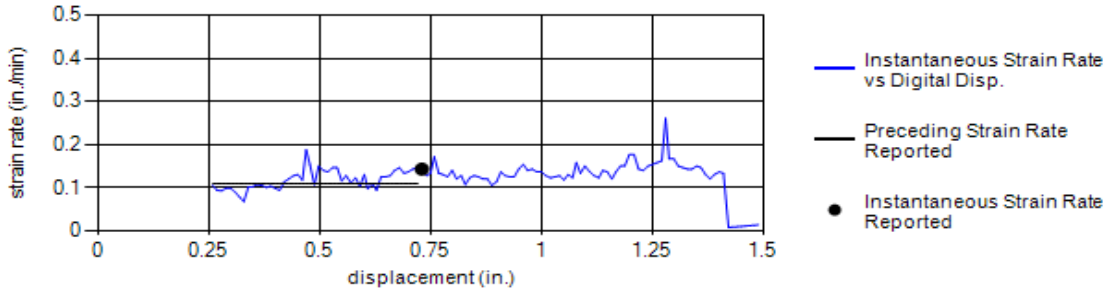
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2001	1647	1596	2059	1807	1822	1.05	1518



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

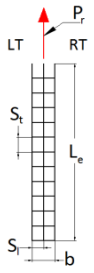
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/9/2010 4:08:00 PM
Test Identification:	TS09.05-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

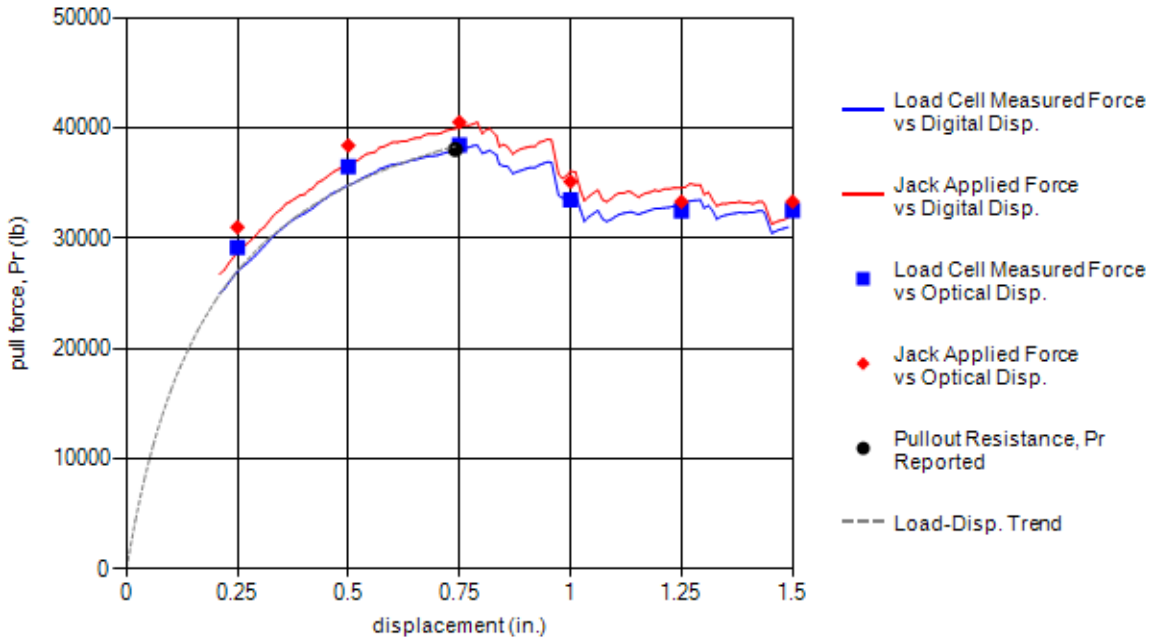
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	116.4	±2.8
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	6.8	±0.7%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	93.5	±2.3%

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	811	38033	6.5	**1.30**

Load-Displacement Curve



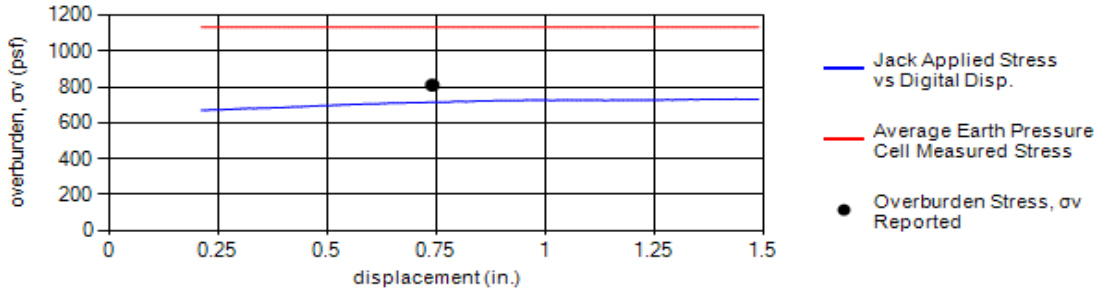
Comments

No incidental skew data.

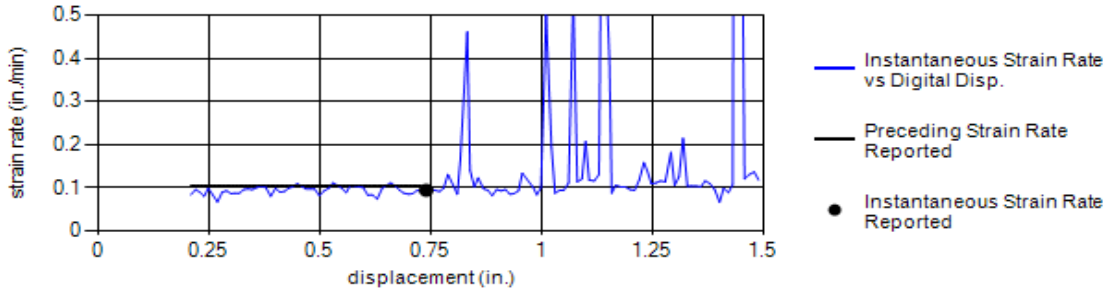
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1848	1327	436	1263	797	1134	2.12	716



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

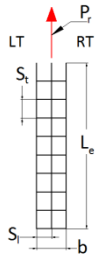
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/9/2010 4:40:00 PM
Test Identification:	TS09.06-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

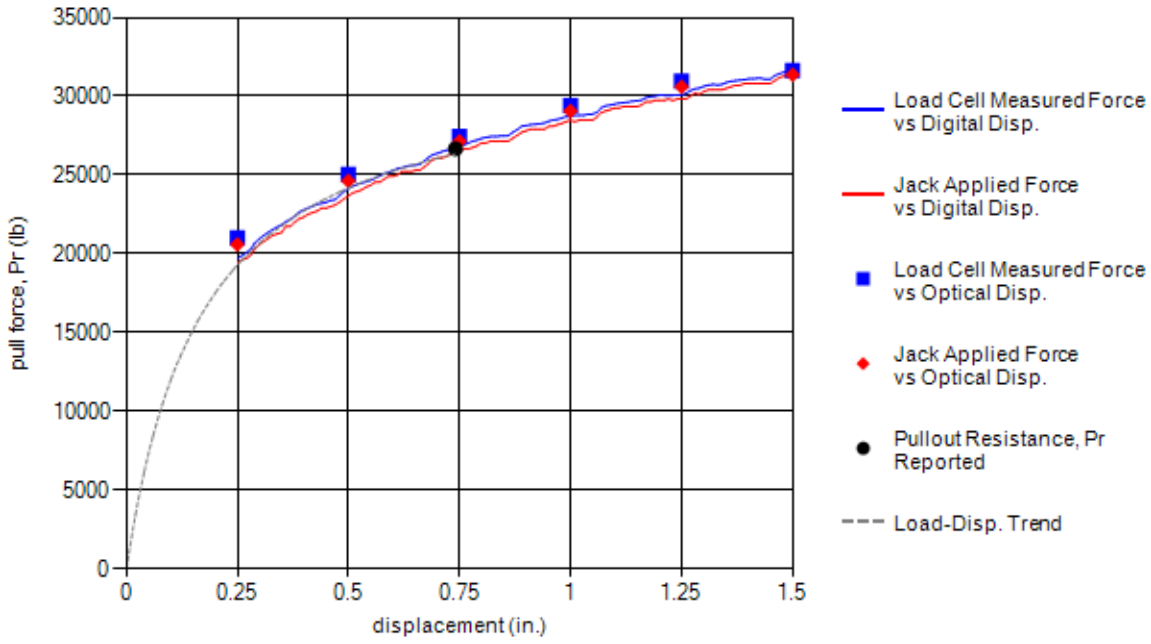
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	116.4	±2.8
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	6.8	±0.7%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	93.5	±2.3%

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	668	26666	5.4	**1.48**

Load-Displacement Curve



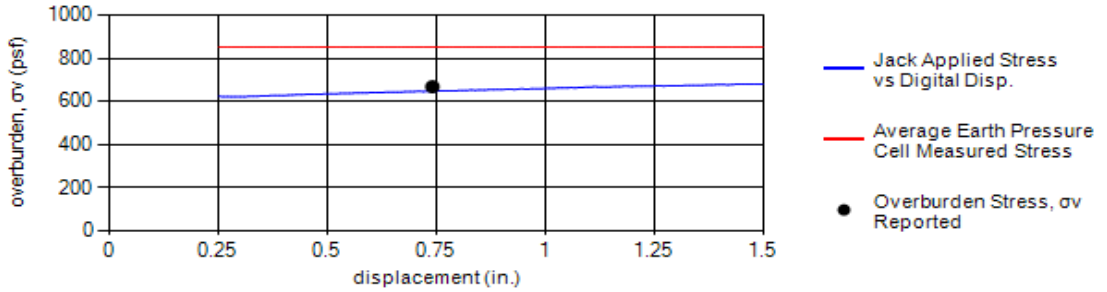
Comments

No incidental skew data.

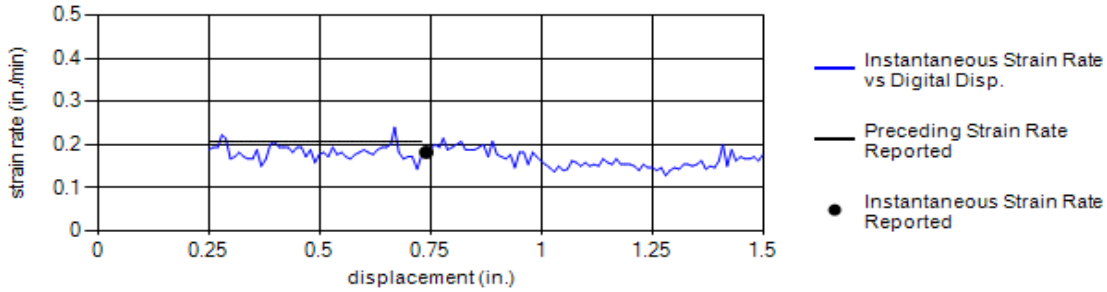
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
896	1247	475	935	713	853	2.81	647



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.18	0.21	0.16



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

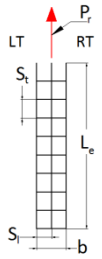
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/10/2010 9:22:00 AM
Test Identification:	TS09.07-G-9x12-W20xW11-L9-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):	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

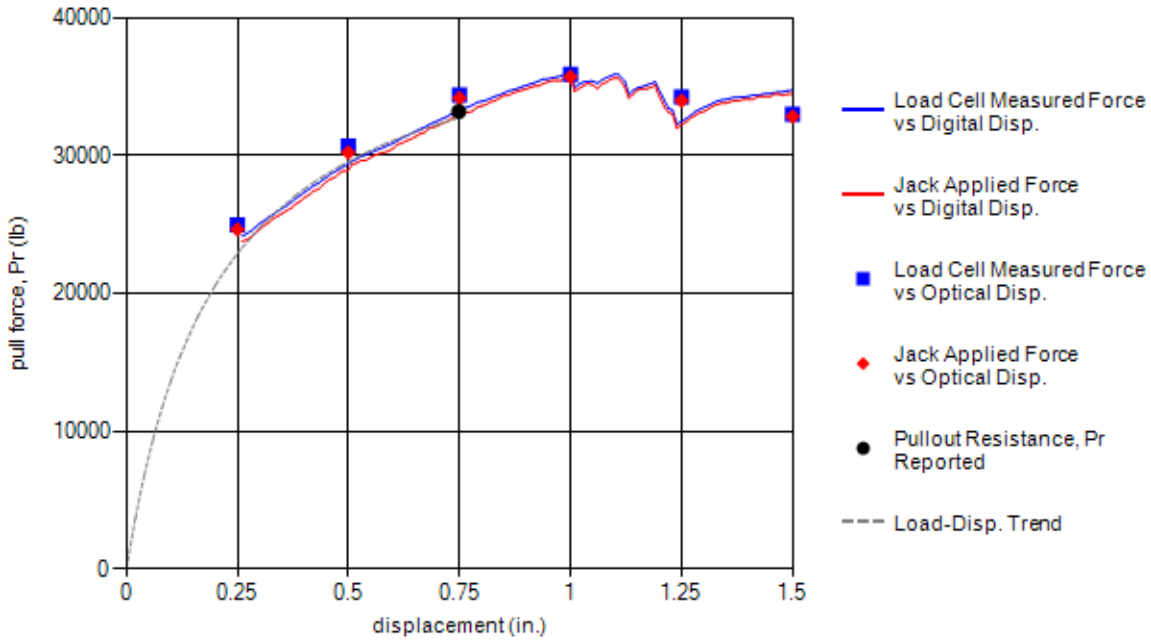
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	116.4 ±2.8
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	6.8 ±0.7%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	93.5 ±2.3%

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	1536	33179	12.4	**0.80**

Load-Displacement Curve



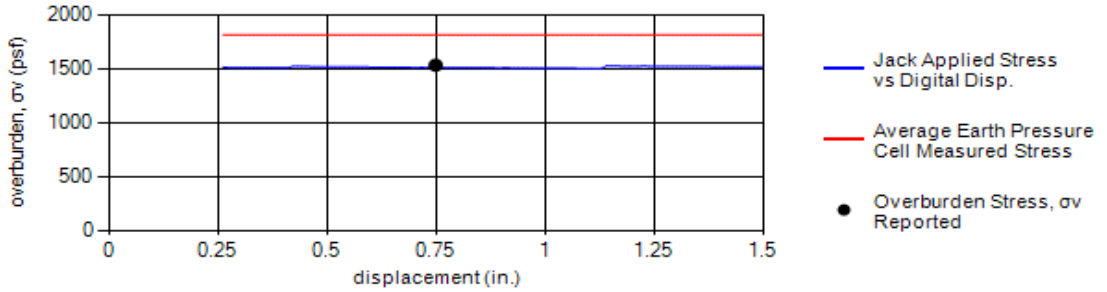
Comments

No incidental skew data.

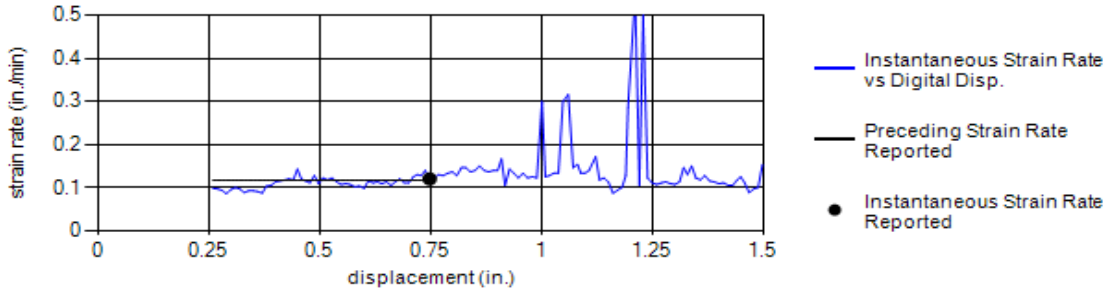
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1892	2245	1281	1966	1701	1817	1.32	1515



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

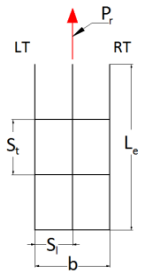
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/10/2010 9:55:00 AM
Test Identification:	TS09.08-G-9x12-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:*	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

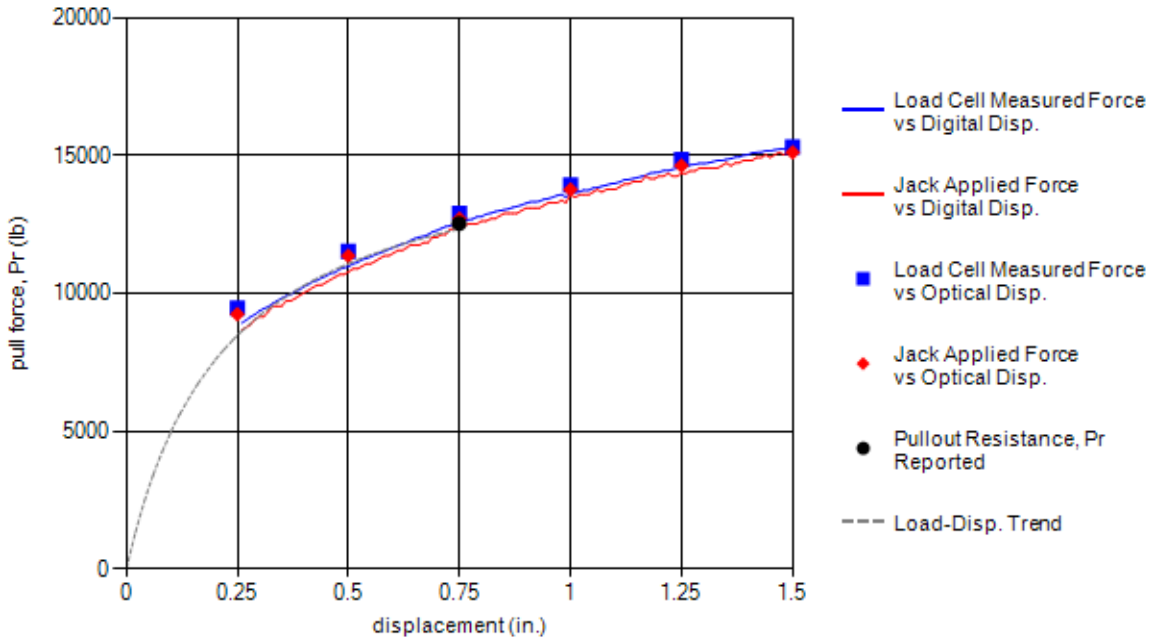
Specification:	TxDOT Item 423 - Type B

Moisture Density Relationship (TEX-114-E)		In-Place Density (TEX-115-E)		
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Dry Unit Weight, γ_d (pcf):*	116.4	±2.8
Optimum Moisture Content, OMC (%):	7.8%	*Moisture Content, w (%):*	6.8	±0.7%
		Relative Compaction, C_R (%):	93.5	±2.3%

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	1519	12531	12.2	**0.92**

Load-Displacement Curve



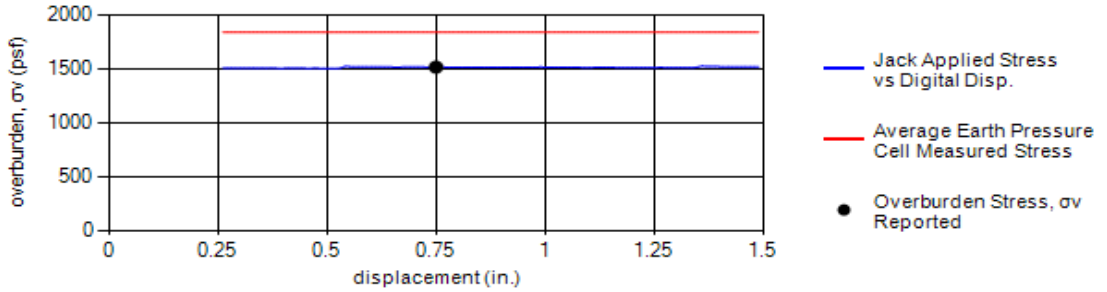
Comments

No incidental skew data.

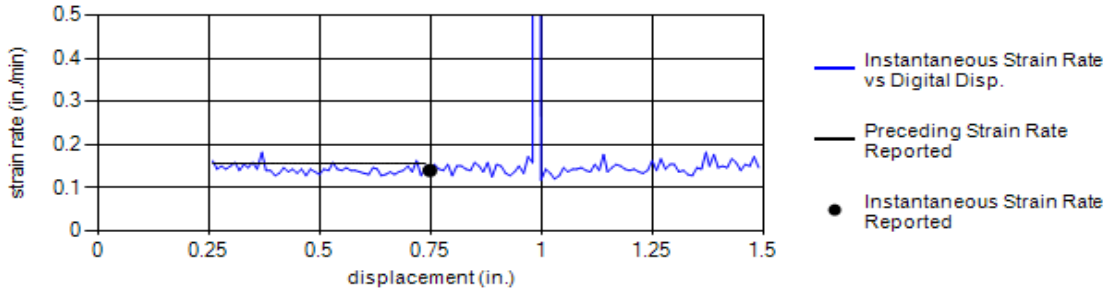
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1877	2452	1210	1956	1726	1844	1.30	1519



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

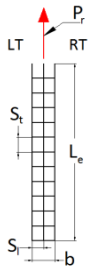
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/9/2010 1:15:00 PM
Test Identification:	TS09.09-G-9x12-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:*	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 B

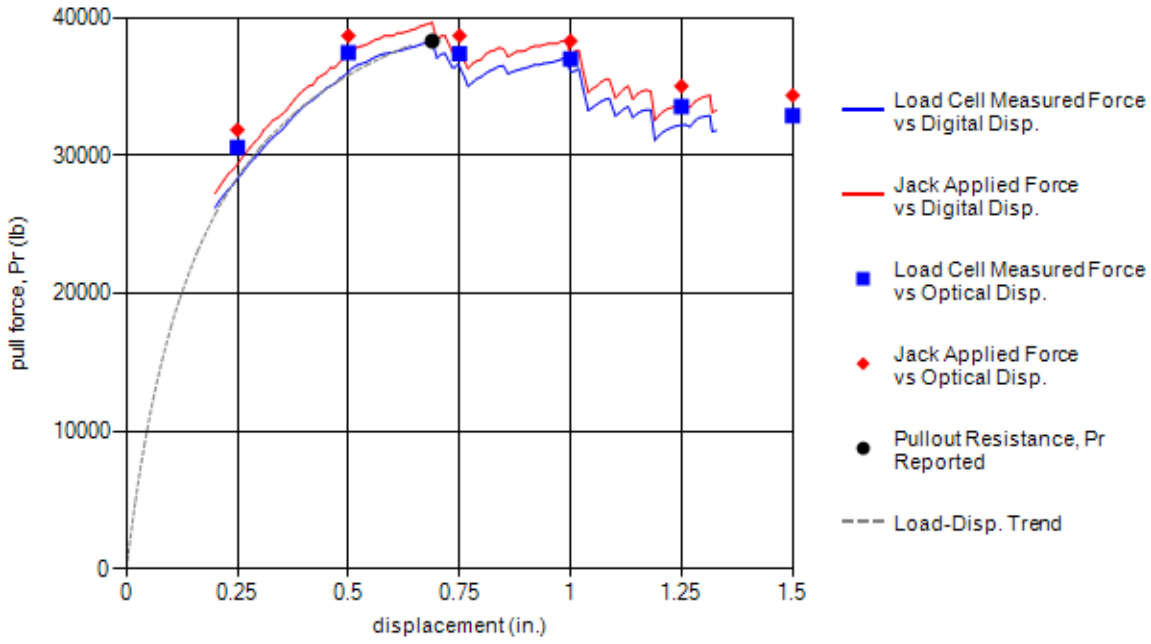
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	116.4	±2.8
Moisture Content, w (%):	6.8	±0.7%
Relative Compaction, C_R (%):	93.5	±2.3%

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	795	38289	6.4	**1.34**

Load-Displacement Curve



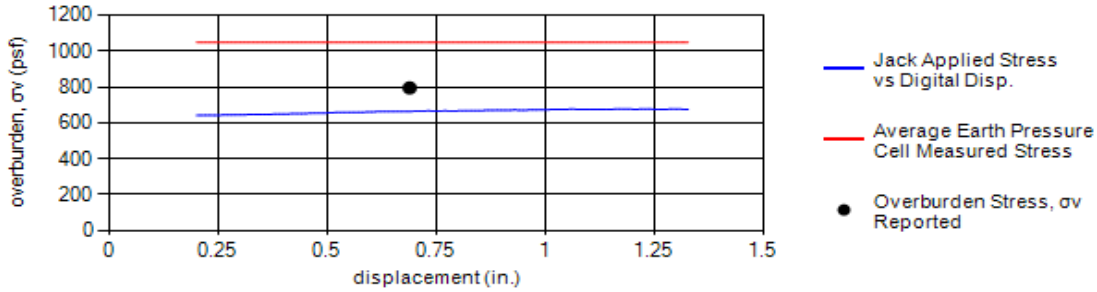
Comments

No incidental skew data.

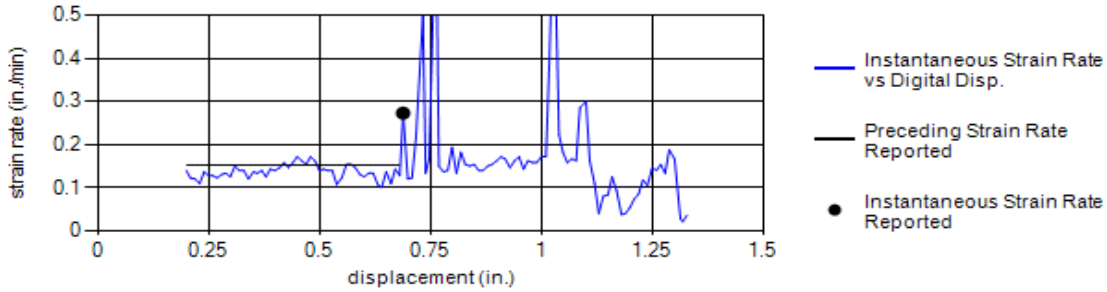
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1413	852	728	1459	800	1050	2.25	664



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.27	0.15	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

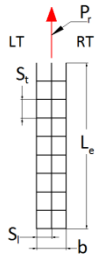
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/9/2010 1:58:00 PM
Test Identification:	TS09.10-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

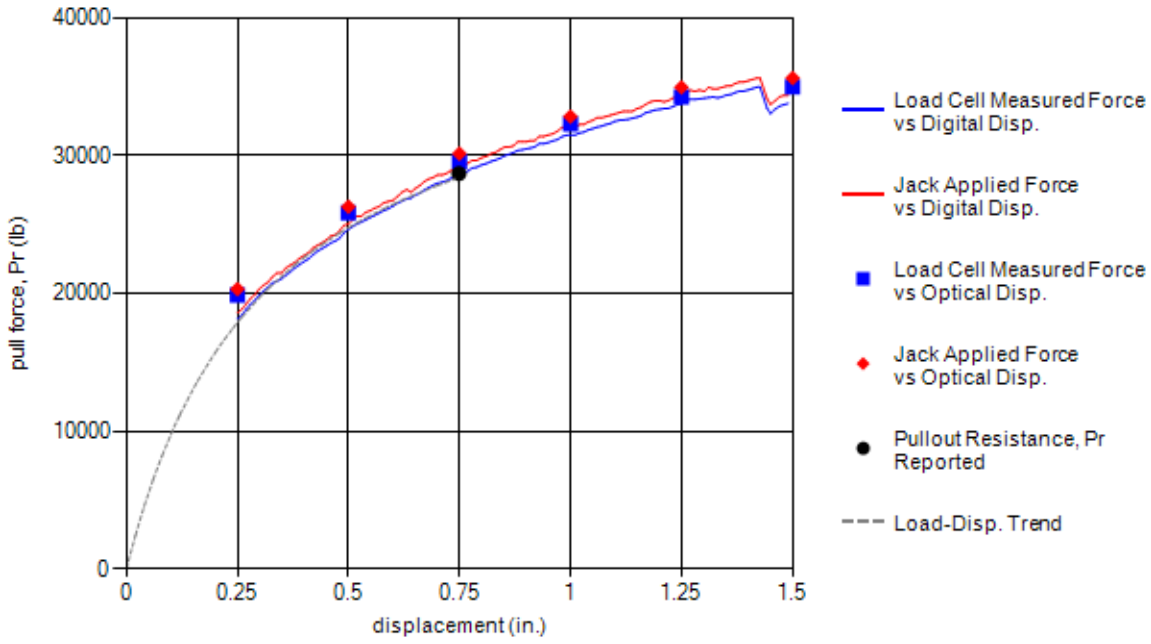
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	116.4	±2.8
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	6.8	±0.7%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	93.5	±2.3%

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	656	28687	5.3	**1.62**

Load-Displacement Curve



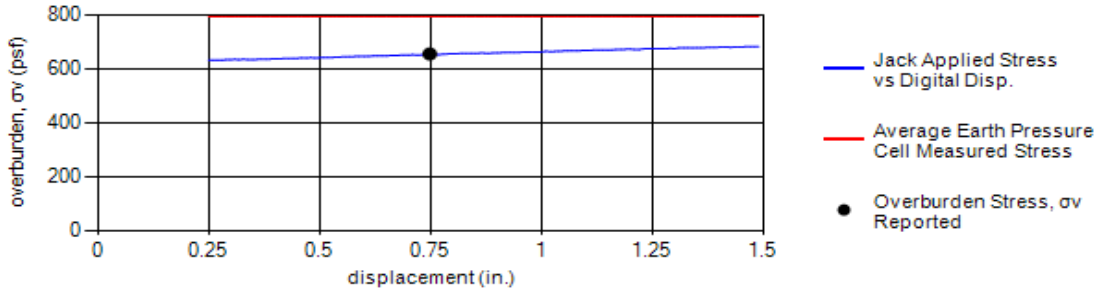
Comments

No incidental skew data.

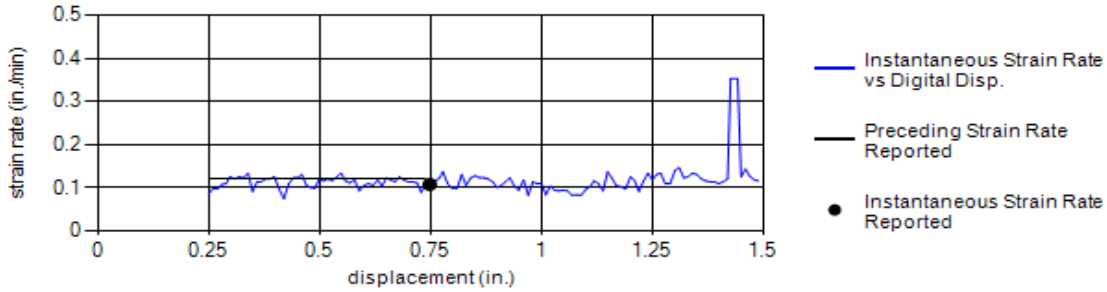
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
814	695	534	1195	737	795	2.75	655



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

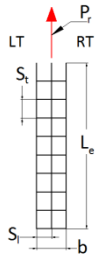
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/9/2010 2:38:00 PM
Test Identification:	TS09.11-G-9x12-W20xW11-L9-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):	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

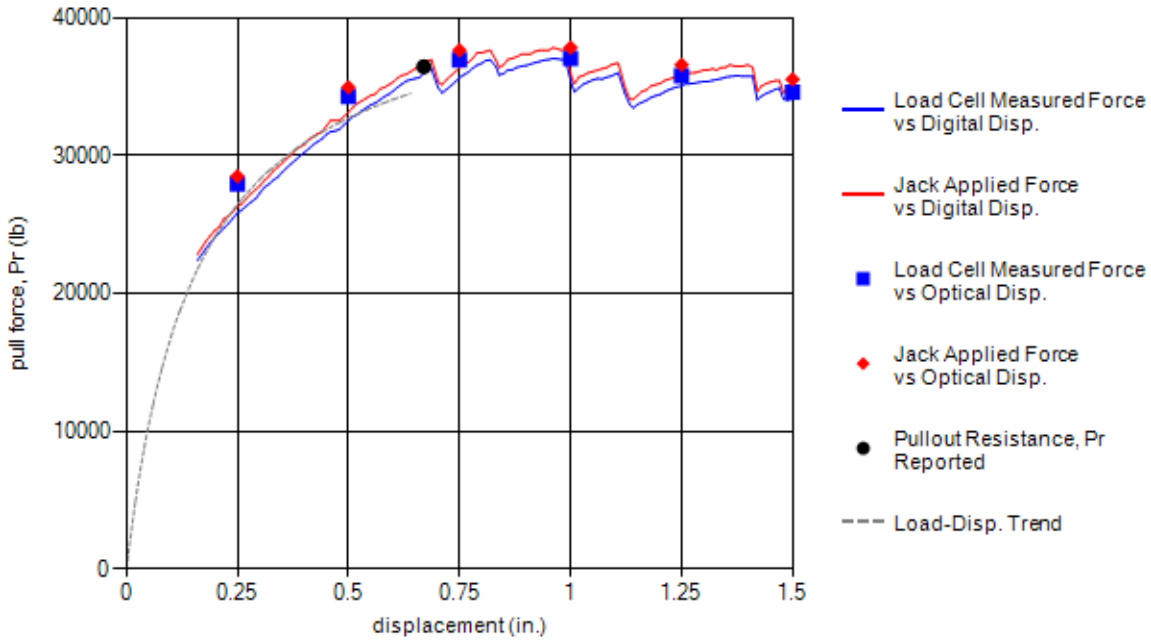
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	116.4 ±2.8
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	6.8 ±0.7%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	93.5 ±2.3%

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	1518	36425	12.2	**0.89**

Load-Displacement Curve



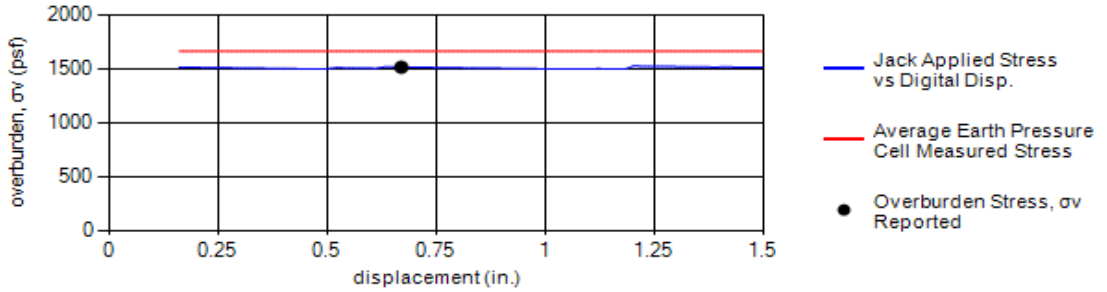
Comments

No incidental skew data.

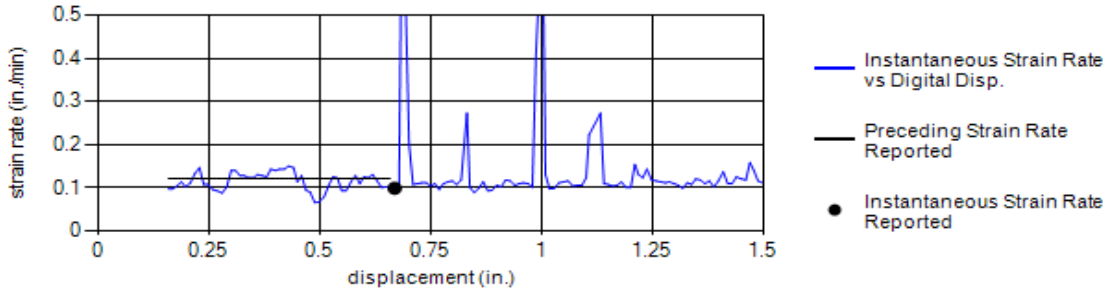
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1877	1477	1107	2223	1652	1667	1.32	1518



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*
No Data	No Data	No Data	No Data	No Data	No Data

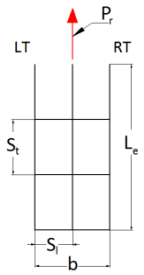
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/9/2010 3:15:00 PM
Test Identification:	TS09.12-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

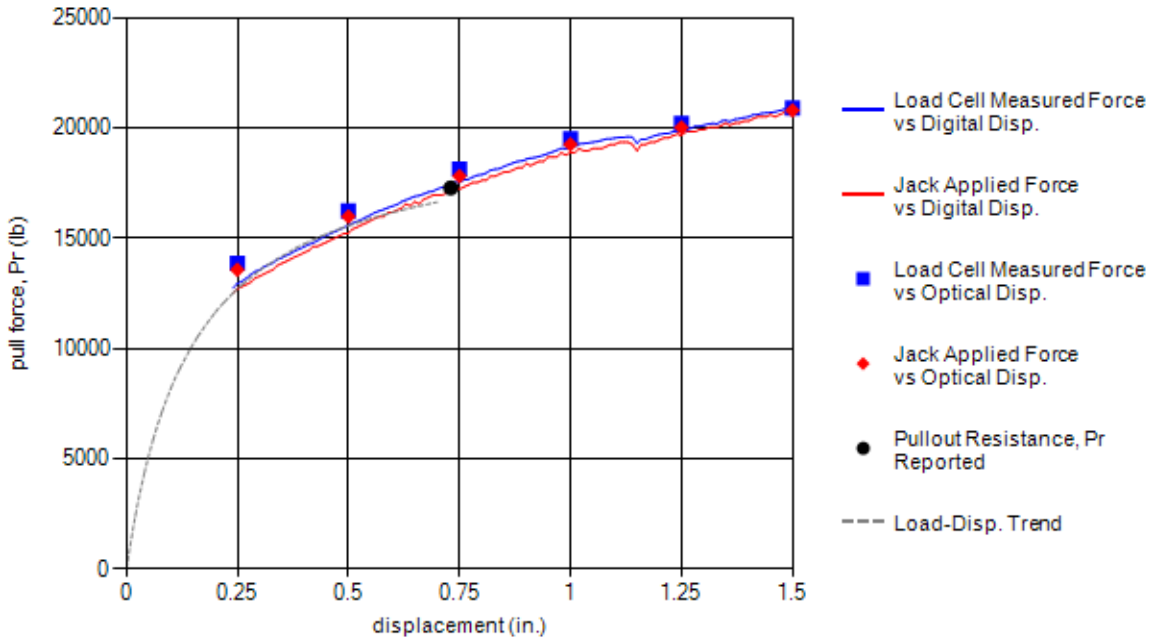
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	116.4	±2.8
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	6.8	±0.7%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	93.5	±2.3%

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	1512	17275	12.2	**1.27**

Load-Displacement Curve



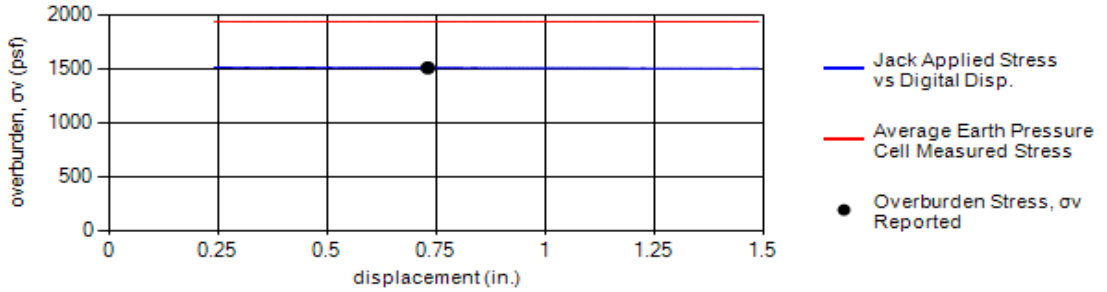
Comments

No incidental skew data.

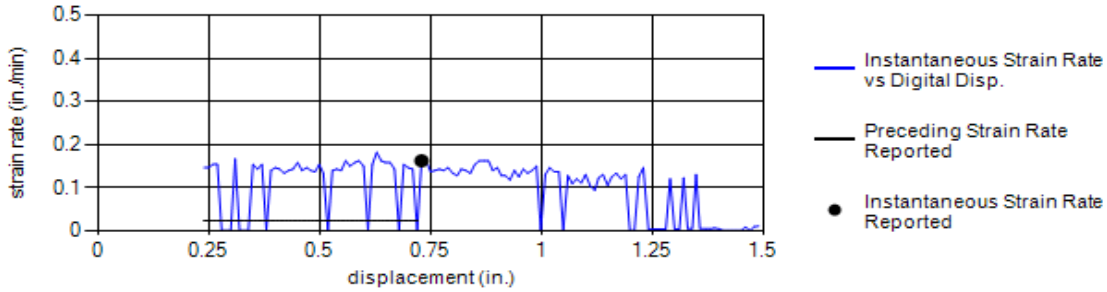
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1926	2713	1173	2198	1690	1940	1.31	1512



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.16	0.02	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

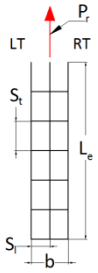
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/13/2010 11:17:00 AM
Test Identification:	TS10.01-G-9x12-W20xW7.5-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.):*	0.31	*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 B

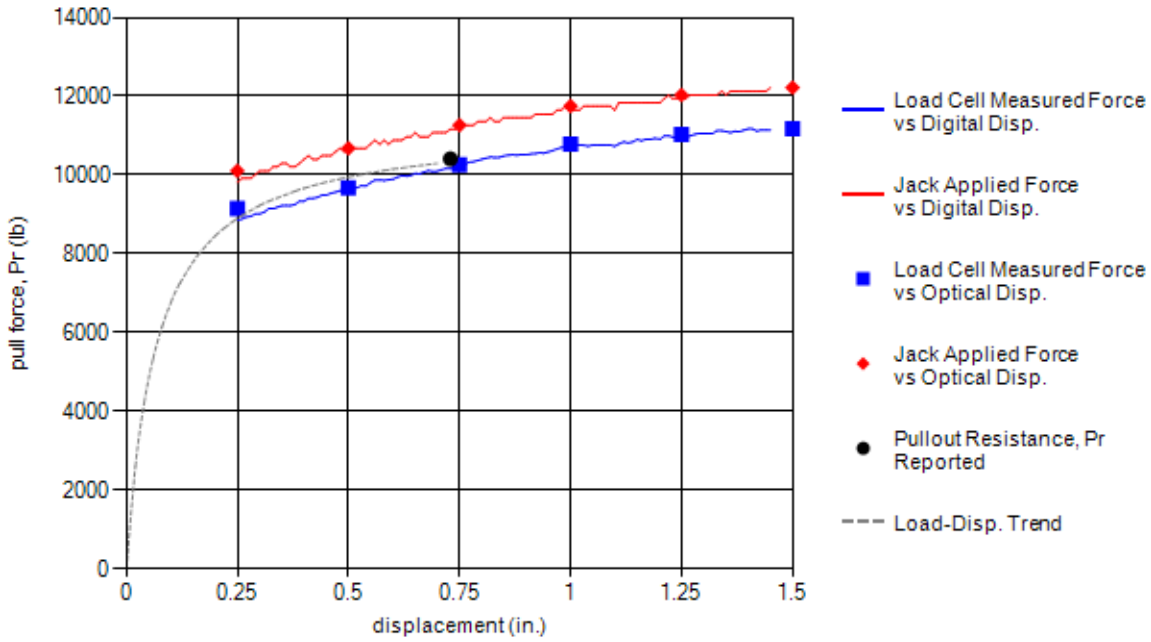
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	119.0	±0.8
Moisture Content, w (%):	7.6	±0.6%
Relative Compaction, C_R (%):	95.6	±0.7%

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	10412	4.9	**0.92**

Load-Displacement Curve



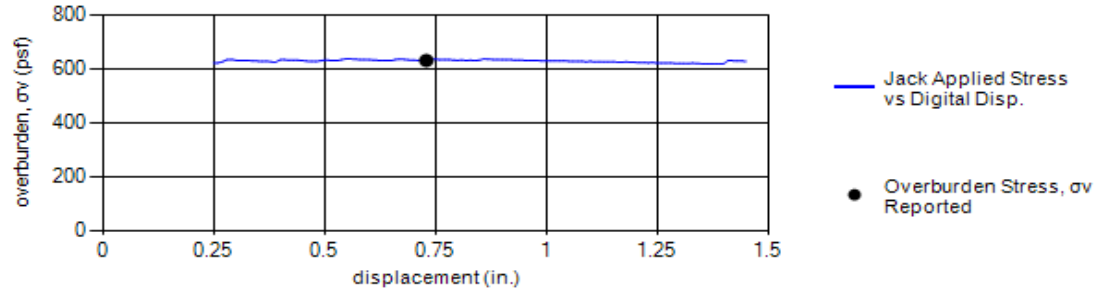
Comments

No earth pressure cell data. No incidental skew data.

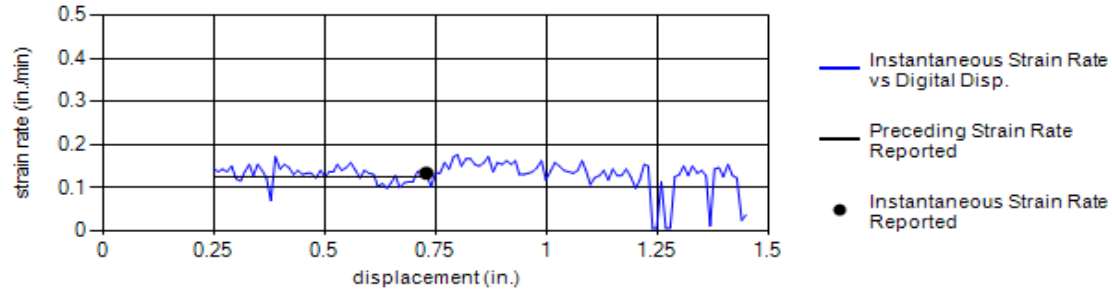
Personnel

Tested:	TW AS 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	632



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.13	0.13	0.32



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

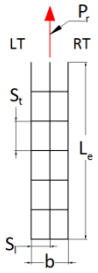
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/13/2010 11:48:00 AM
Test Identification:	TS10.03-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

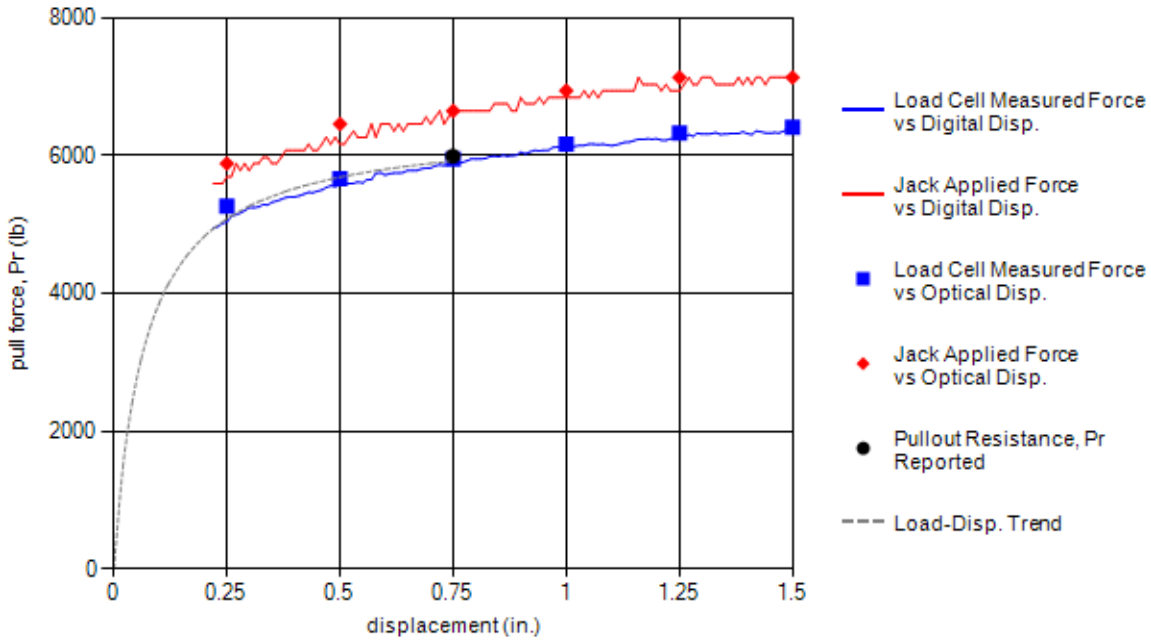
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	119.0 ±0.8
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	7.6 ±0.6%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	95.6 ±0.7%

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	5986	5.0	**1.04**

Load-Displacement Curve



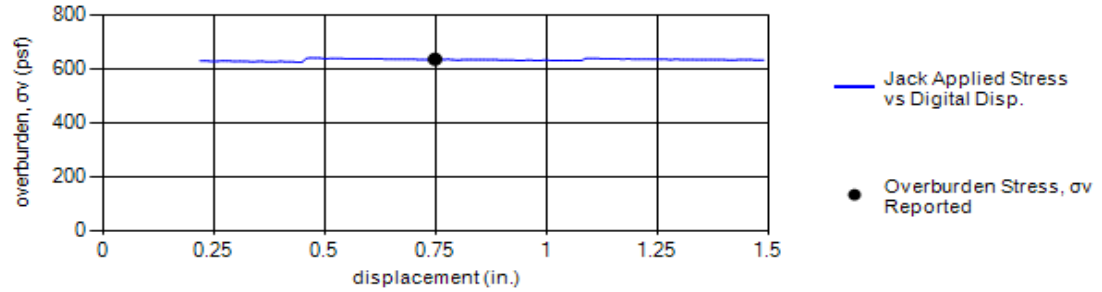
Comments

No earth pressure cell data. No incidental skew data.

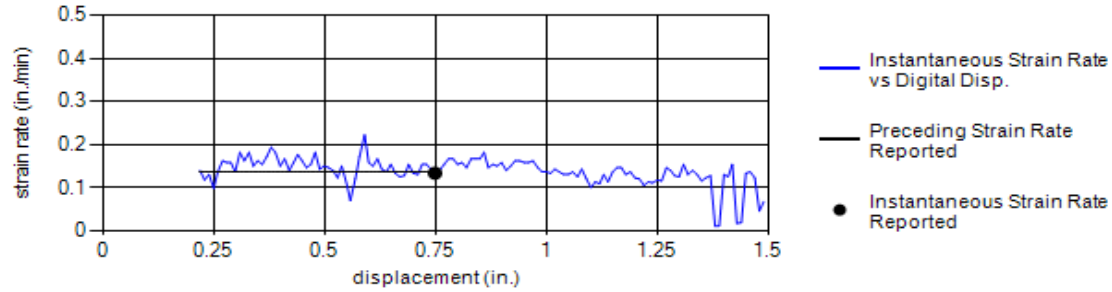
Personnel

Tested:	TW AS 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	637



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.13	0.14	0.31



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

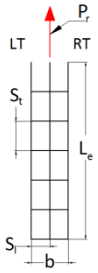
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/13/2010 1:44:00 PM
Test Identification:	TS10.04-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

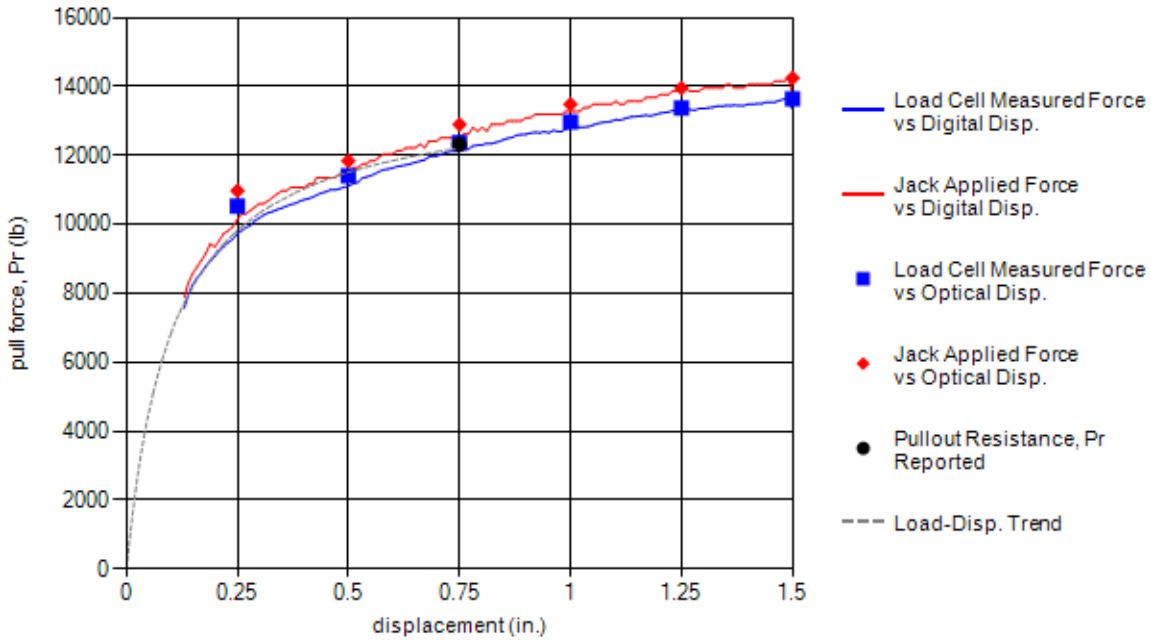
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	119.0 ±0.8
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	7.6 ±0.6%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	95.6 ±0.7%

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	1525	12316	11.9	**0.90**

Load-Displacement Curve



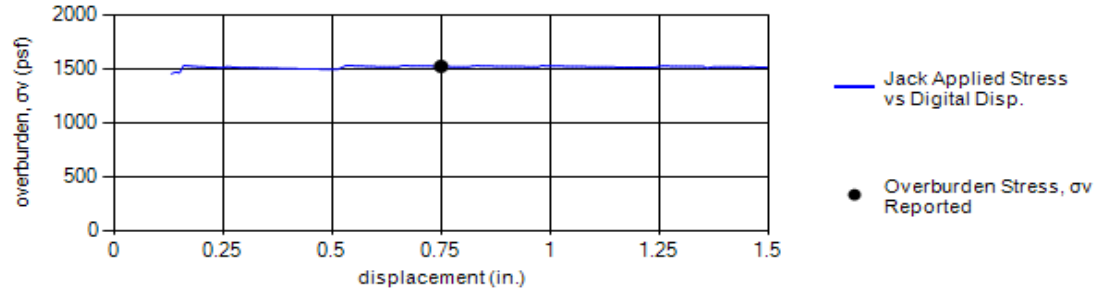
Comments

No earth pressure cell data. No incidental skew data.

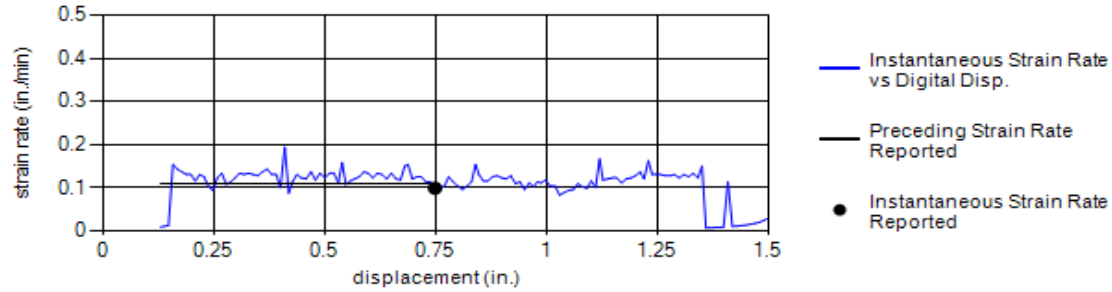
Personnel

Tested:	TW MB AS
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	1525



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

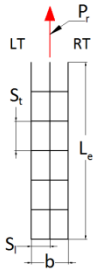
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/16/2010 9:23:00 AM
Test Identification:	TS10.06-G-9x12-W20xW7.5-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.):*	0.31	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

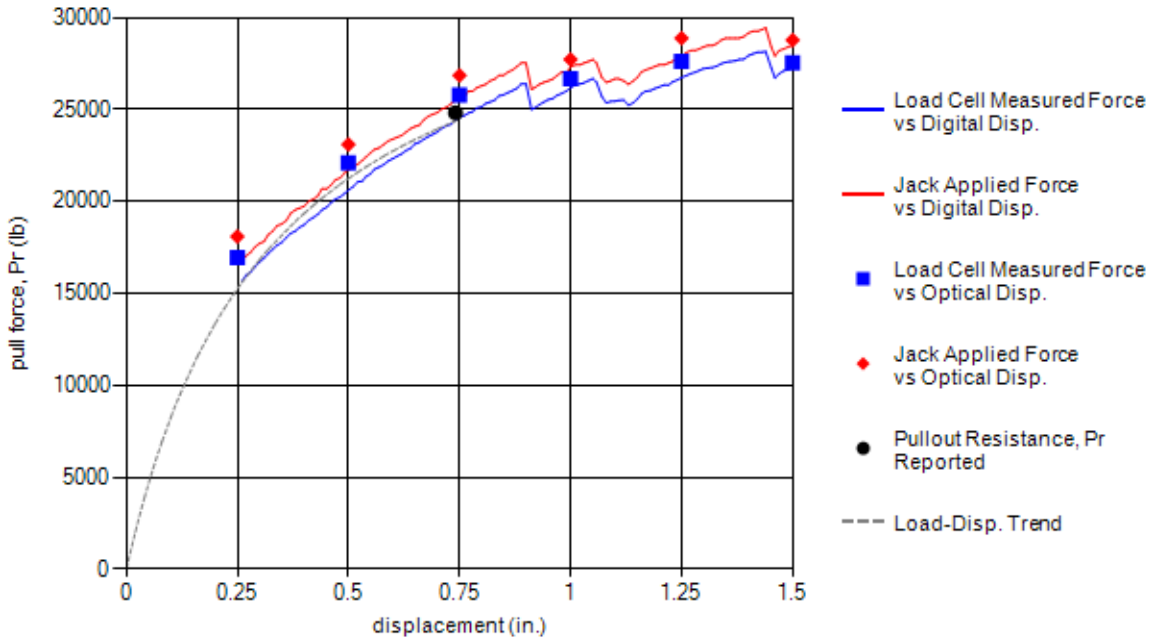
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	119.0 ±0.8
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	7.6 ±0.6%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	95.6 ±0.7%

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	1520	24810	11.9	**0.91**

Load-Displacement Curve



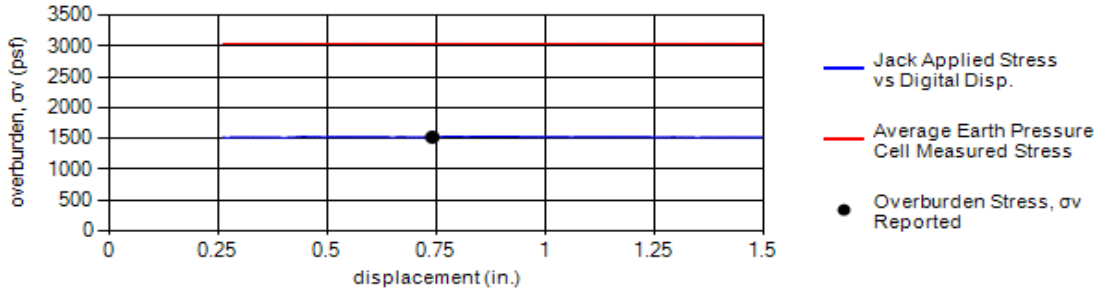
Comments

No incidental skew data.

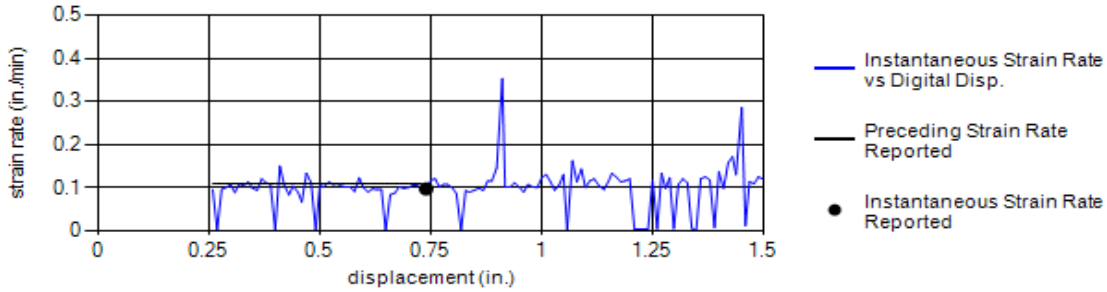
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3522	3263	2632	2990	2799	3041	1.09	1519



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

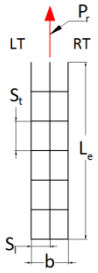
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/16/2010 10:00:00 AM
Test Identification:	TS10.07-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

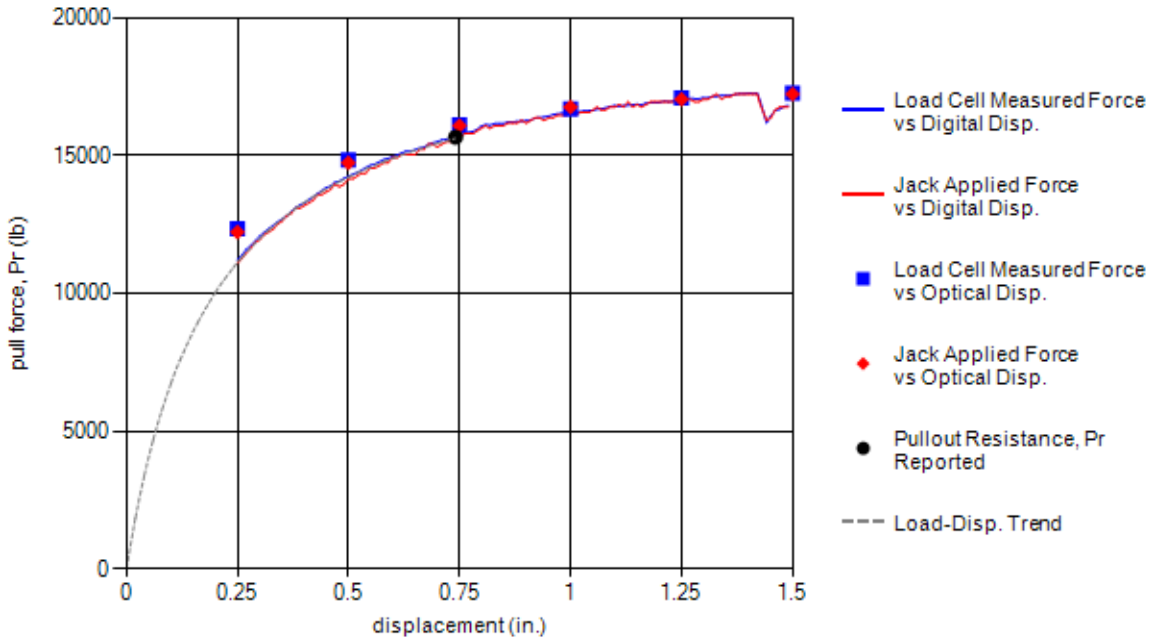
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	119.0 ±0.8
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	7.6 ±0.6%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	95.6 ±0.7%

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	15658	5.1	**2.66**

Load-Displacement Curve



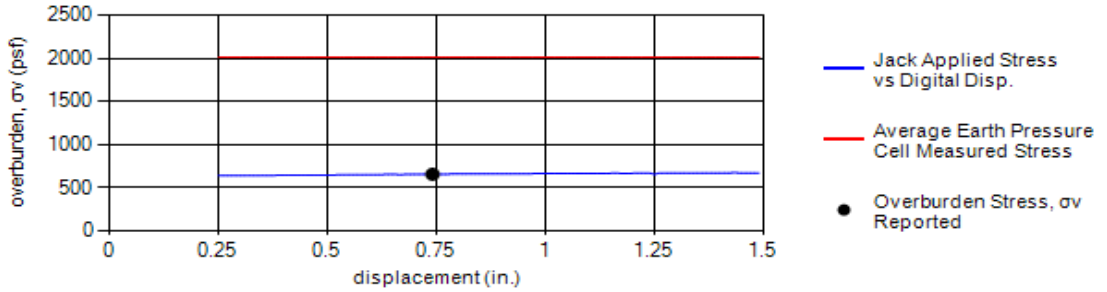
Comments

No incidental skew data.

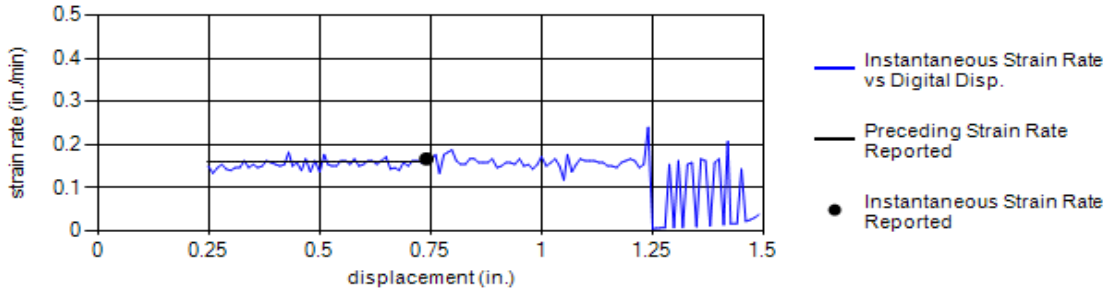
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2291	2199	1733	1975	1869	2013	2.53	654



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.17	0.16	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	No Data	No Data	No Data	No Data

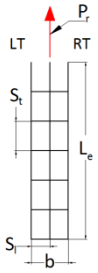
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/16/2010 11:39:00 AM
Test Identification:	TS10.08-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 B

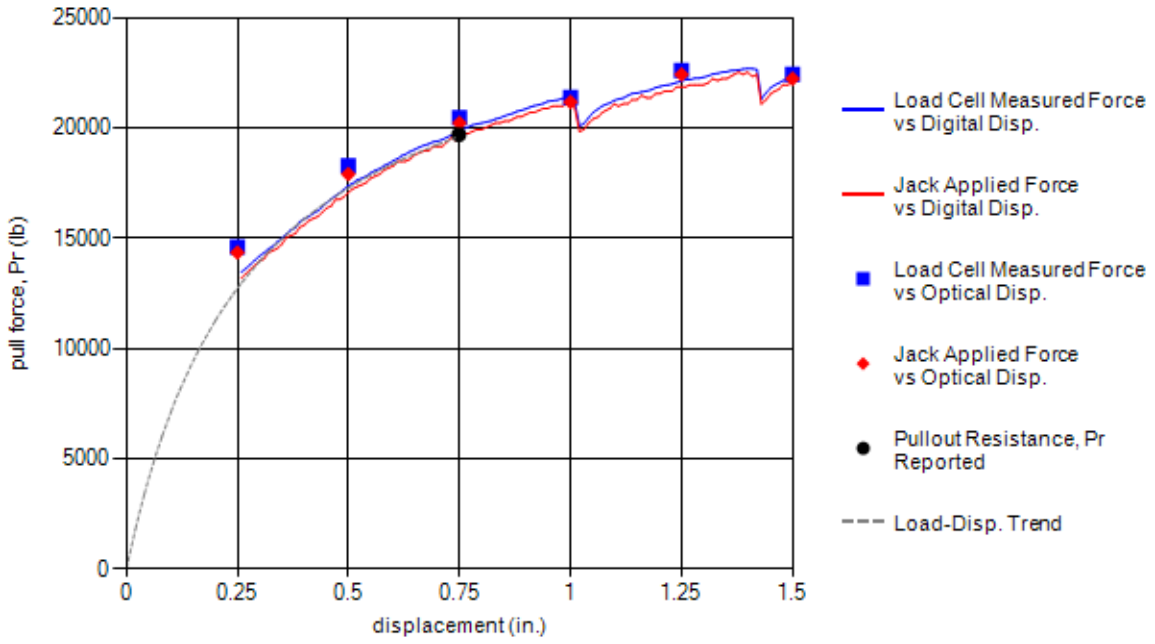
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	119.0	±0.8
Moisture Content, w (%):	7.6	±0.6%
Relative Compaction, C_R (%):	95.6	±0.7%

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	1517	19684	11.9	**1.44**

Load-Displacement Curve



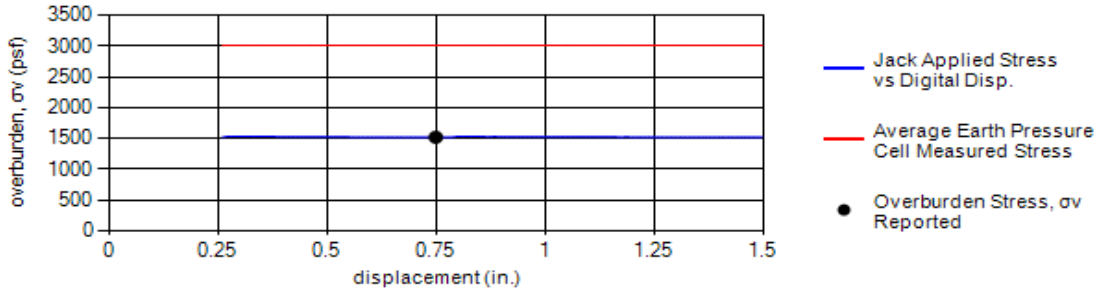
Comments

No incidental skew data.

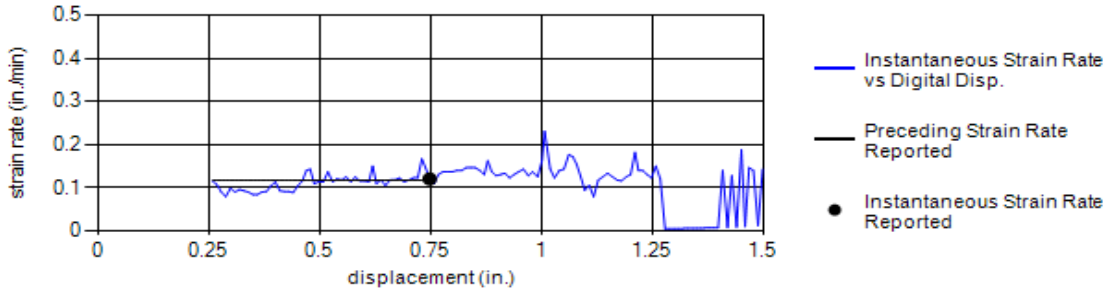
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3495	3048	2709	2948	2842	3009	1.13	1517



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

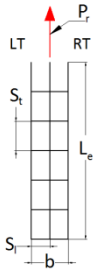
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/13/2010 2:33:00 PM
Test Identification:	TS10.09-G-9x12-W20xW7.5-L6-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):	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

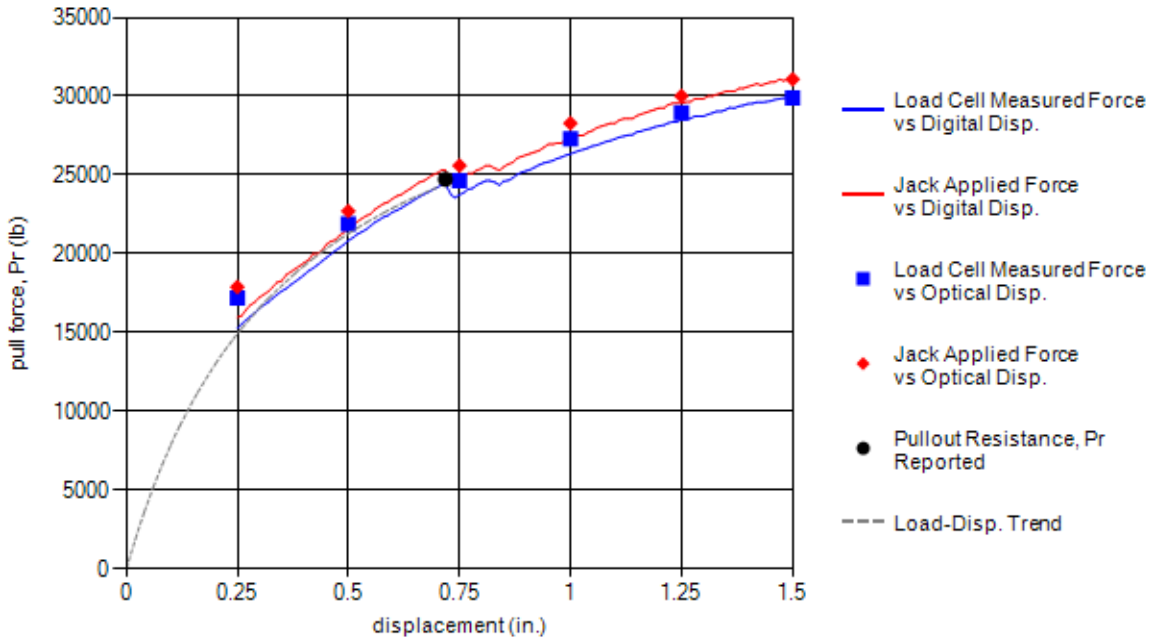
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	119.0 ±0.8
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	7.6 ±0.6%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	95.6 ±0.7%

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	0.72	911	24732	7.1	**1.51**

Load-Displacement Curve



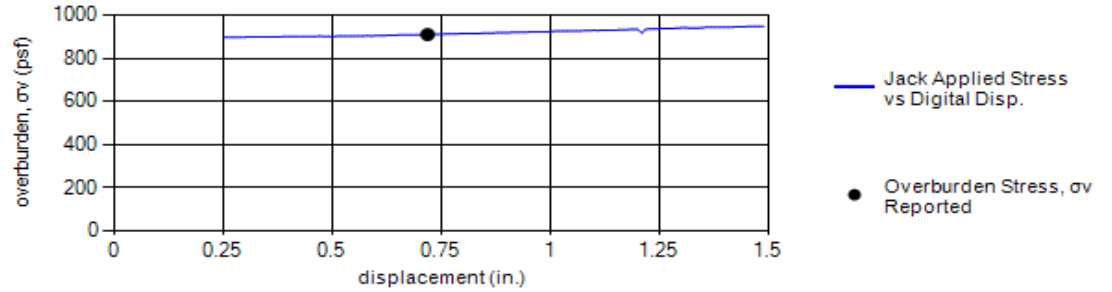
Comments

No earth pressure cell data. No incidental skew data.

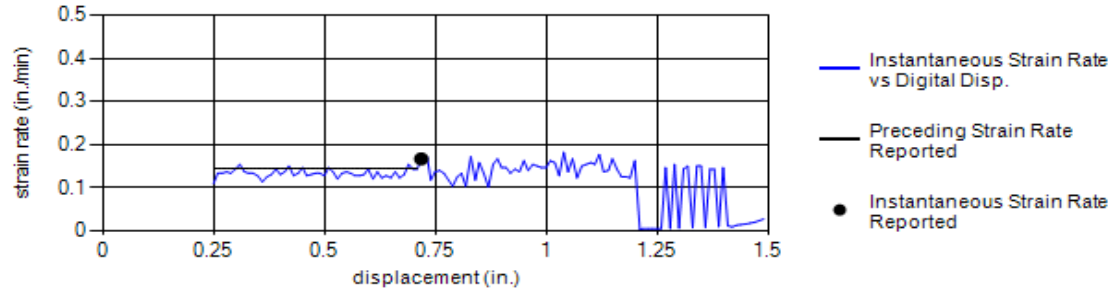
Personnel

Tested:	TW AS MB
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	1.96	911



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

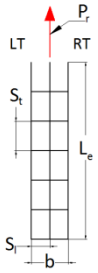
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/13/2010 3:16:00 PM
Test Identification:	TS10.10-G-9x12-W20xW7.5-L6-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.):*	0.31	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

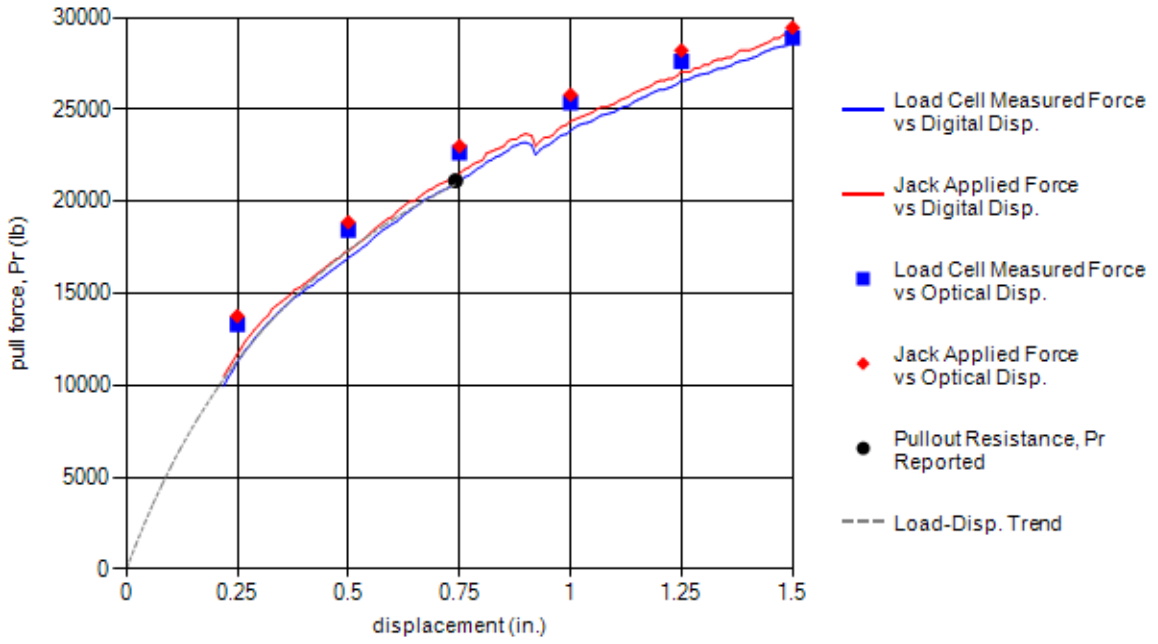
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	119.0 ±0.8
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	7.6 ±0.6%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	95.6 ±0.7%

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	1529	21118	11.9	**0.77**

Load-Displacement Curve



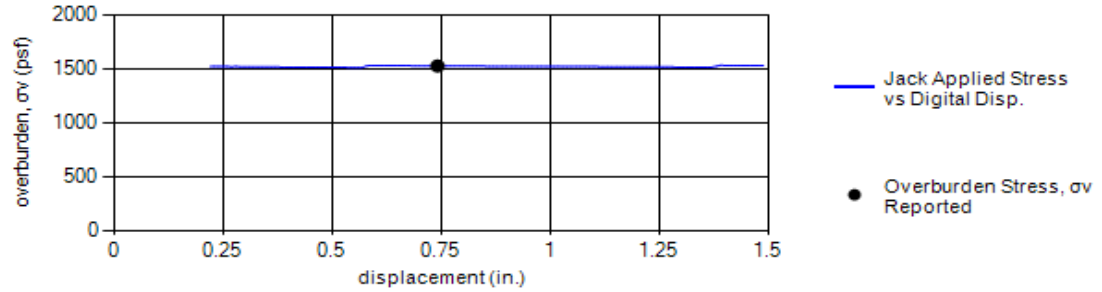
Comments

No earth pressure cell data. No incidental skew data.

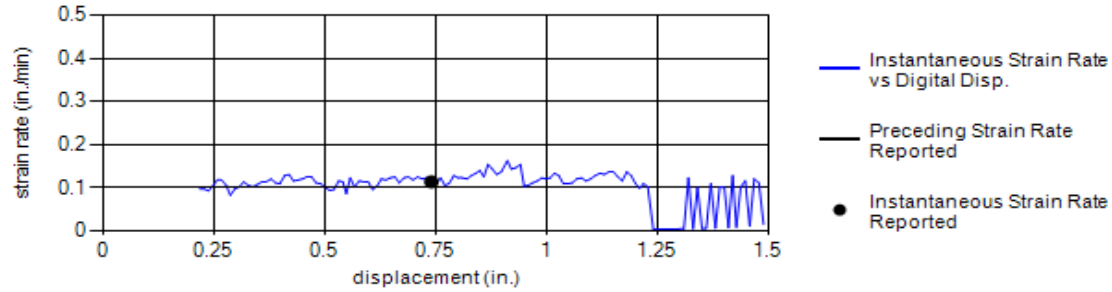
Personnel

Tested:	TW MB AS
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	1.16	1529



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*
No Data	No Data	No Data	No Data	No Data	No Data

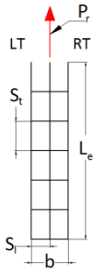
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/13/2010 3:50:00 PM
Test Identification:	TS10.11-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

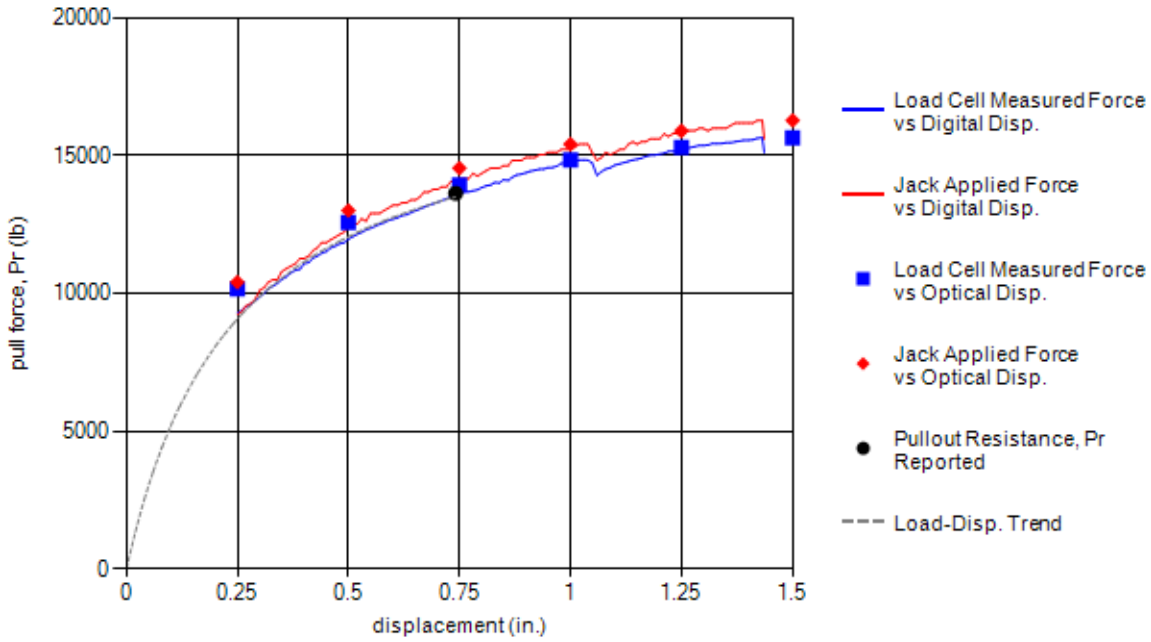
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	119.0 ±0.8
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	7.6 ±0.6%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	95.6 ±0.7%

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	656	13622	5.1	**2.31**

Load-Displacement Curve



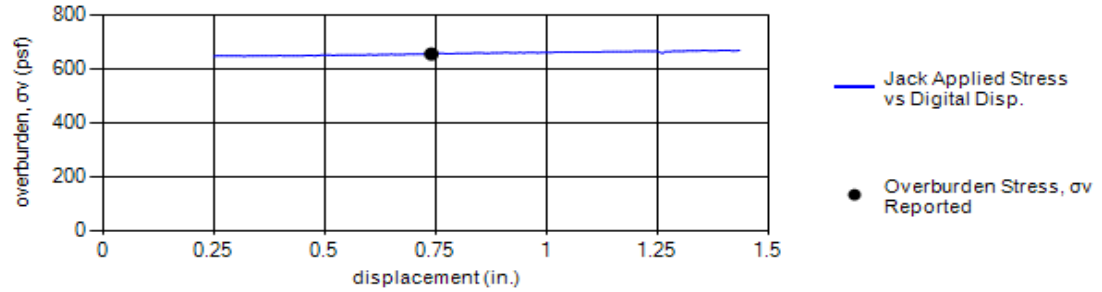
Comments

No earth pressure cell data. No incidental skew data.

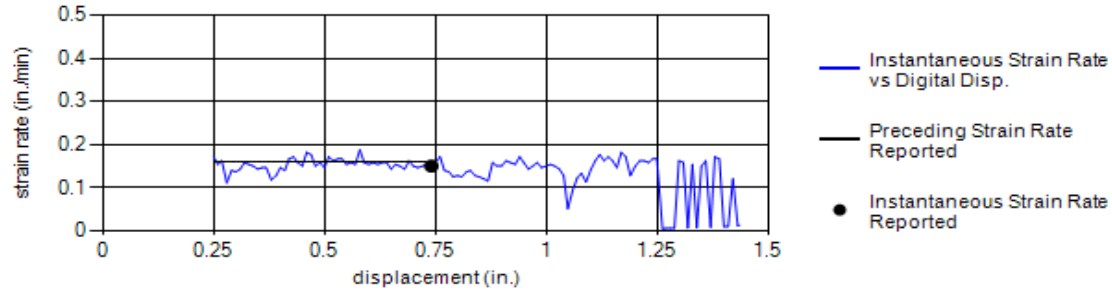
Personnel

Tested:	TW AS MB
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	2.72	656



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.15	0.16	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

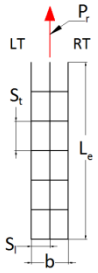
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/13/2010 4:20:00 PM
Test Identification:	TS10.12-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

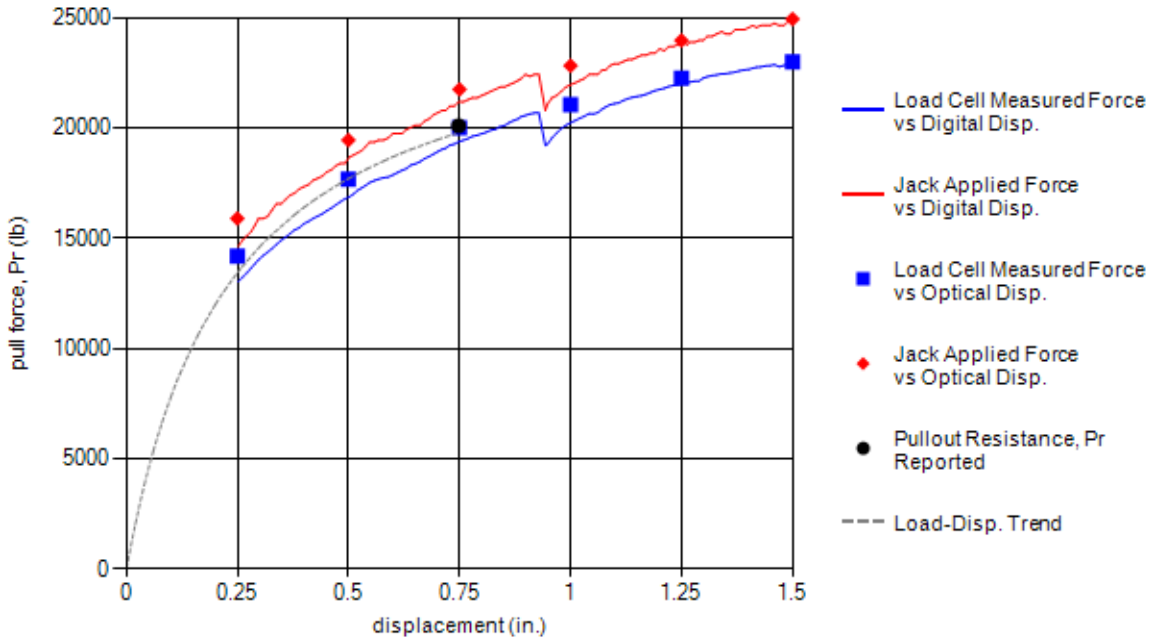
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	119.0 ±0.8
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	7.6 ±0.6%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	95.6 ±0.7%

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	1523	20084	11.9	**1.47**

Load-Displacement Curve



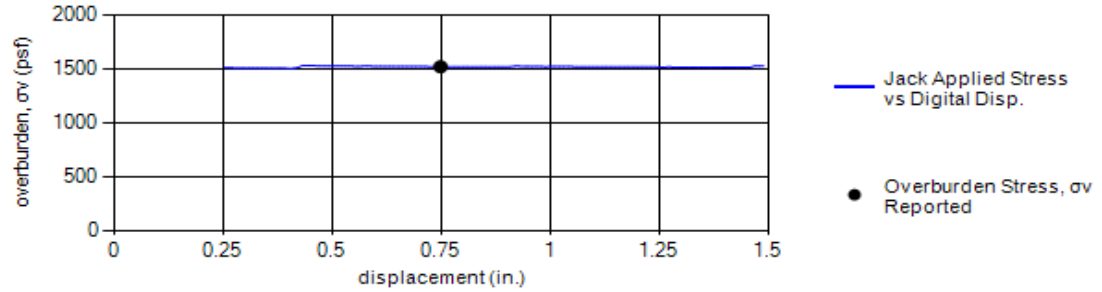
Comments

No earth pressure cell data. No incidental skew data.

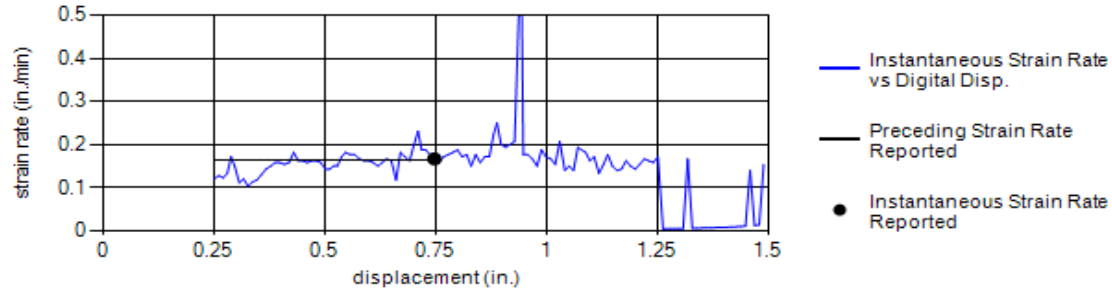
Personnel

Tested:	TW MB AS
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	1.17	1523



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.17	0.16	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	No Data	No Data	No Data	No Data

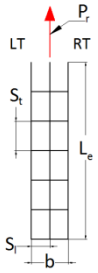
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/19/2010 10:47:00 AM
Test Identification:	TS11.01-G-9x18-W20xW7.5-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.):*	0.31	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	18	*Spacing, S_l (in.):*	9

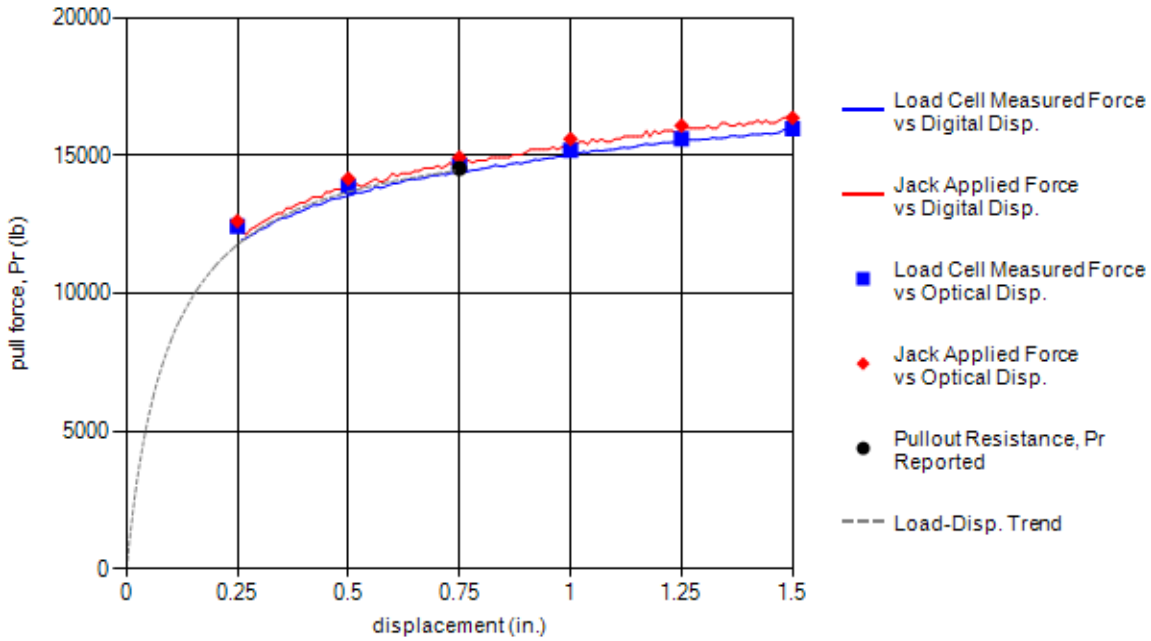
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	116.9 ±1.5
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	6.6 ±0.2%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	93.9 ±1.2%

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	14524	5.1	**0.85**

Load-Displacement Curve



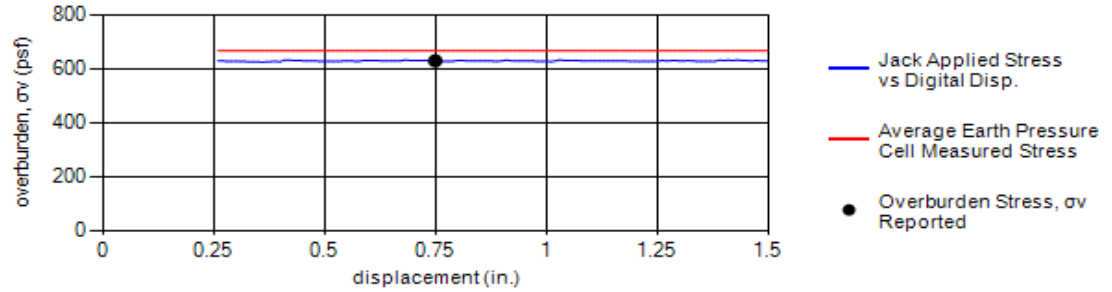
Comments

No incidental skew data.

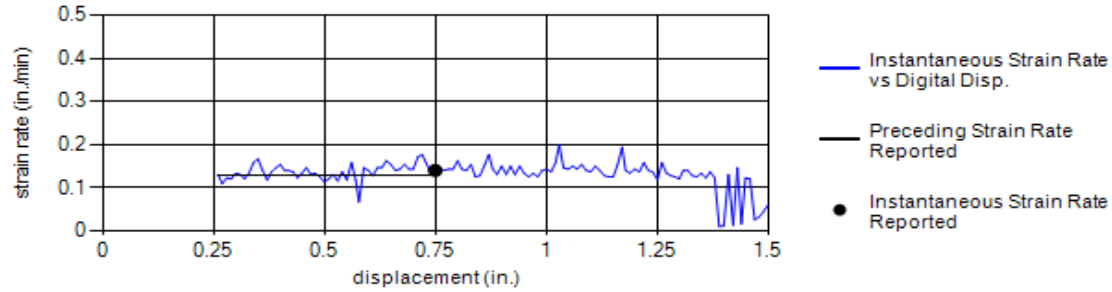
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
747	649	677	579	686	668	1.04	631



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.14	0.13	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

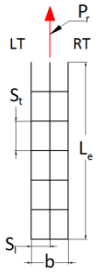
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/19/2010 11:32:00 AM
Test Identification:	TS11.02-G-9x18-W20xW7.5-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.):*	0.31	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	18	*Spacing, S_l (in.):*	9

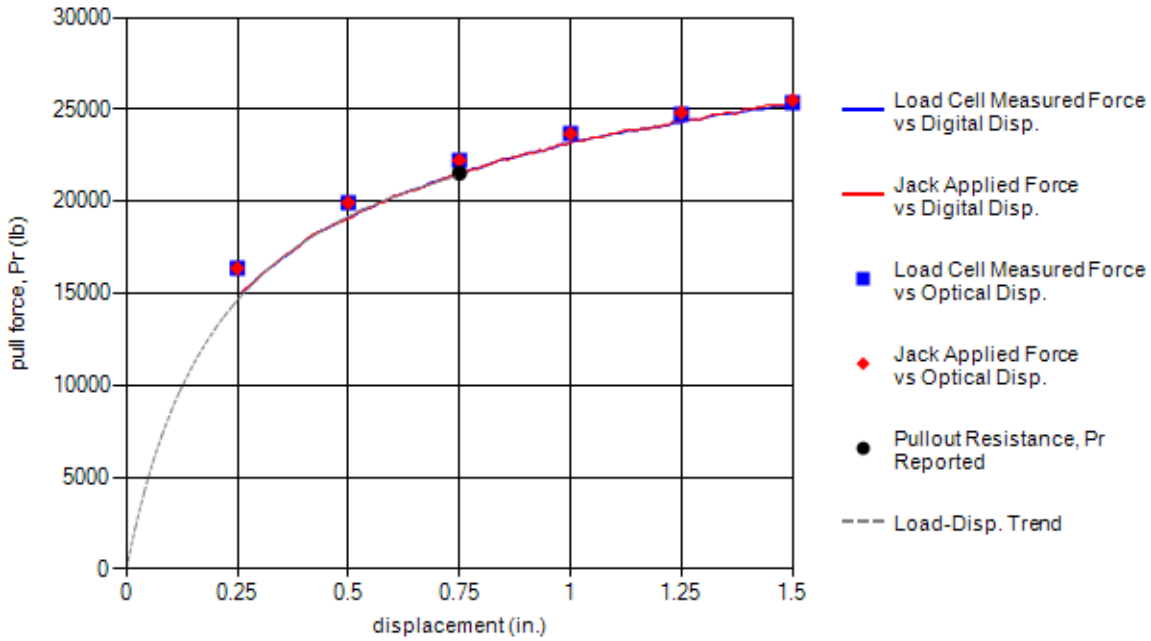
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	116.9	±1.5
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	6.6	±0.2%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	93.9	±1.2%

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	1518	21531	12.2	**0.53**

Load-Displacement Curve



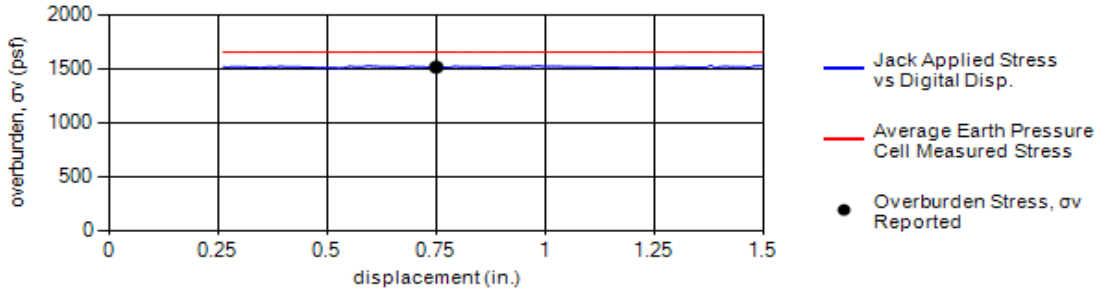
Comments

No incidental skew data.

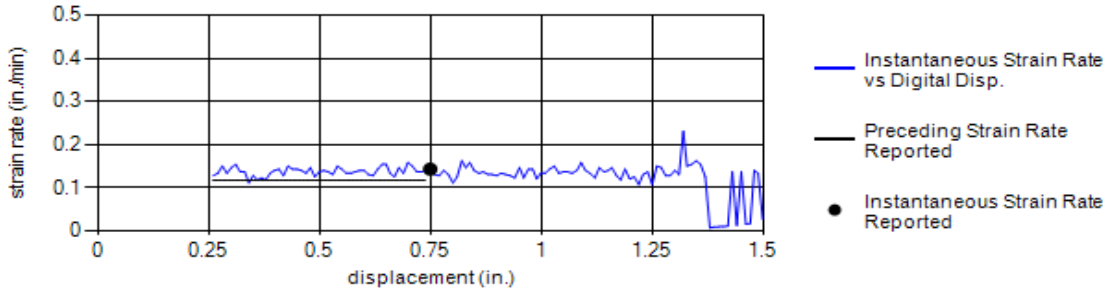
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1768	1643	1553	1643	1681	1658	1.02	1518



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.14	0.12	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

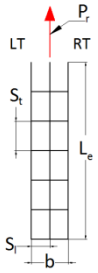
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/19/2010 11:57:00 AM
Test Identification:	TS11.03-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

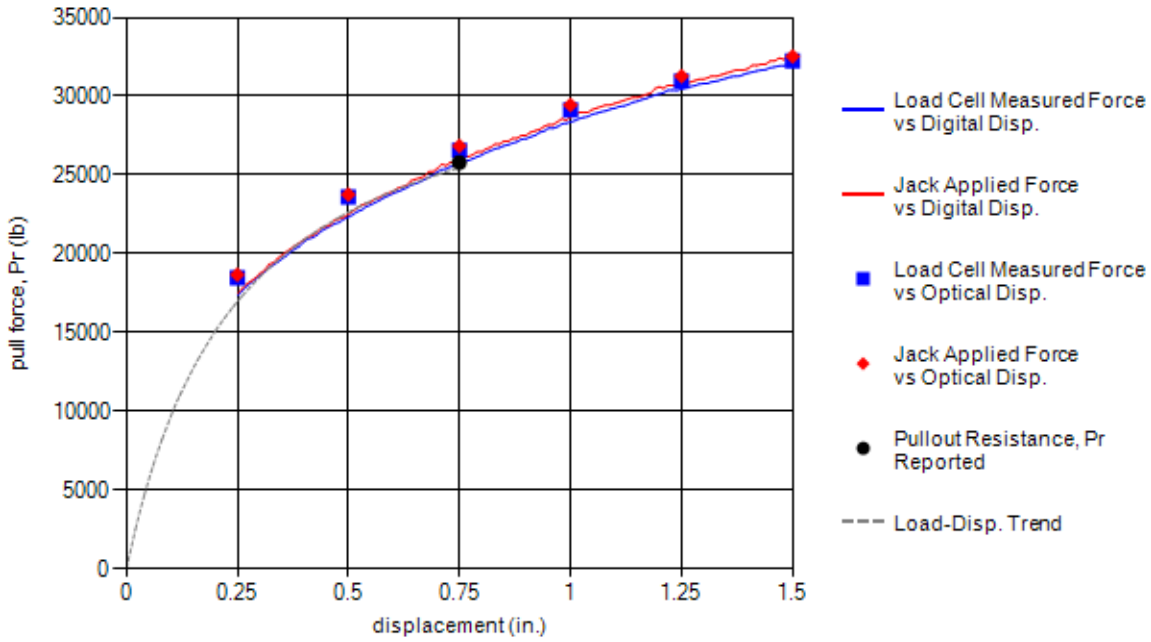
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	116.9 ±1.5
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	6.6 ±0.2%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	93.9 ±1.2%

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	2534	25790	20.3	**0.38**

Load-Displacement Curve



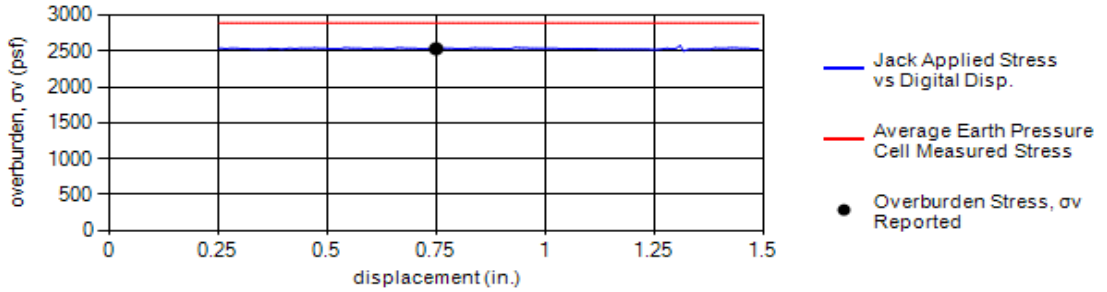
Comments

No incidental skew data.

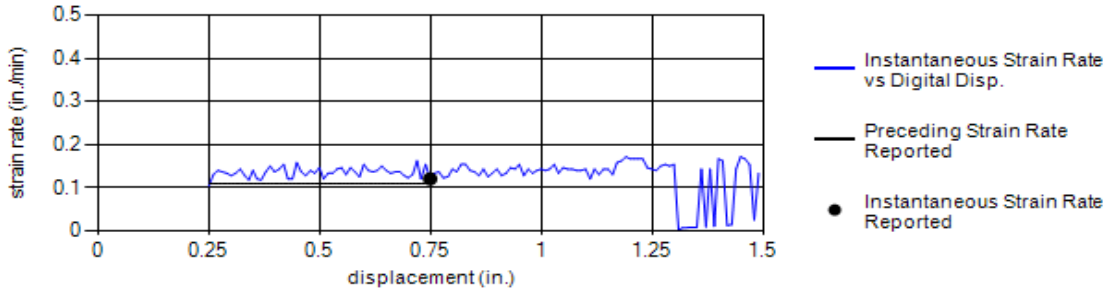
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3086	2932	2618	2997	2842	2895	1.02	2533



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

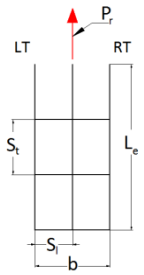
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/19/2010 1:20:00 PM
Test Identification:	TS11.04-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

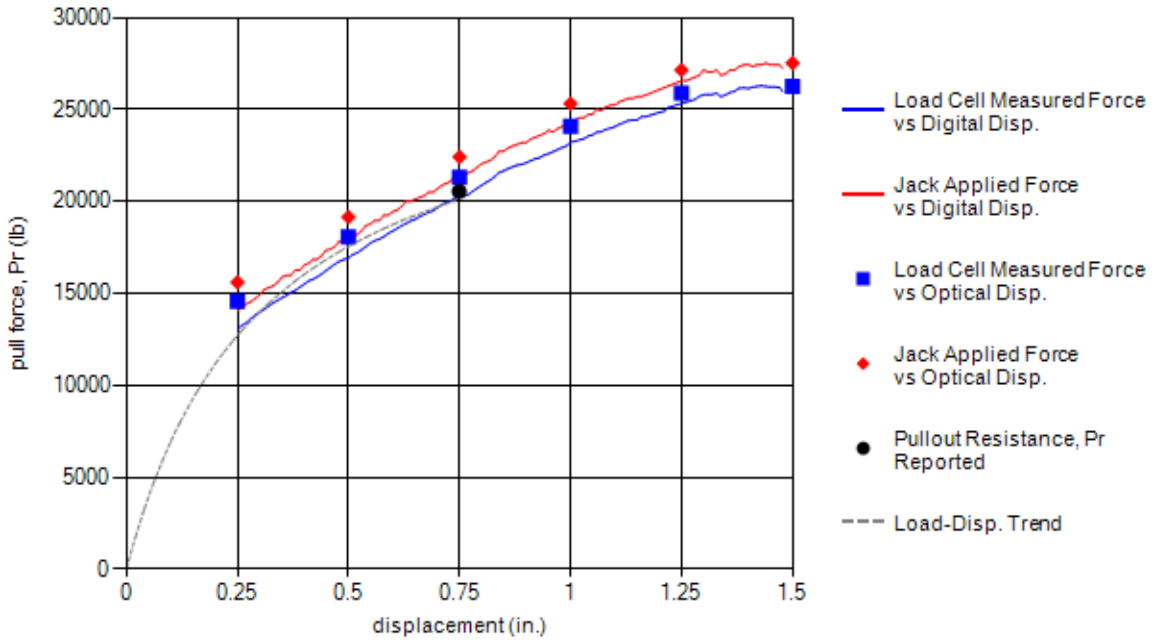
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	116.9	±1.5
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	6.6	±0.2%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	93.9	±1.2%

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	4929	20538	39.6	**0.31**

Load-Displacement Curve



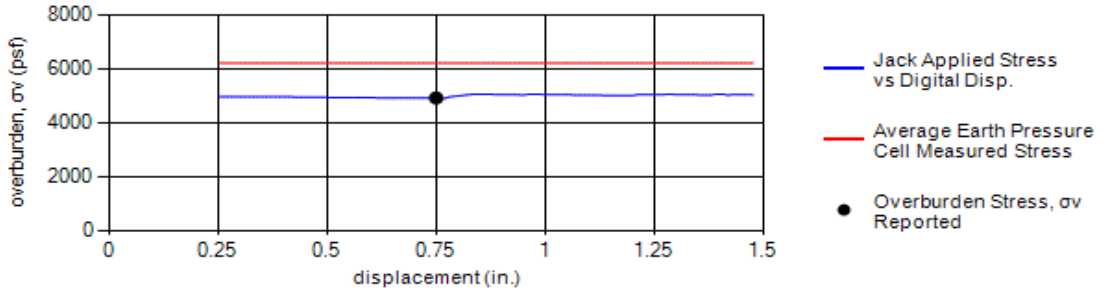
Comments

No incidental skew data.

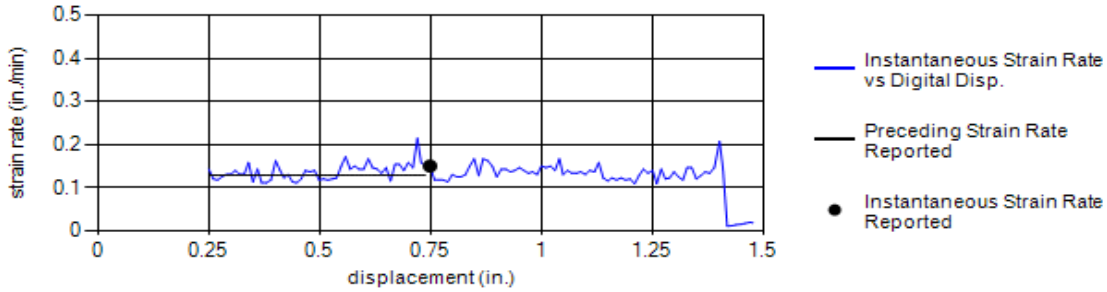
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
6909	6416	5409	6345	6031	6222	1.02	4921



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

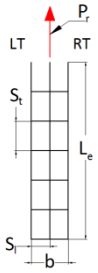
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/19/2010 3:54:00 PM
Test Identification:	TS11.05-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

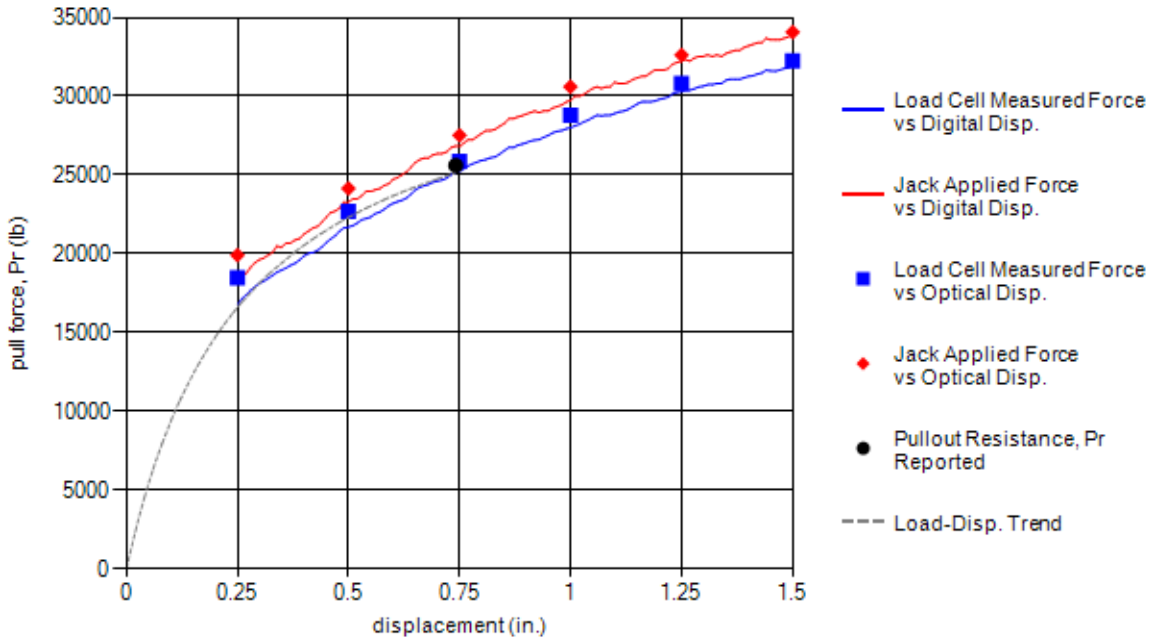
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	116.9 ±1.5
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	6.6 ±0.2%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	93.9 ±1.2%

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	654	25610	5.3	**1.45**

Load-Displacement Curve



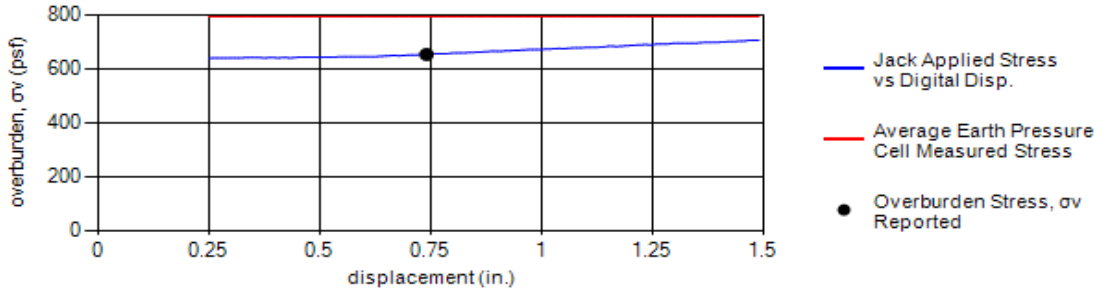
Comments

No incidental skew data.

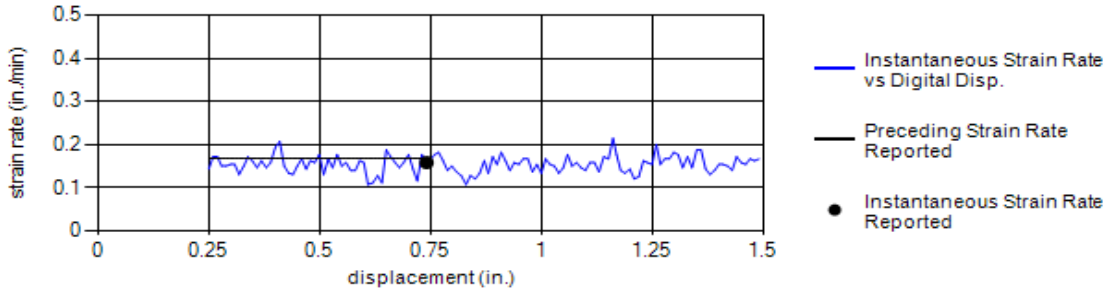
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1335	566	643	706	723	795	8.11	654



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.16	0.17	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	No Data	No Data	No Data	No Data

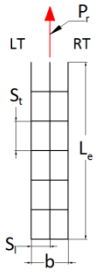
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/20/2010 11:02:00 AM
Test Identification:	TS11.06-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

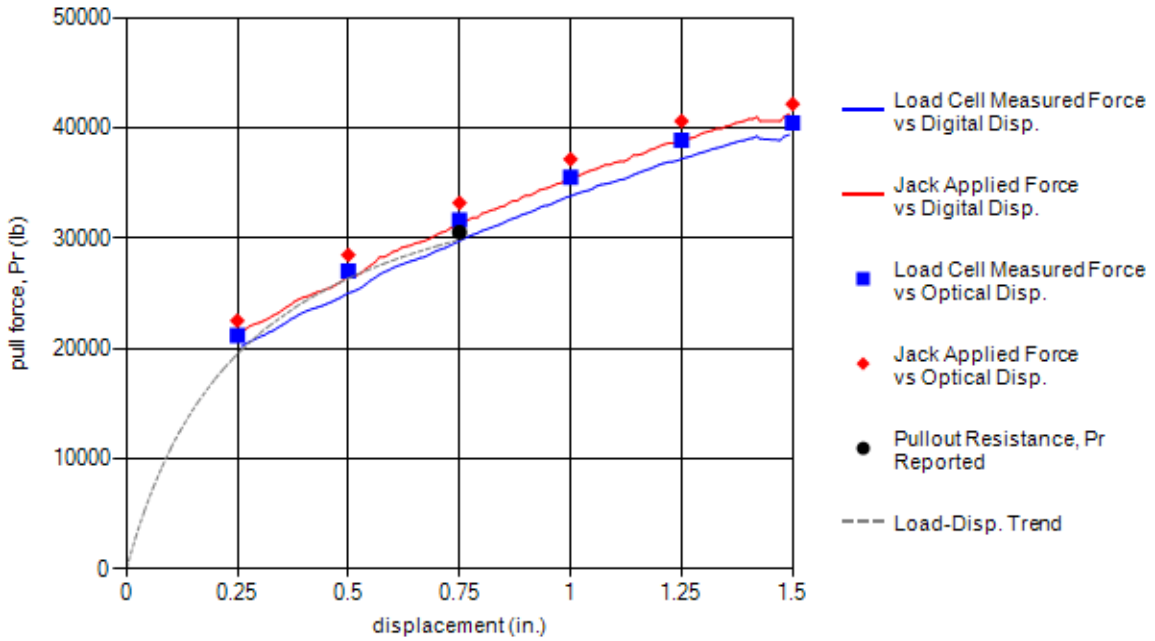
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	116.9	±1.5
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	6.6	±0.2%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	93.9	±1.2%

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	1511	30522	12.1	**0.75**

Load-Displacement Curve



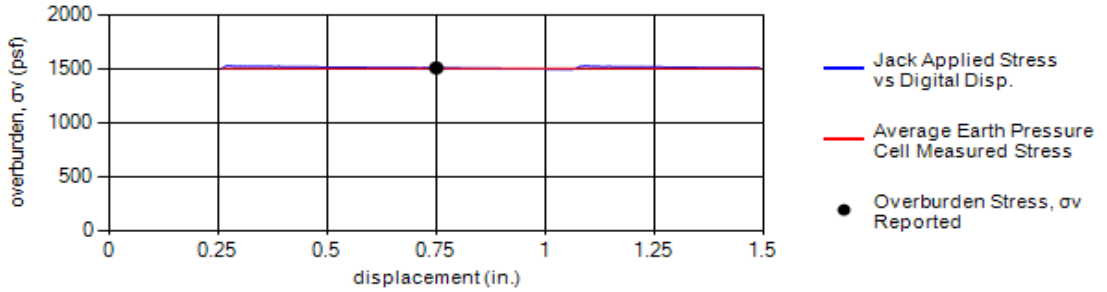
Comments

No incidental skew data.

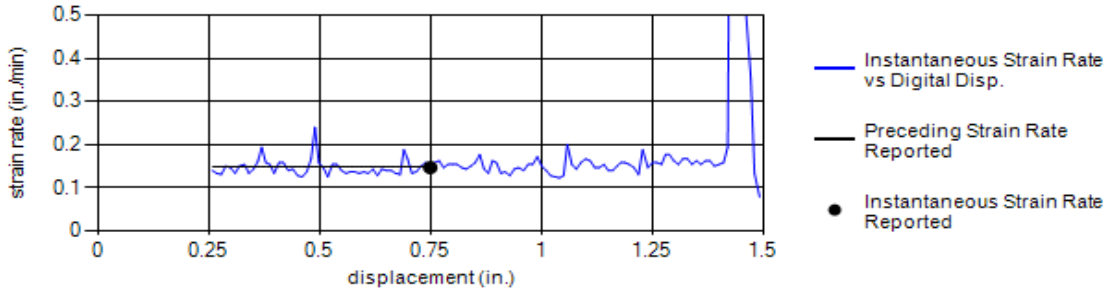
Personnel

Tested:	TW MB SH
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1581	1314	1394	1713	1523	1505	4.20	1511



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

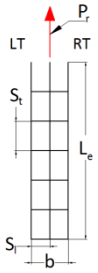
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/20/2010 11:30:00 AM
Test Identification:	TS11.07-G-9x18-W20xW7.5-L9-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):	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

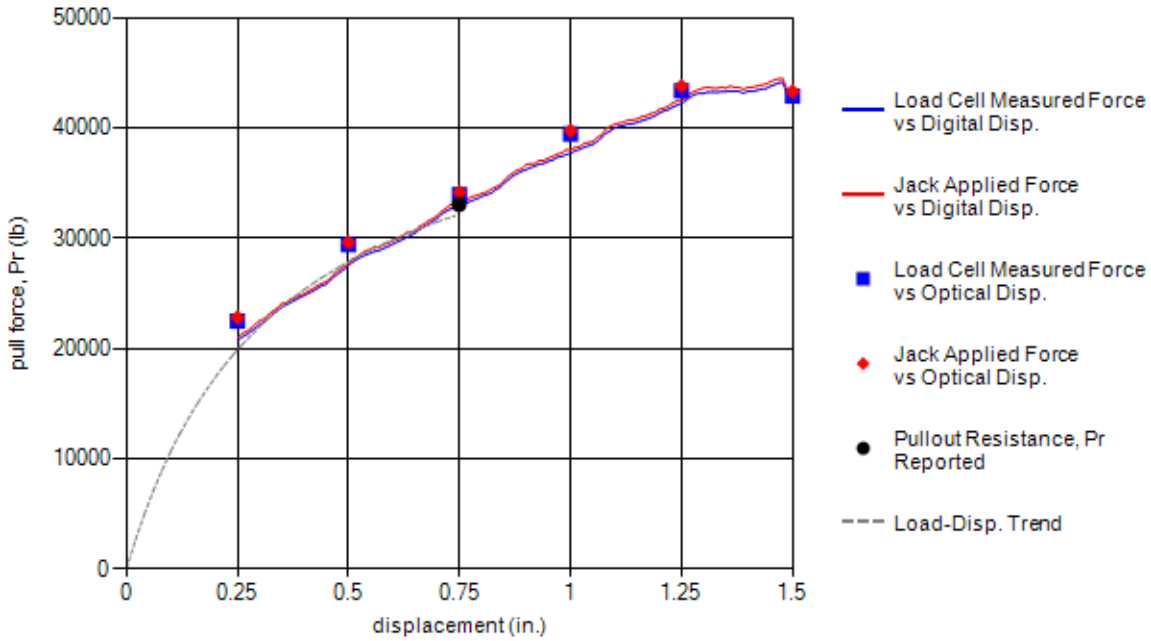
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	116.9 ±1.5
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	6.6 ±0.2%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	93.9 ±1.2%

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	2524	33041	20.3	**0.48**

Load-Displacement Curve



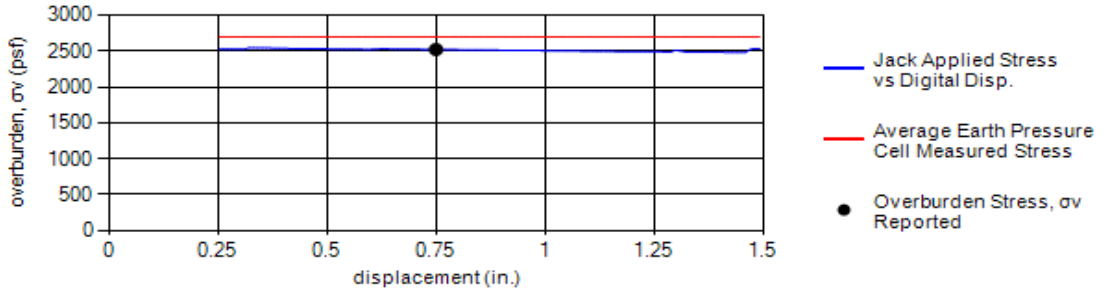
Comments

No incidental skew data.

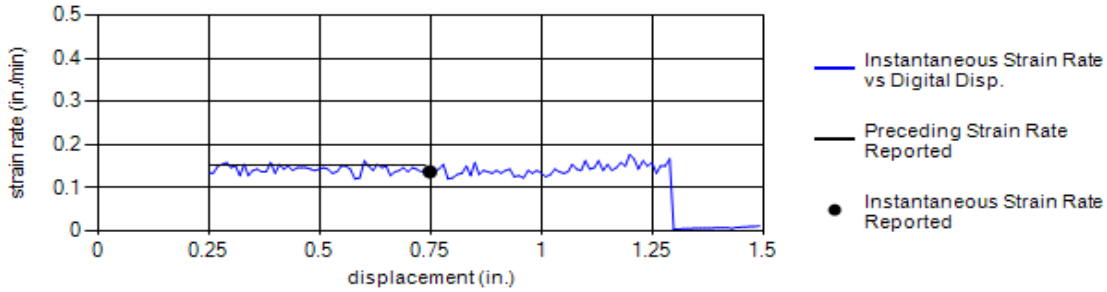
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2777	2393	2561	3060	2689	2696	2.34	2524



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

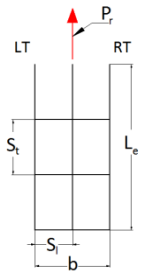
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/20/2010 12:00:00 PM
Test Identification:	TS11.08-G-9x18-W20xW7.5-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.):*	0.31	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	18	*Spacing, S_l (in.):*	9

Backfill Material

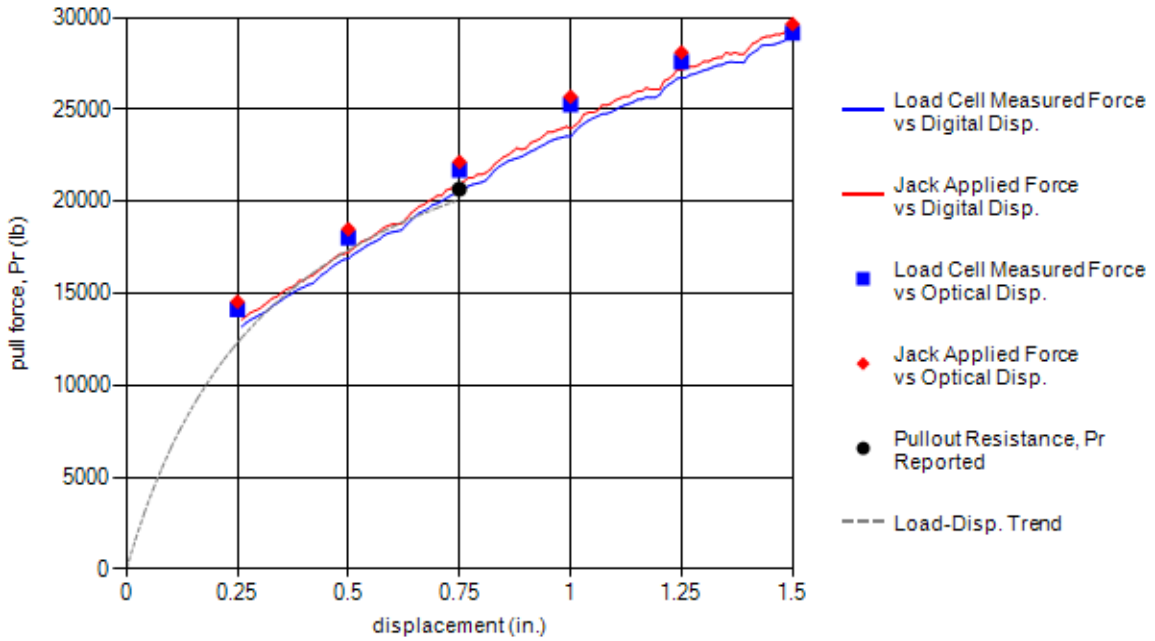
Specification:	TxDOT Item 423 - Type B

Moisture Density Relationship (TEX-114-E)		In-Place Density (TEX-115-E)		
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Dry Unit Weight, γ_d (pcf):*	116.9	±1.5
Optimum Moisture Content, OMC (%):	7.8%	*Moisture Content, w (%):*	6.6	±0.2%
		Relative Compaction, C_R (%):	93.9	±1.2%

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	5057	20661	40.6	**0.30**

Load-Displacement Curve



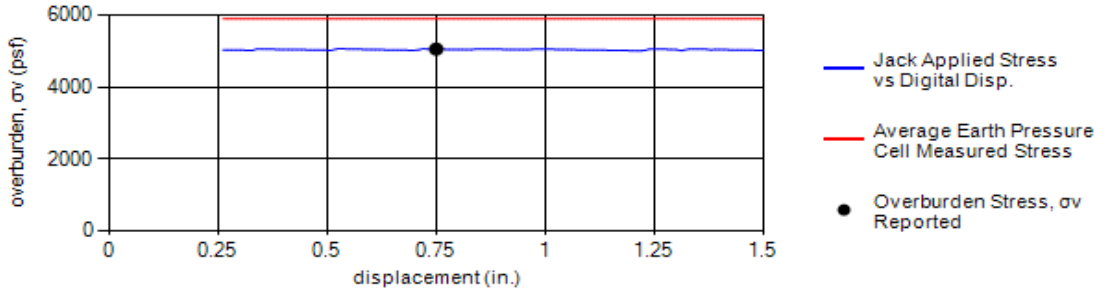
Comments

No incidental skew data.

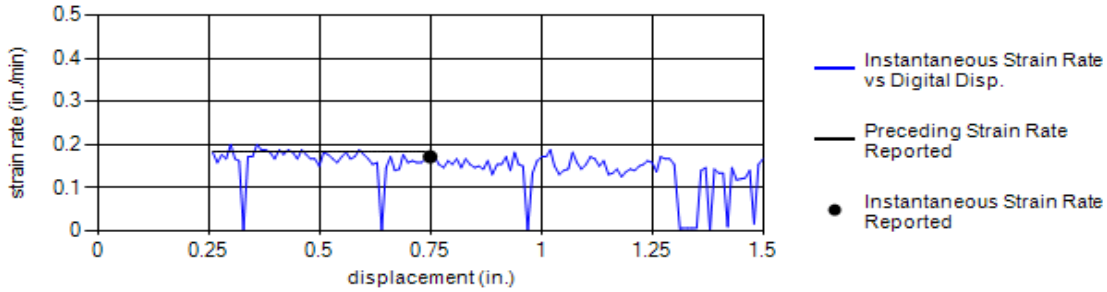
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
6120	5536	5464	6500	5886	5901	1.08	5057



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.17	0.18	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	No Data	No Data	No Data	No Data

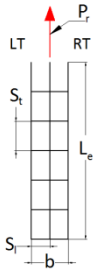
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/19/2010 1:54:00 PM
Test Identification:	TS11.09-G-9x18-W20xW7.5-L9-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):	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

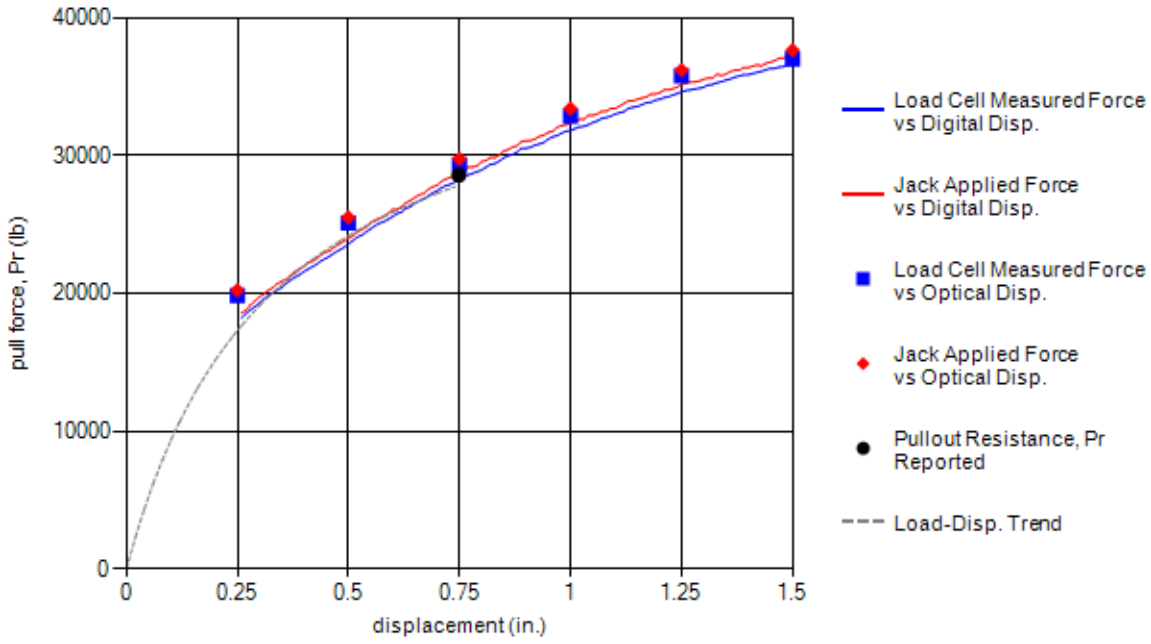
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	116.9 ±1.5
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	6.6 ±0.2%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	93.9 ±1.2%

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	634	28564	5.1	**1.67**

Load-Displacement Curve



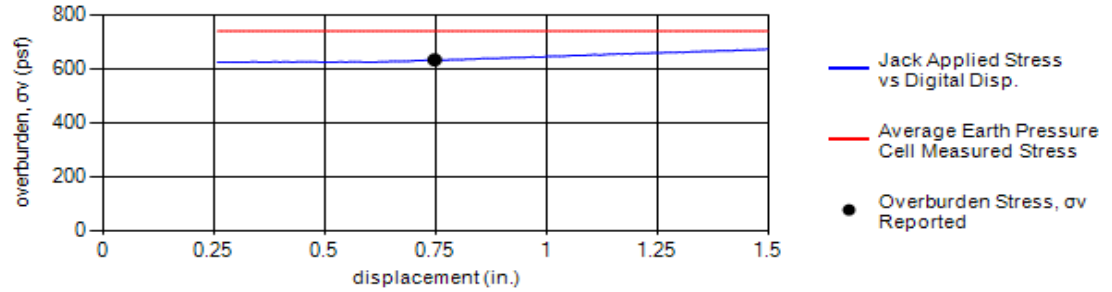
Comments

No incidental skew data.

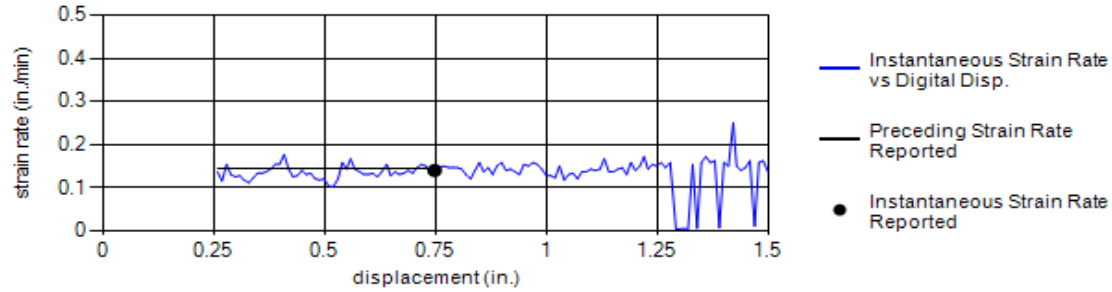
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1335	595	621	517	638	741	8.69	634



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

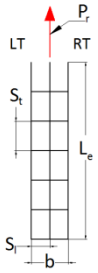
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/19/2010 2:21:00 PM
Test Identification:	TS11.10-G-9x18-W20xW7.5-L9-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):	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

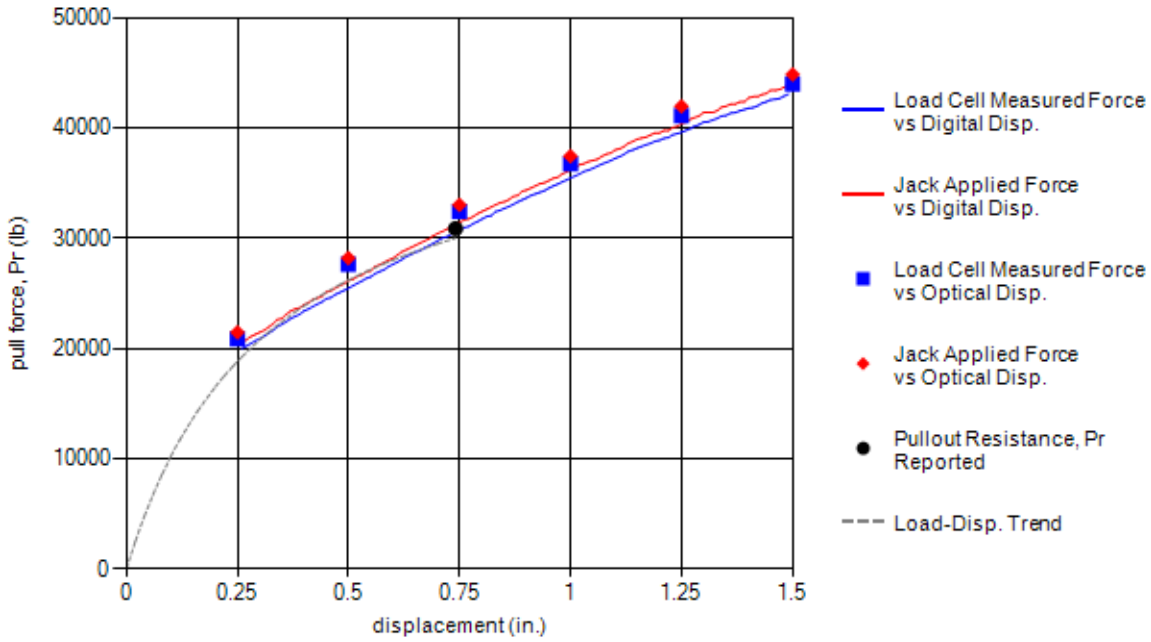
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	116.9 ±1.5
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	6.6 ±0.2%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	93.9 ±1.2%

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	1496	30865	12.0	**0.76**

Load-Displacement Curve



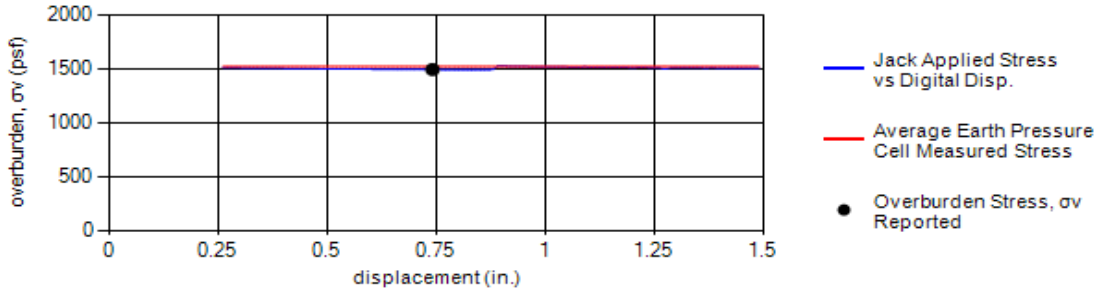
Comments

No incidental skew data.

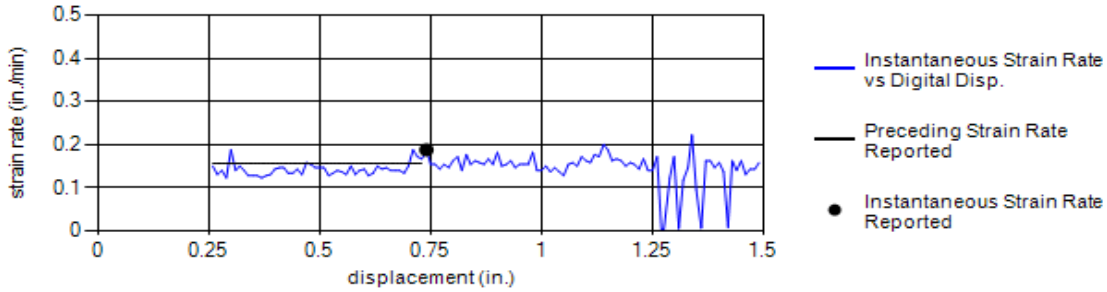
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1679	1509	1239	1628	1564	1524	4.23	1496



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.19	0.16	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

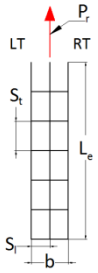
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/19/2010 2:49:00 PM
Test Identification:	TS11.11-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

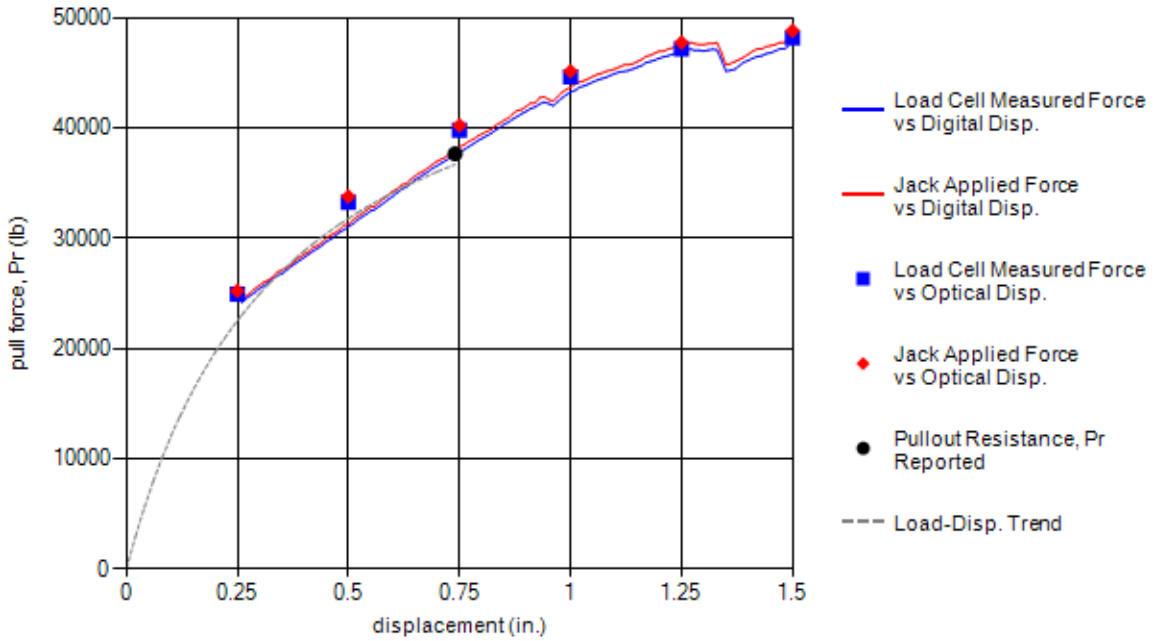
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	116.9 ±1.5
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	6.6 ±0.2%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	93.9 ±1.2%

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	2539	37640	20.4	**0.55**

Load-Displacement Curve



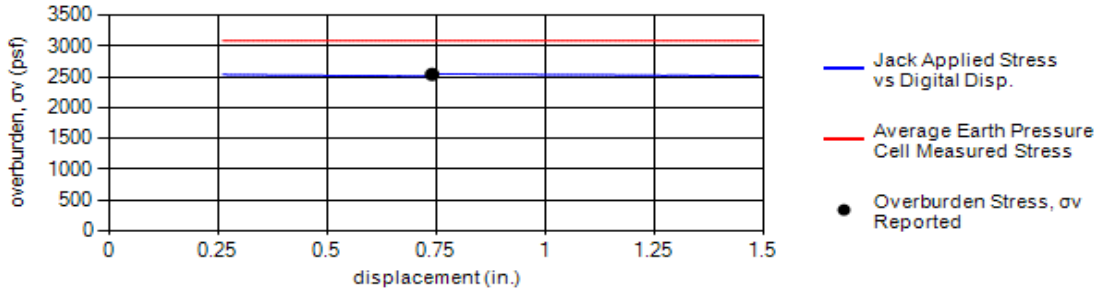
Comments

No incidental skew data.

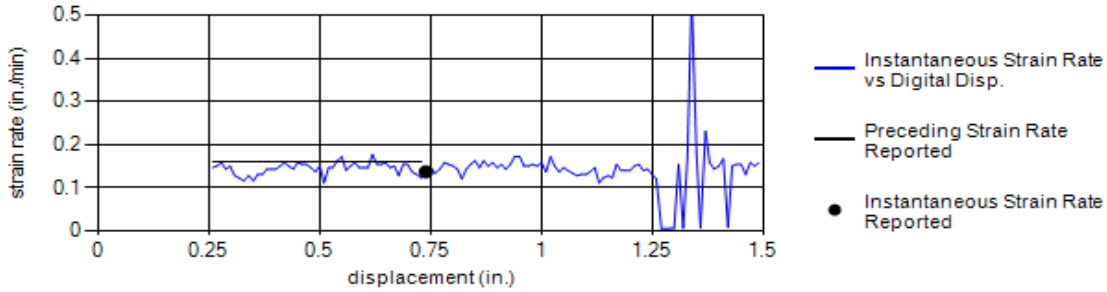
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3313	3010	2639	3368	3099	3086	2.09	2539



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

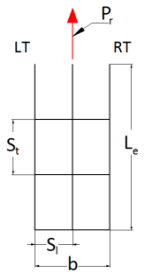
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/19/2010 3:17:00 PM
Test Identification:	TS11.12-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

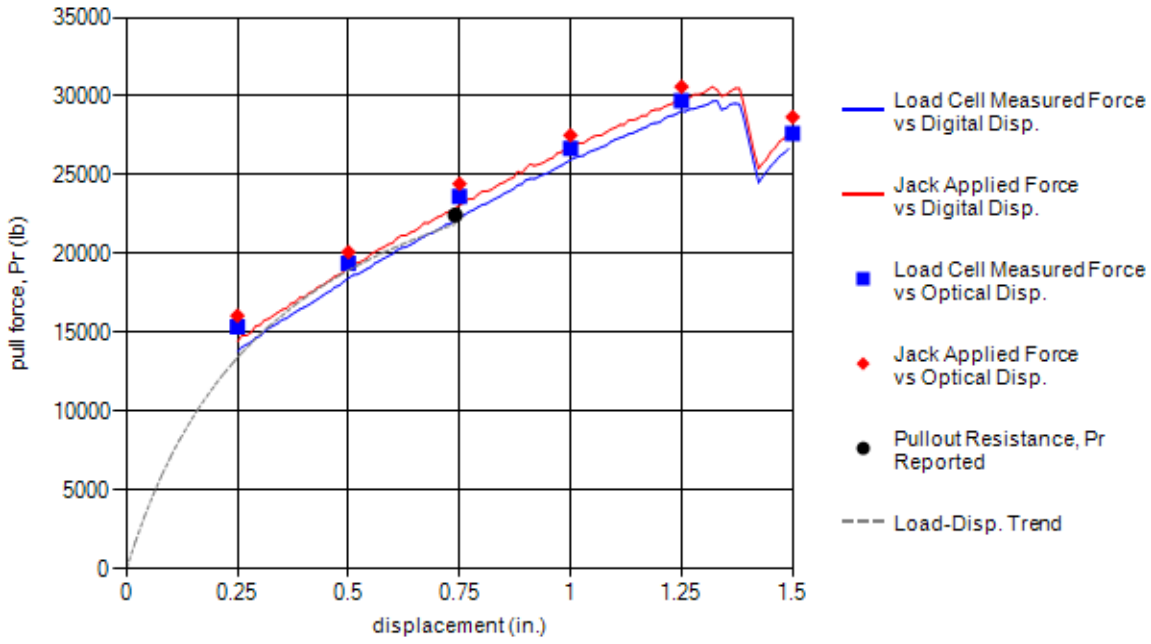
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	116.9	±1.5
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	6.6	±0.2%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	93.9	±1.2%

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	22456	40.6	**0.33**

Load-Displacement Curve



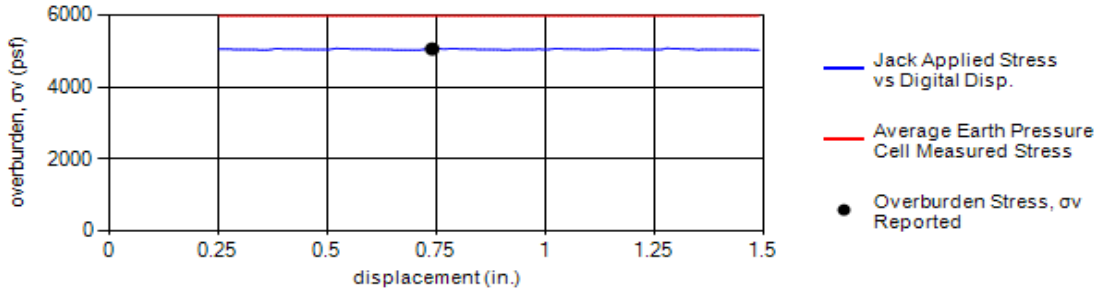
Comments

No incidental skew data.

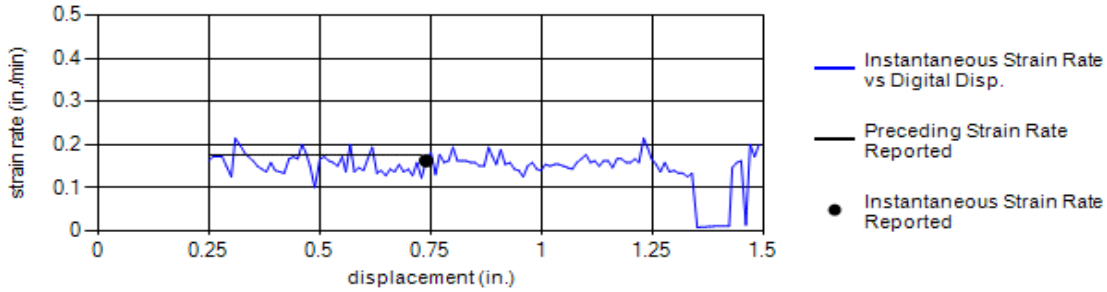
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
6320	5899	5458	6361	5882	5984	1.08	5061



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



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

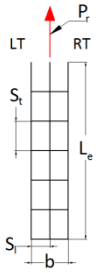
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/26/2010 1:47:00 PM
Test Identification:	TS12.01-G-9x24-W20xW7.5-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.):*	0.31	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	24	*Spacing, S_l (in.):*	9

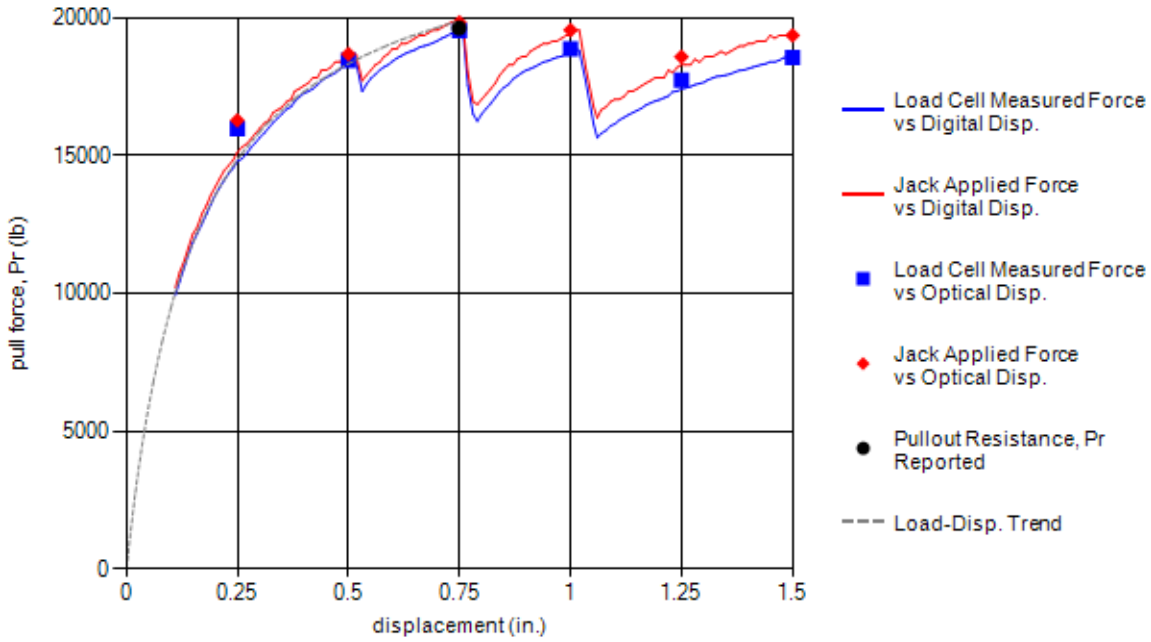
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	115.2 ±2.8
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	9.3 ±2.0%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	92.6 ±2.3%

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	634	19615	5.0	**0.86**

Load-Displacement Curve



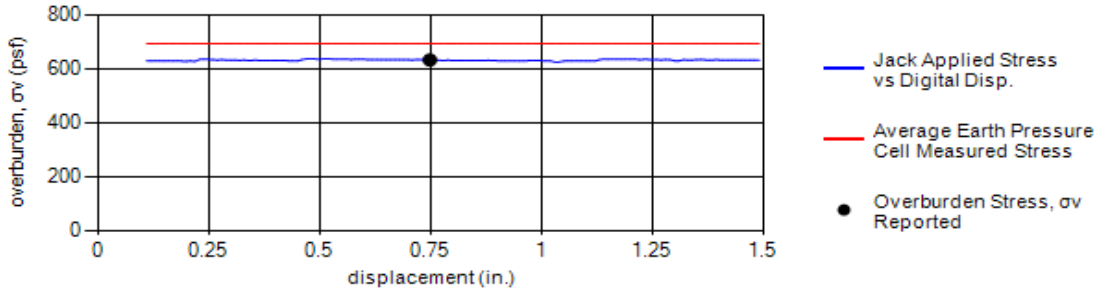
Comments

No incidental skew data.

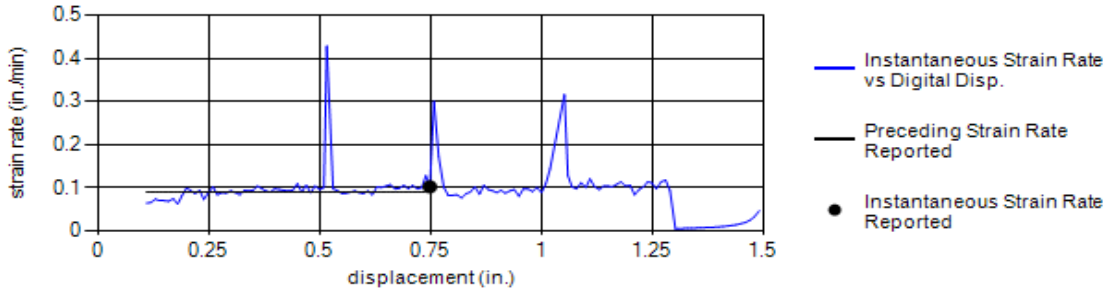
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
941	766	658	527	582	695	1.05	634



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*
No Data	No Data	No Data	No Data	No Data	No Data

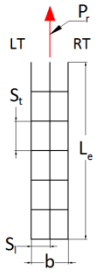
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/26/2010 3:00:00 PM
Test Identification:	TS12.02-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

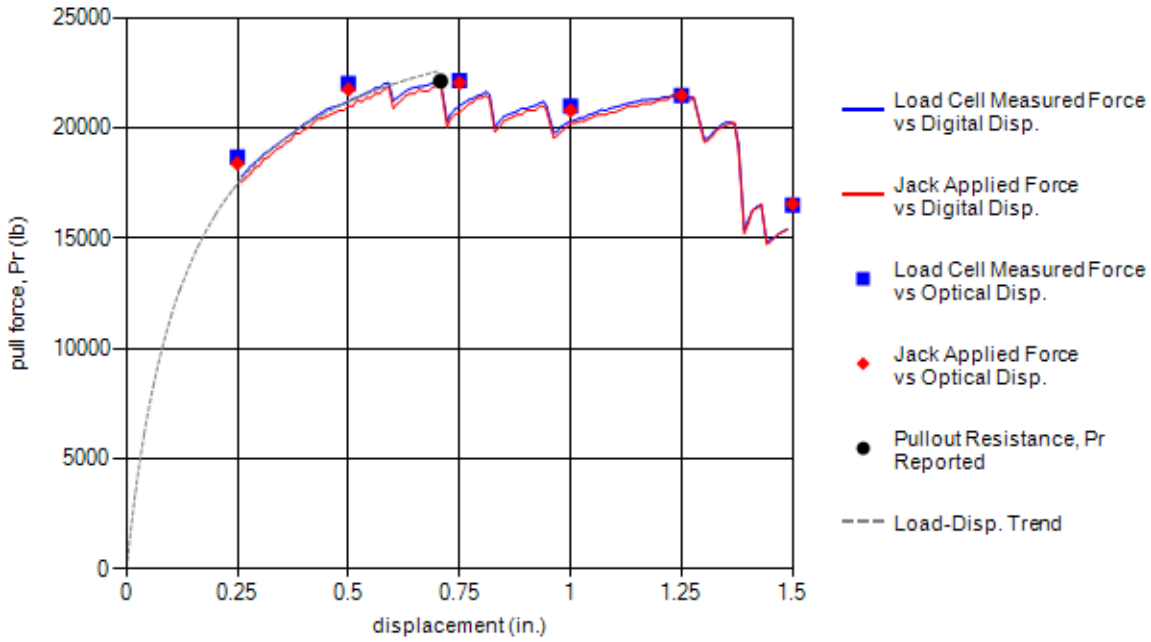
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	115.2 ±2.8
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	9.3 ±2.0%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	92.6 ±2.3%

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	1507	22115	12.0	**0.41**

Load-Displacement Curve



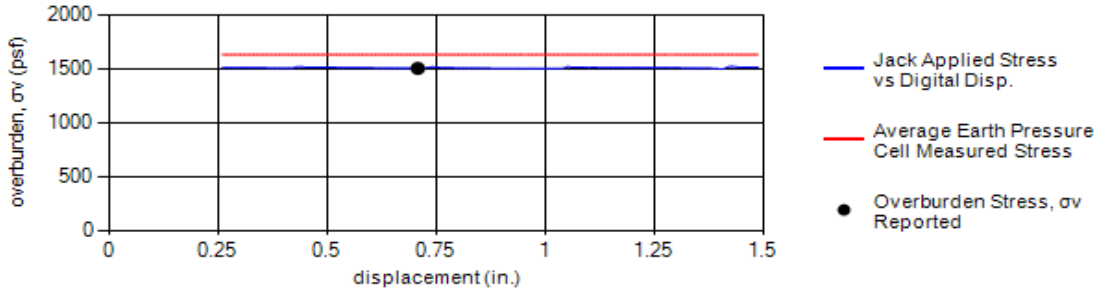
Comments

No incidental skew data.

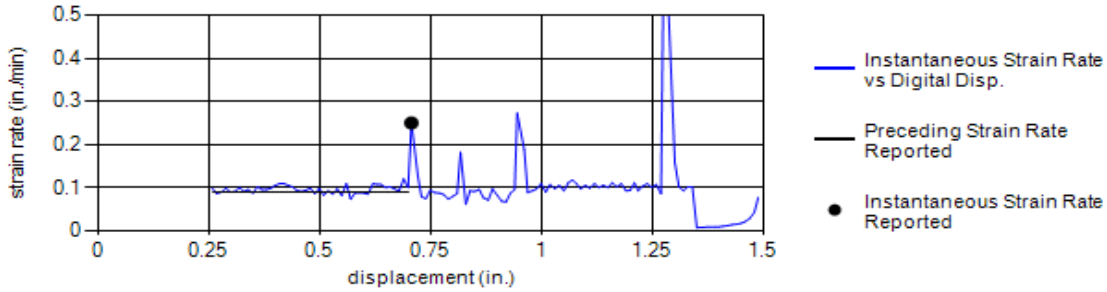
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1913	2004	1585	1320	1354	1635	1.01	1507



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.25	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

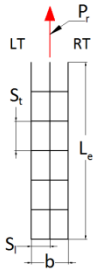
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/26/2010 3:29:00 PM
Test Identification:	TS12.03-G-9x24-W20xW7.5-L12-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):	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

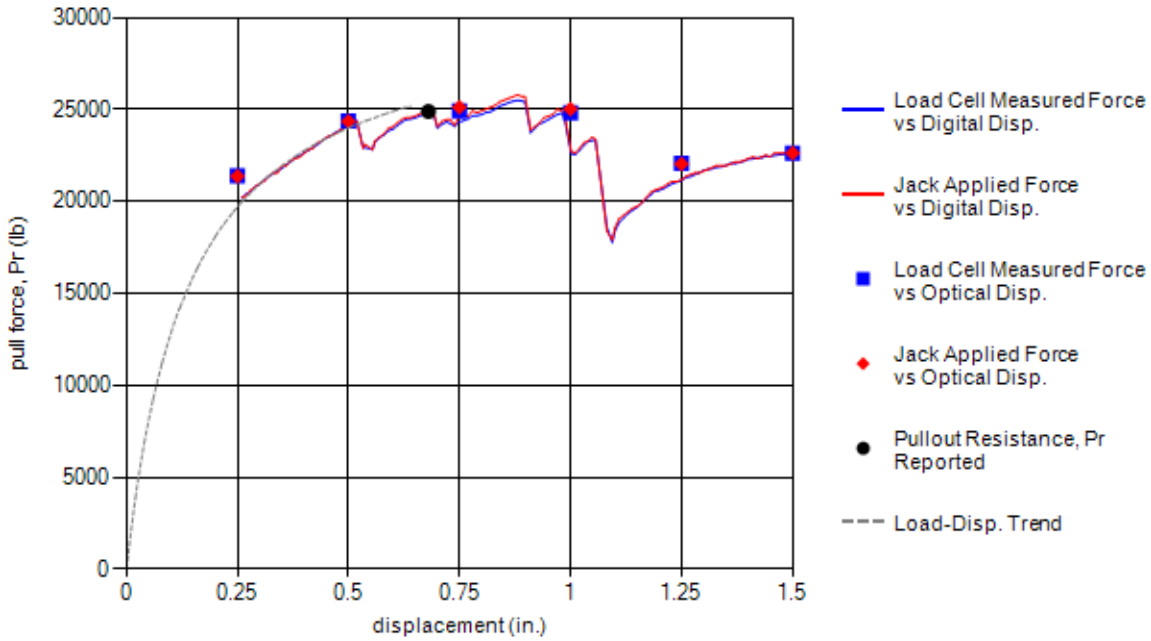
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	115.2 ±2.8
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	9.3 ±2.0%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	92.6 ±2.3%

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	0.68	2548	24887	20.2	**0.27**

Load-Displacement Curve



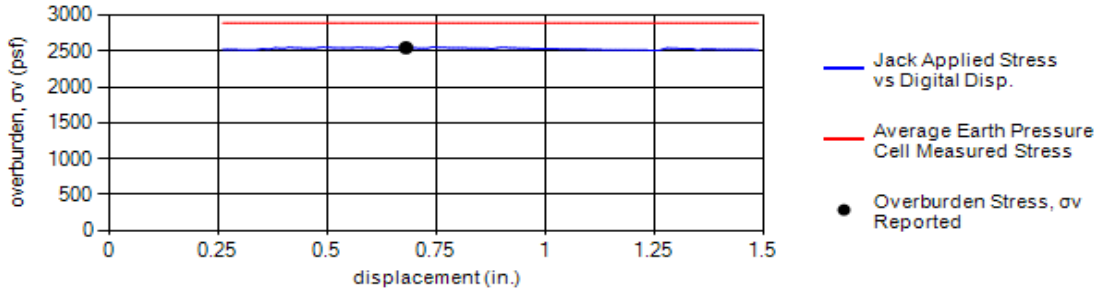
Comments

No incidental skew data.

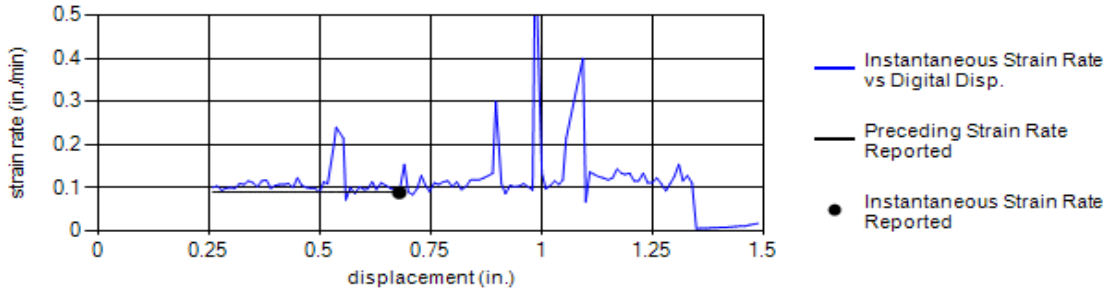
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3392	3636	2786	2288	2365	2893	1.01	2548



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*
No Data	No Data	No Data	No Data	No Data	No Data

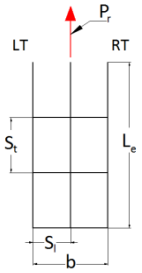
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/26/2010 4:09:00 PM
Test Identification:	TS12.04-G-9x24-W20xW7.5-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.):*	0.31	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	24	*Spacing, S_l (in.):*	9

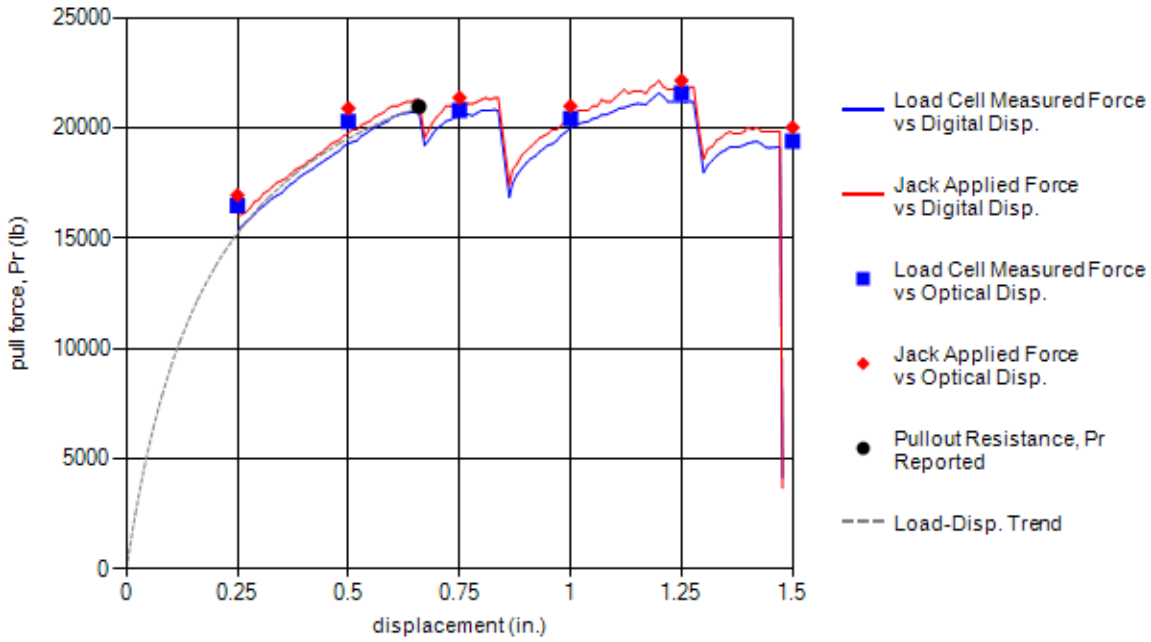
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	115.2 ±2.8
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	9.3 ±2.0%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	92.6 ±2.3%

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	5058	20954	40.1	**0.23**

Load-Displacement Curve



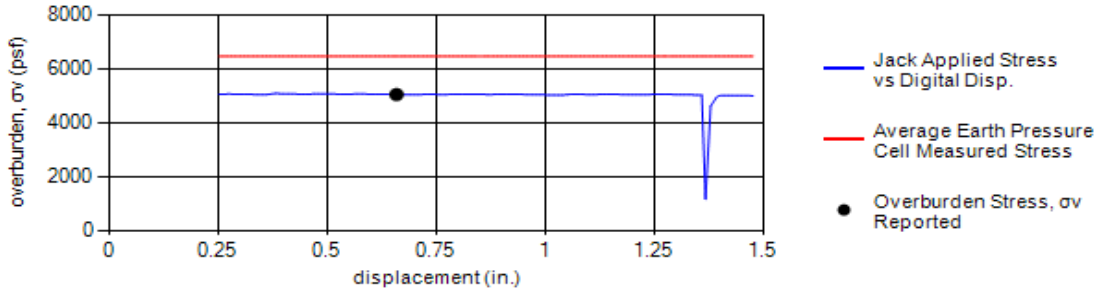
Comments

No incidental skew data.

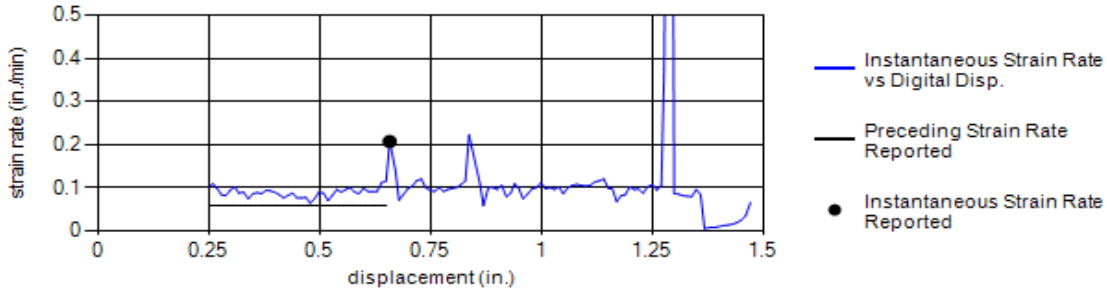
Personnel

Tested:	TW MB MF
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
7763	8107	6596	4812	5129	6481	1.07	5058



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

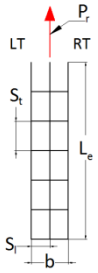
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/29/2010 3:19:00 PM
Test Identification:	TS12.05-G-9x24-W20xW7.5-L12-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):	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

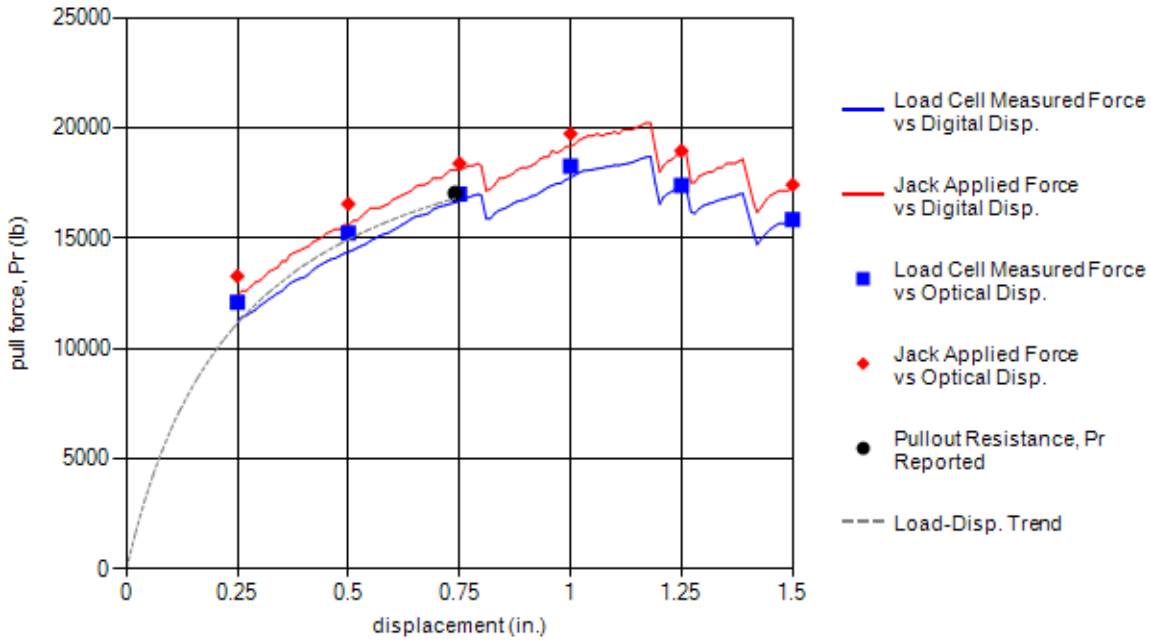
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	115.2 ±2.8
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	9.3 ±2.0%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	92.6 ±2.3%

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	642	17031	5.1	**0.74**

Load-Displacement Curve



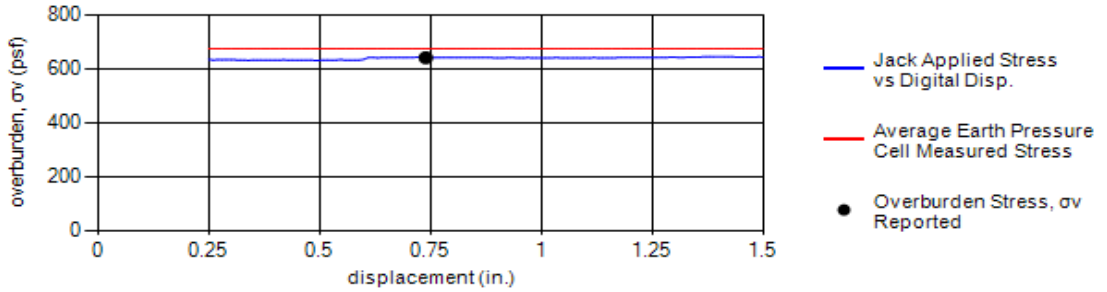
Comments

No incidental skew data.

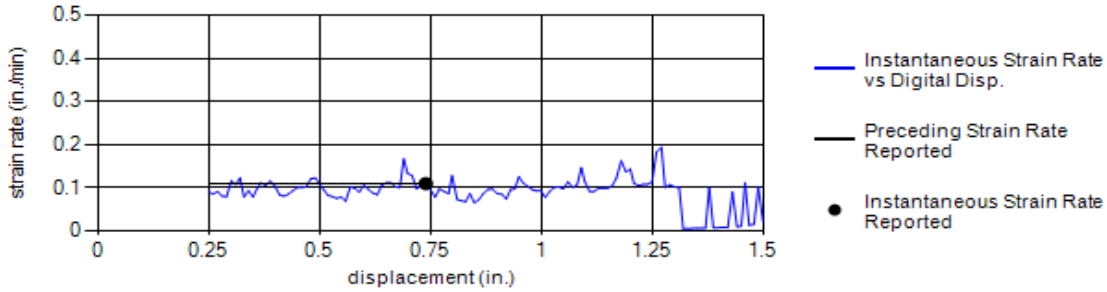
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
790	754	660	669	508	676	10.44	642



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*
No Data	No Data	No Data	No Data	No Data	No Data

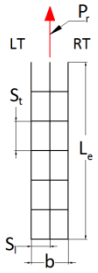
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	9/1/2010 8:23:00 AM
Test Identification:	TS12.06-G-9x24-W20xW7.5-L12-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):	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

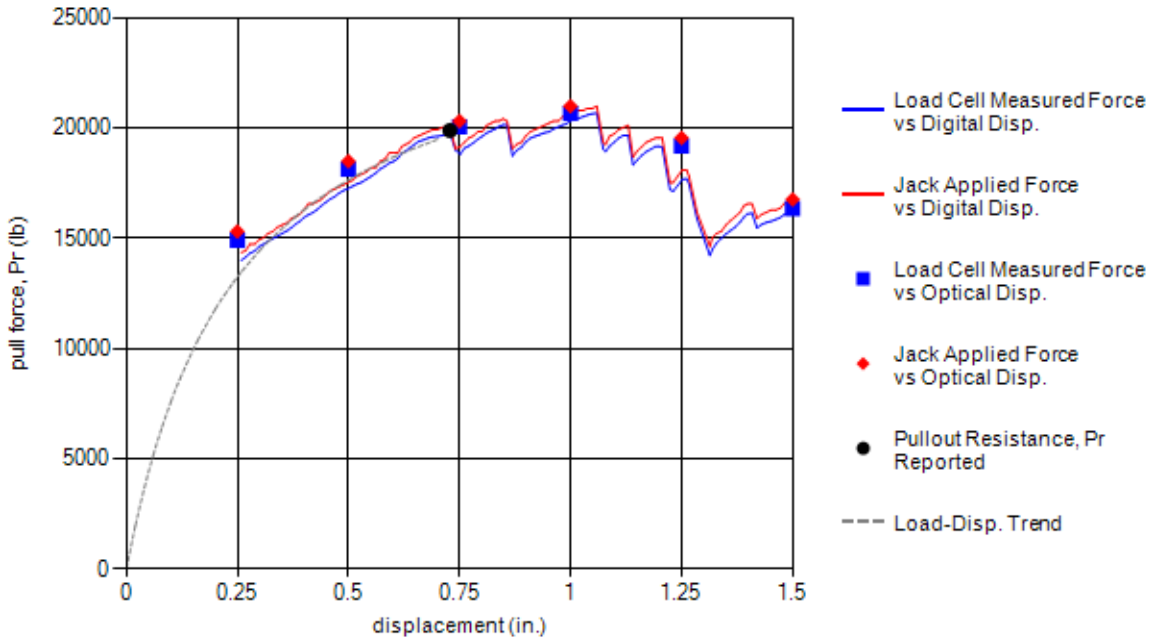
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	115.2 ±2.8
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	9.3 ±2.0%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	92.6 ±2.3%

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	1516	19876	12.0	**0.36**

Load-Displacement Curve



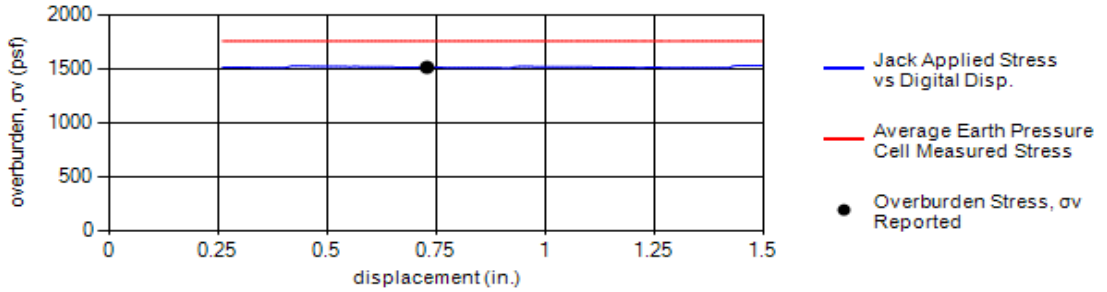
Comments

No incidental skew data.

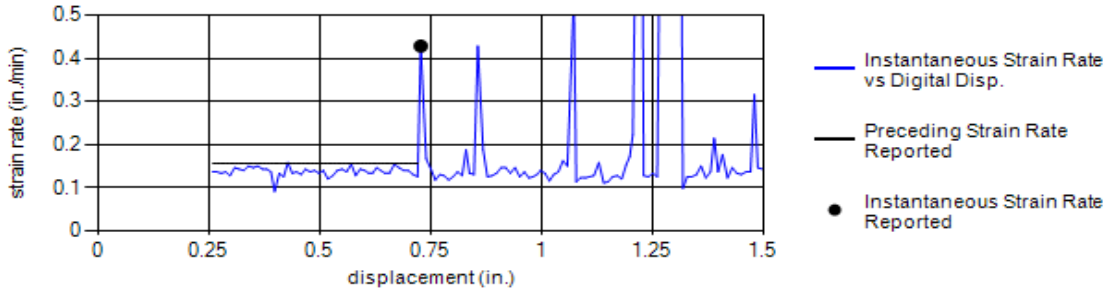
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1921	2198	1921	1366	1399	1761	4.01	1516



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.43	0.15	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

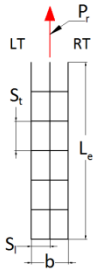
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	9/1/2010 8:56:00 AM
Test Identification:	TS12.07-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

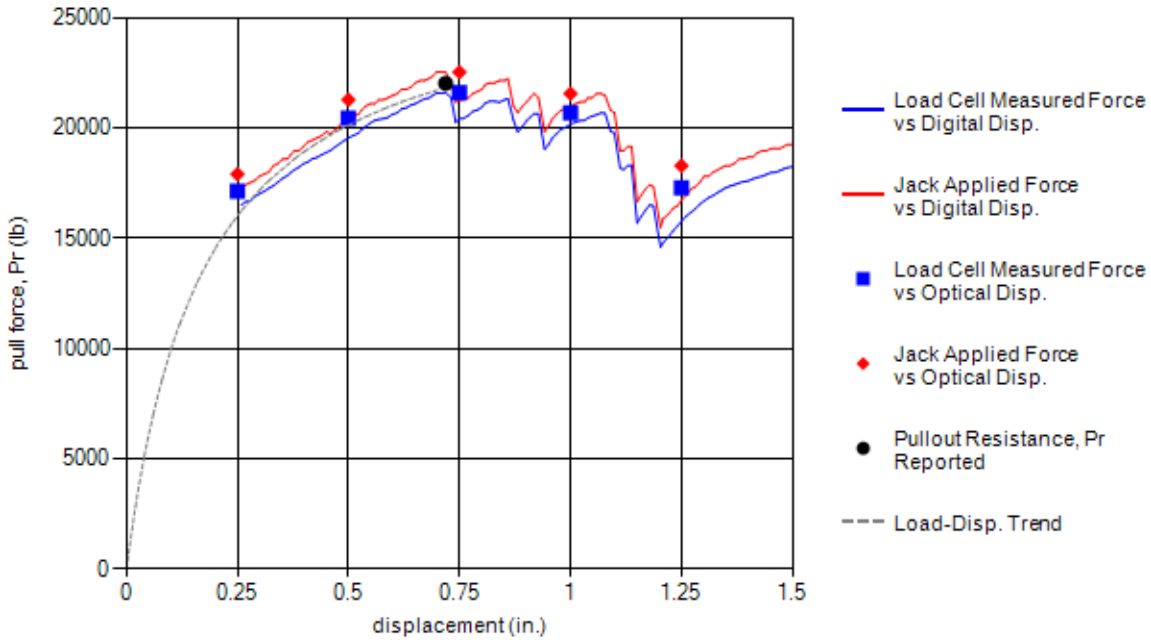
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	115.2 ±2.8
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	9.3 ±2.0%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	92.6 ±2.3%

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	0.72	2530	22015	20.1	**0.24**

Load-Displacement Curve



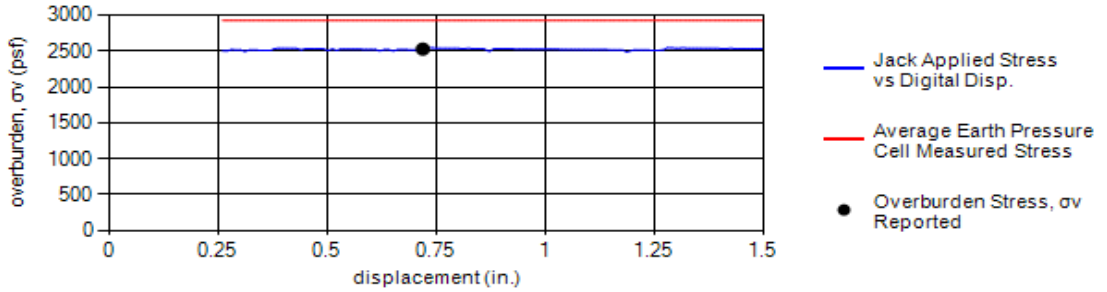
Comments

No incidental skew data.

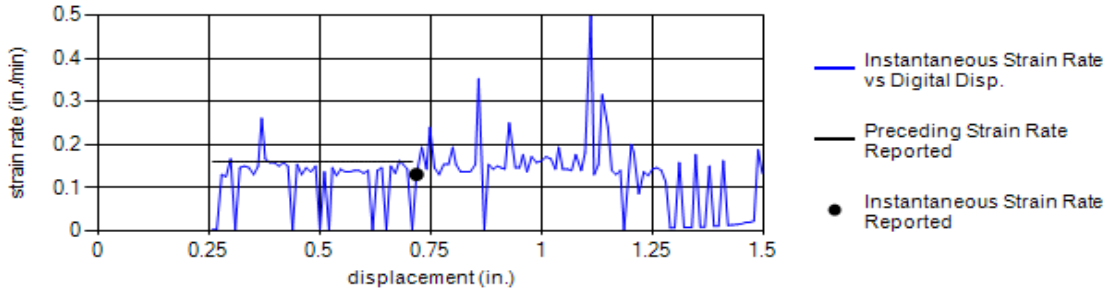
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3228	3710	3133	2241	2334	2929	2.41	2530



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.13	0.16	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	No Data	No Data	No Data	No Data

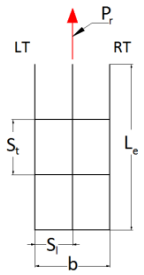
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	9/1/2010 9:31:00 AM
Test Identification:	TS12.08-G-9x24-W20xW7.5-L6-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):	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 B

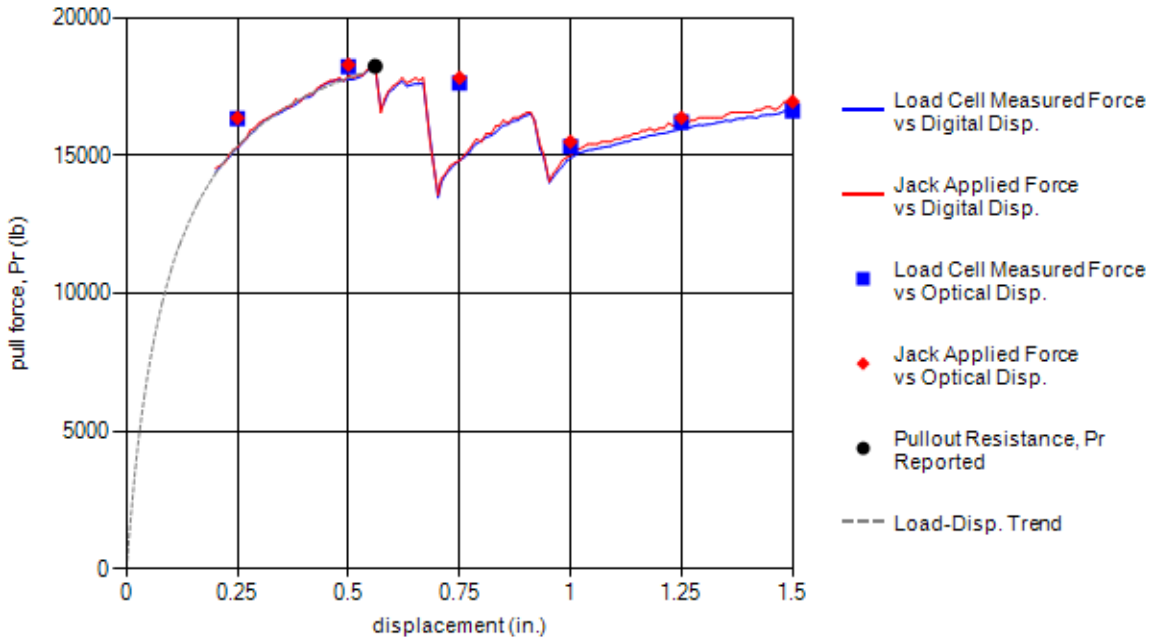
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	115.2	±2.8
Moisture Content, w (%):	9.3	±2.0%
Relative Compaction, C_R (%):	92.6	±2.3%

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	5088	18229	40.4	**0.20**

Load-Displacement Curve



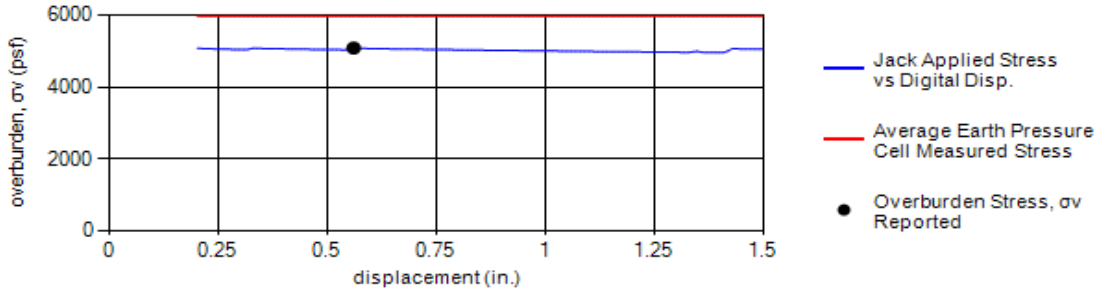
Comments

No incidental skew data.

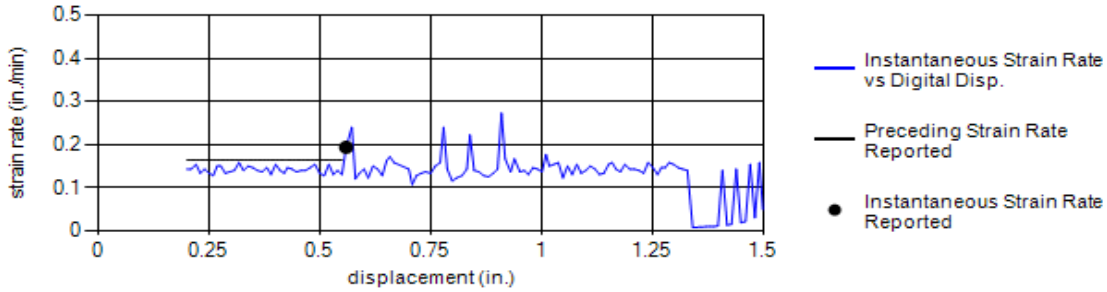
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
6839	7320	6351	4491	4858	5972	1.18	5088



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.19	0.16	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

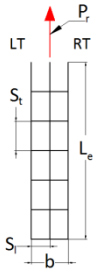
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/28/2010 10:10:00 AM
Test Identification:	TS12.09-G-9x24-W20xW7.5-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.):*	0.31	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	24	*Spacing, S_l (in.):*	9

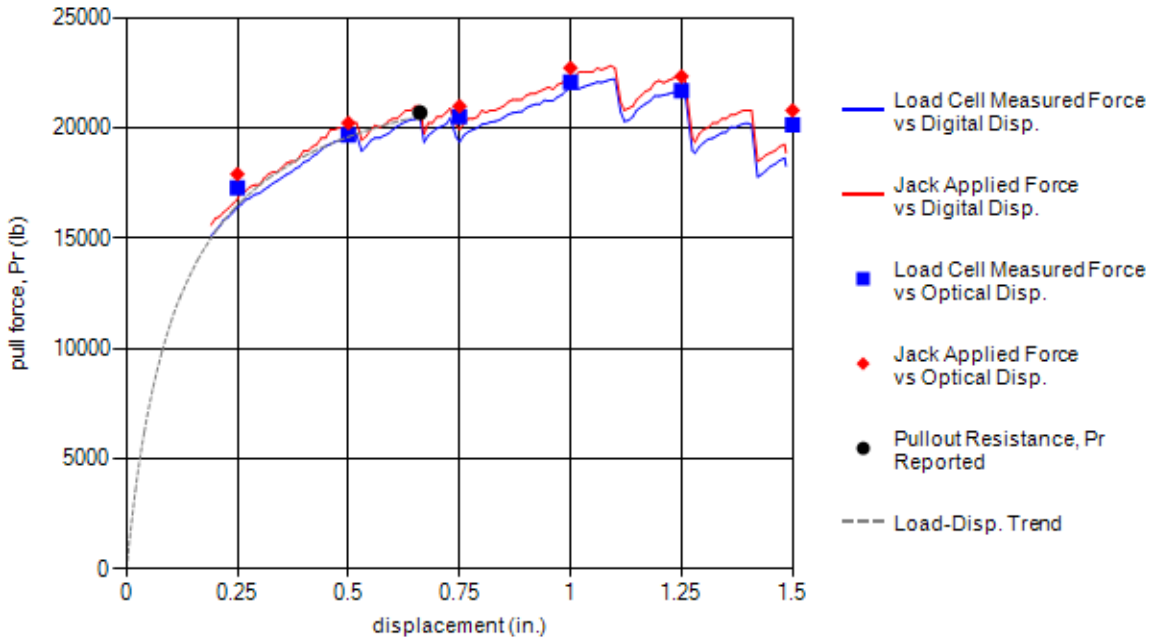
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	115.2 ±2.8
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	9.3 ±2.0%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	92.6 ±2.3%

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	640	20686	5.1	**0.90**

Load-Displacement Curve



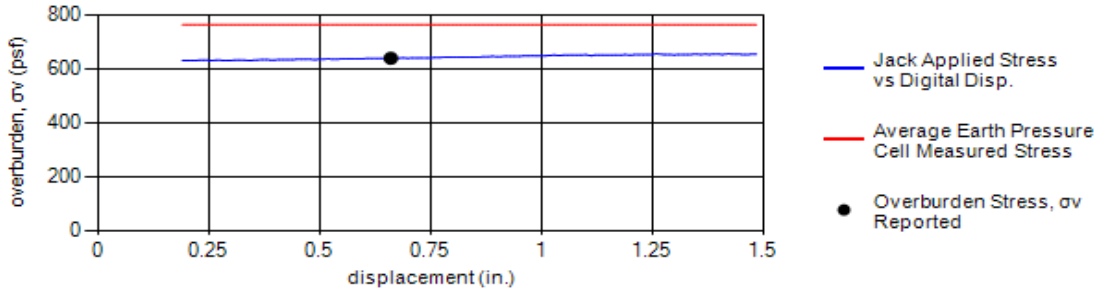
Comments

No incidental skew data.

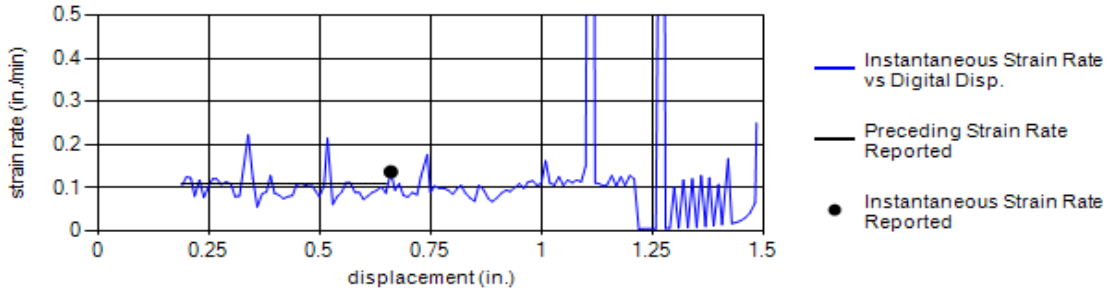
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
867	807	781	779	589	765	9.38	640



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

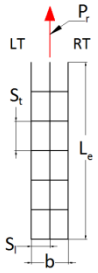
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/30/2010 7:31:00 AM
Test Identification:	TS12.10-G-9x24-W20xW7.5-L12-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):	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

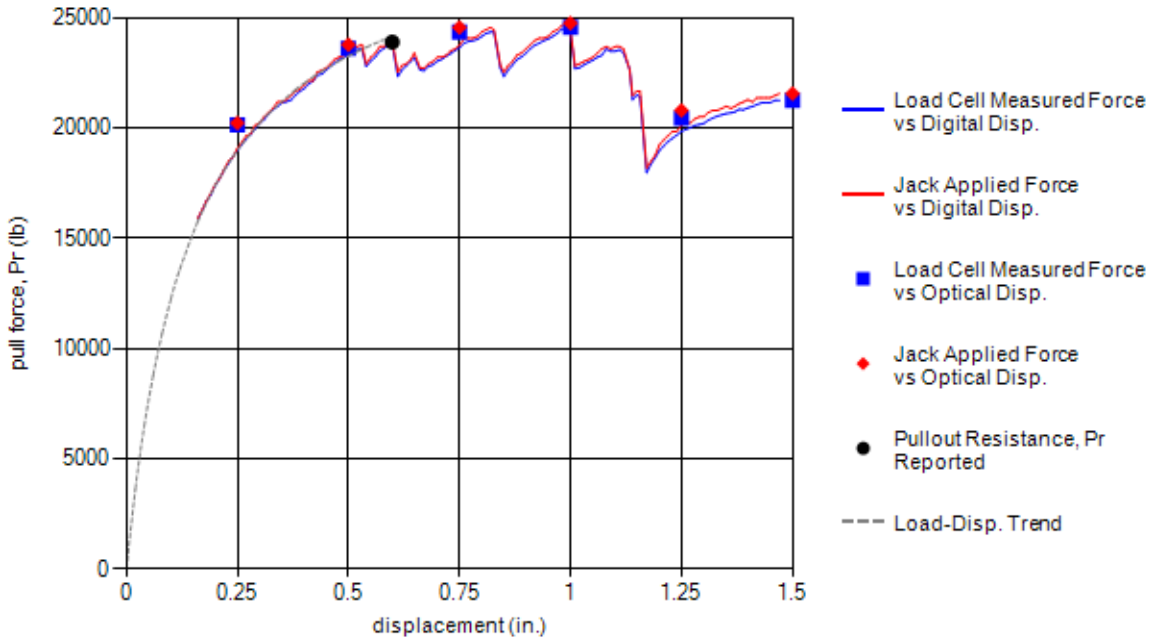
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	115.2 ±2.8
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	9.3 ±2.0%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	92.6 ±2.3%

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	23879	12.1	**0.43**

Load-Displacement Curve



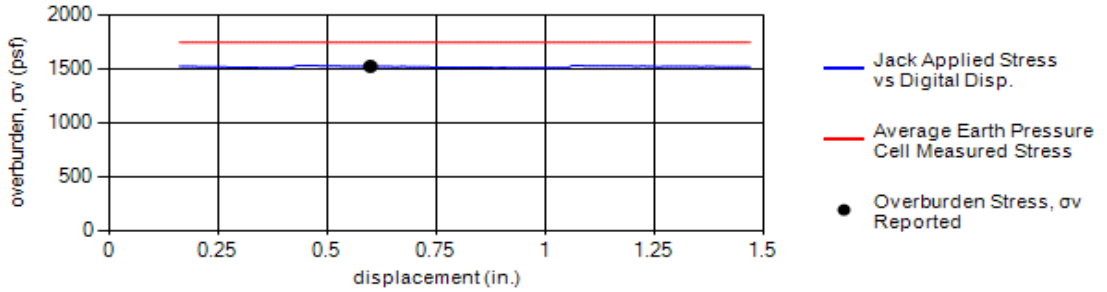
Comments

No incidental skew data.

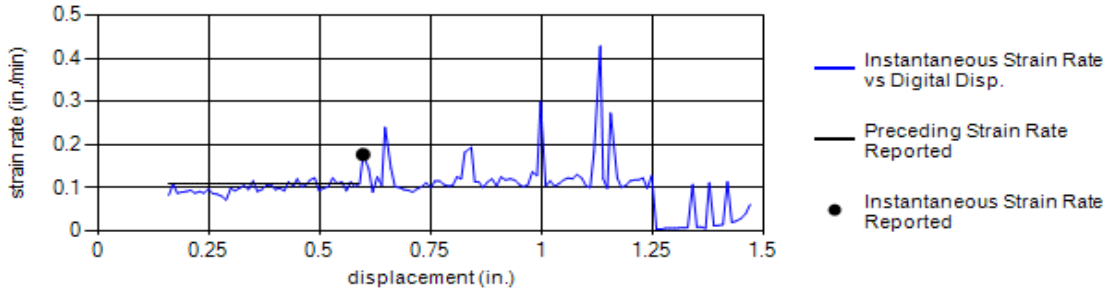
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1927	2015	1808	1599	1392	1748	4.10	1526



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.18	0.11	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

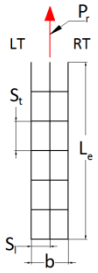
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/30/2010 8:05:00 AM
Test Identification:	TS12.11-G-9x24-W20xW7.5-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.):*	0.31	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	24	*Spacing, S_l (in.):*	9

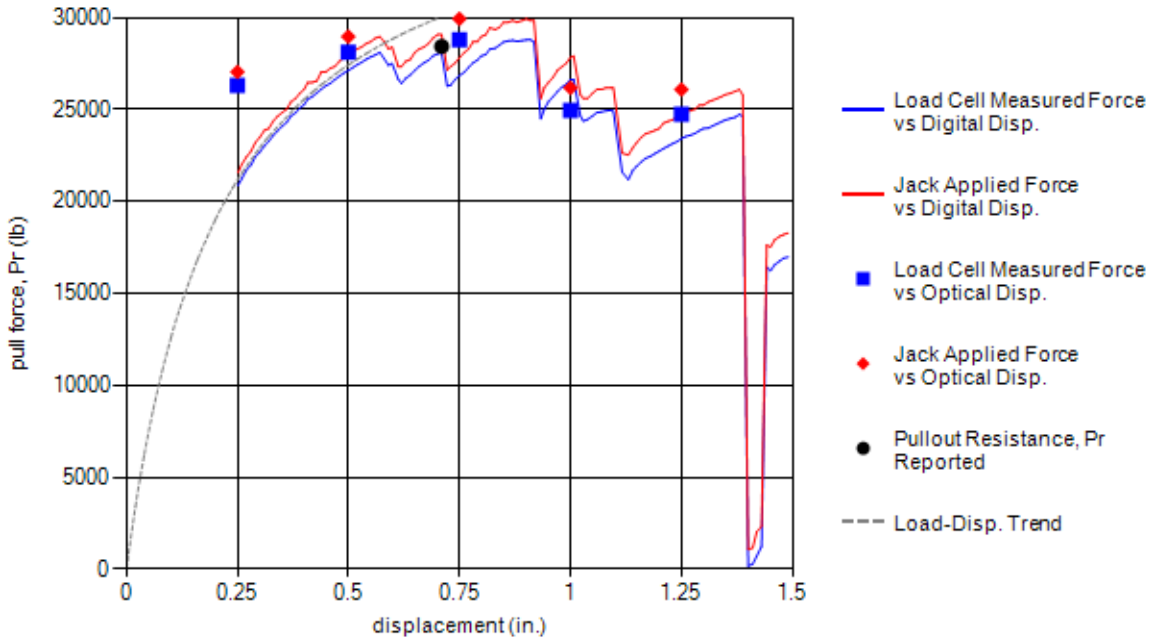
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	115.2 ±2.8
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	9.3 ±2.0%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	92.6 ±2.3%

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	2522	28425	20.0	**0.31**

Load-Displacement Curve



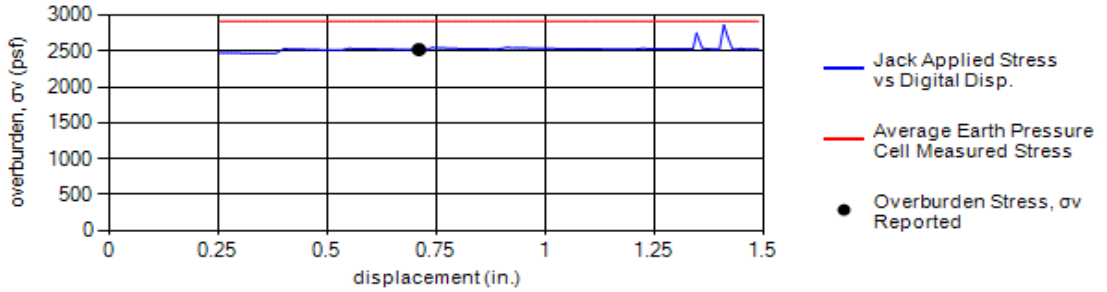
Comments

No incidental skew data.

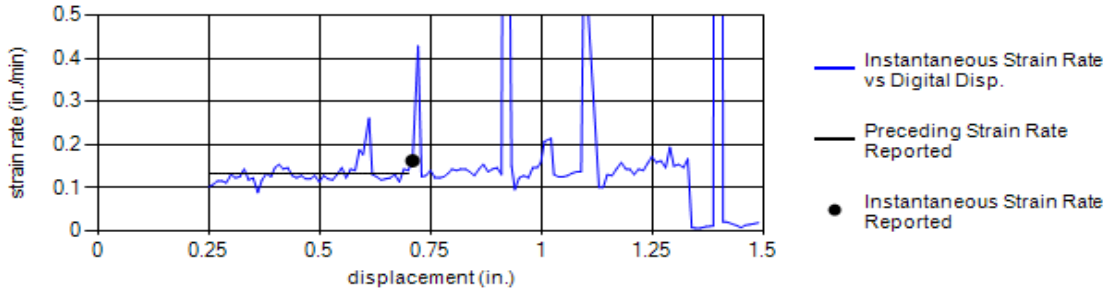
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3318	3555	2949	2428	2339	2918	2.45	2522



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

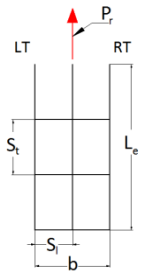
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/30/2010 8:41:00 AM
Test Identification:	TS12.12-G-9x24-W20xW7.5-L6-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):	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

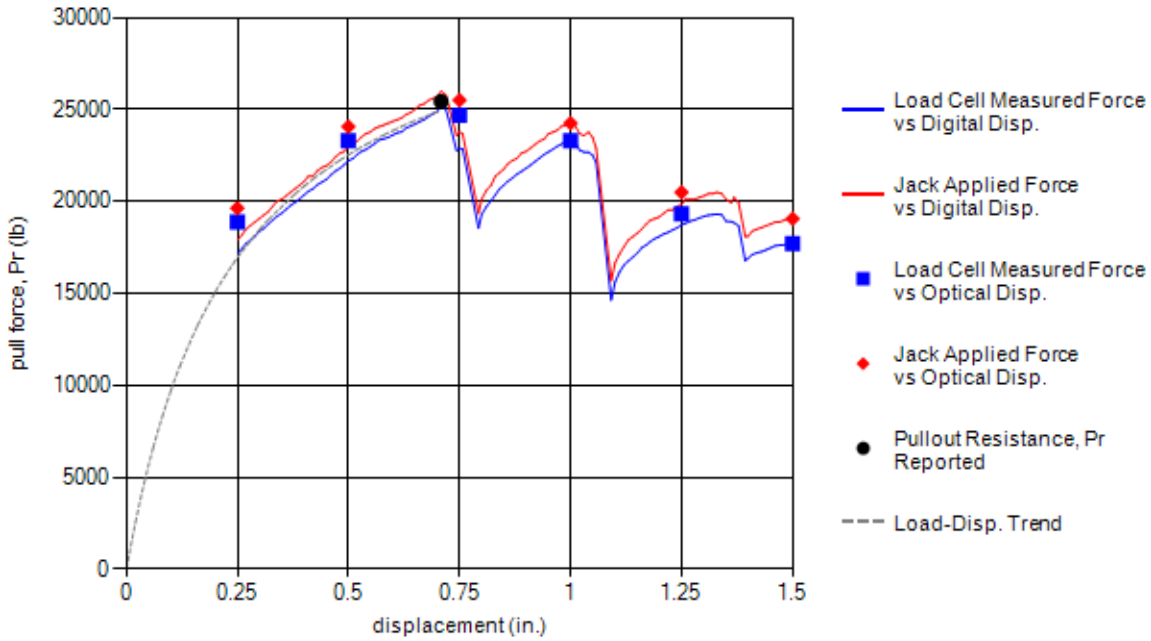
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	115.2 ±2.8
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	9.3 ±2.0%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	92.6 ±2.3%

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	5022	25425	39.9	**0.28**

Load-Displacement Curve



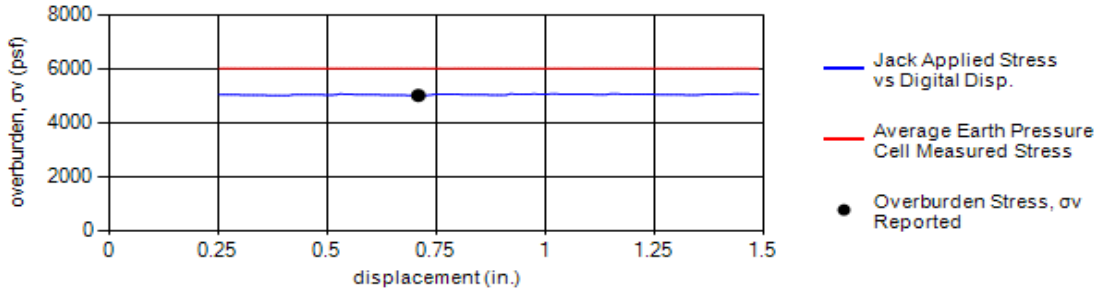
Comments

No incidental skew data.

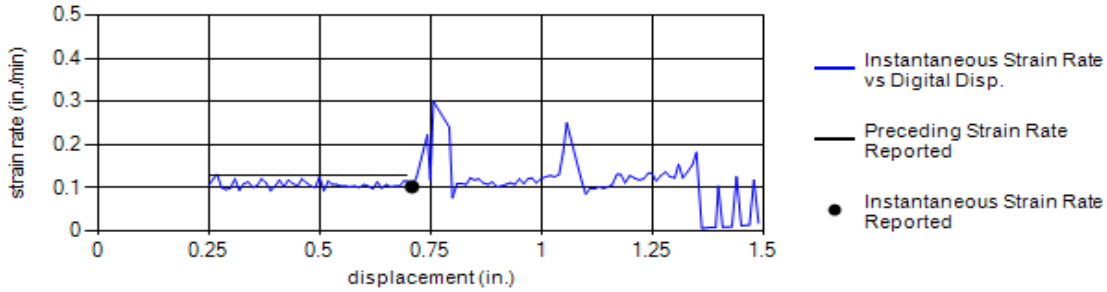
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
7069	7384	6337	4512	4828	6026	1.19	5022



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

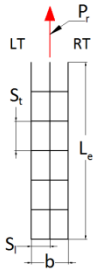
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	9/10/2010 11:44:00 AM
Test Identification:	TS13.01-G-9x18-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:*	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

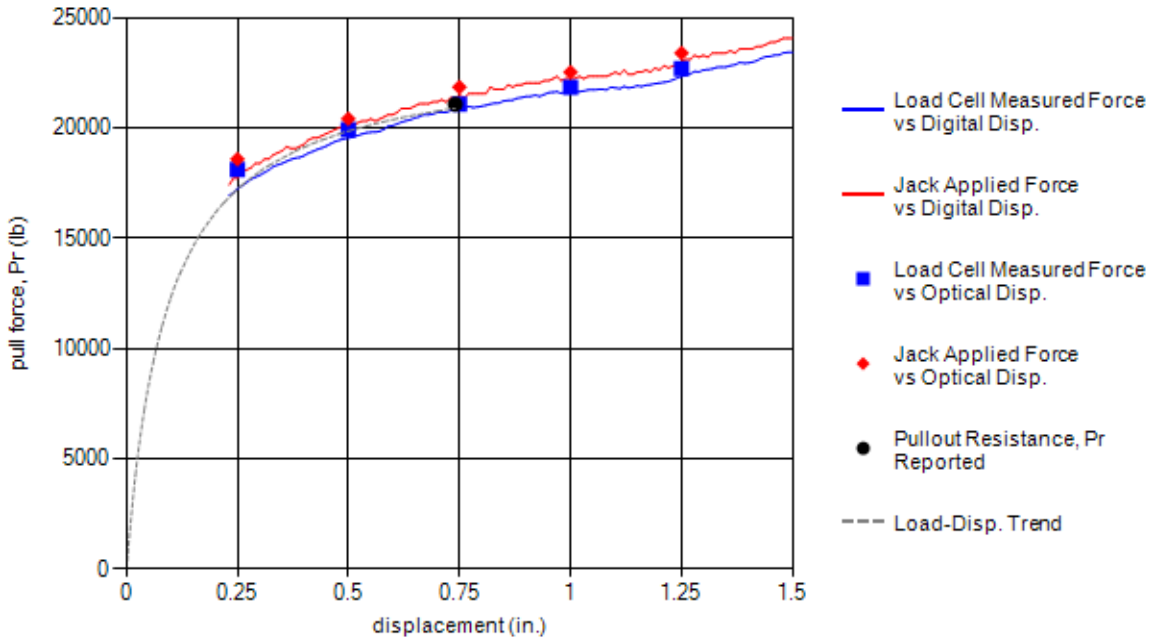
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	120.3	±2.1
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	4.9	±0.6%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	96.6	±1.6%

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)*	***Pullout Resistance Factor, F****
Pullout	0.74	629	21067	5.0	**1.24**

Load-Displacement Curve

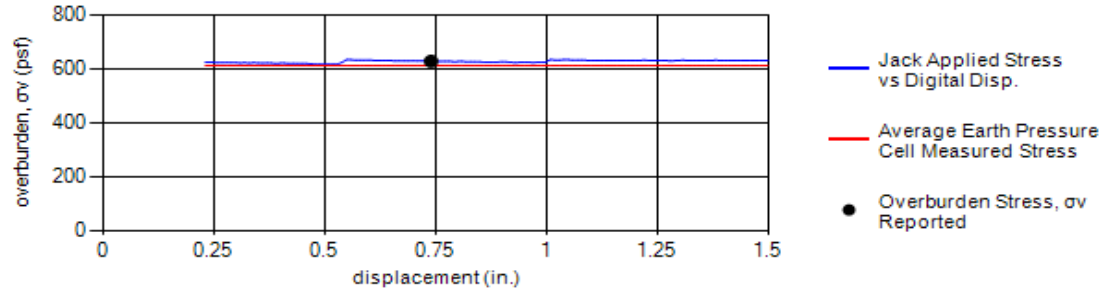


Comments

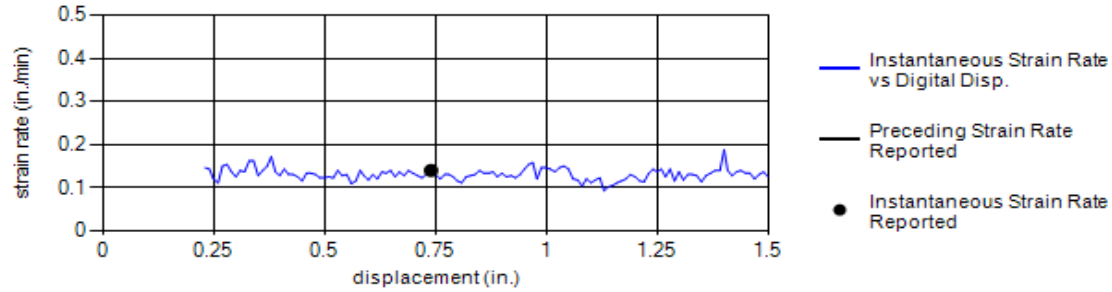
Personnel

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

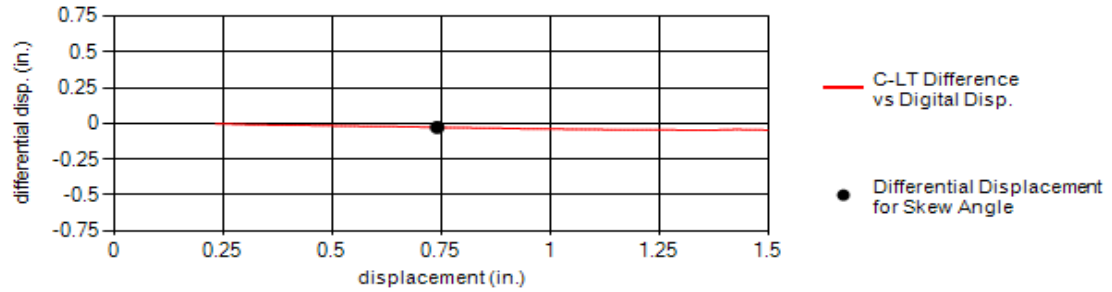
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
844	No Data	593	453	561	613	1.07	629



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.14	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	-0.03	No Data	-0.04	CW



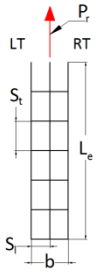
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	9/10/2010 1:44:00 PM
Test Identification:	TS13.02-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

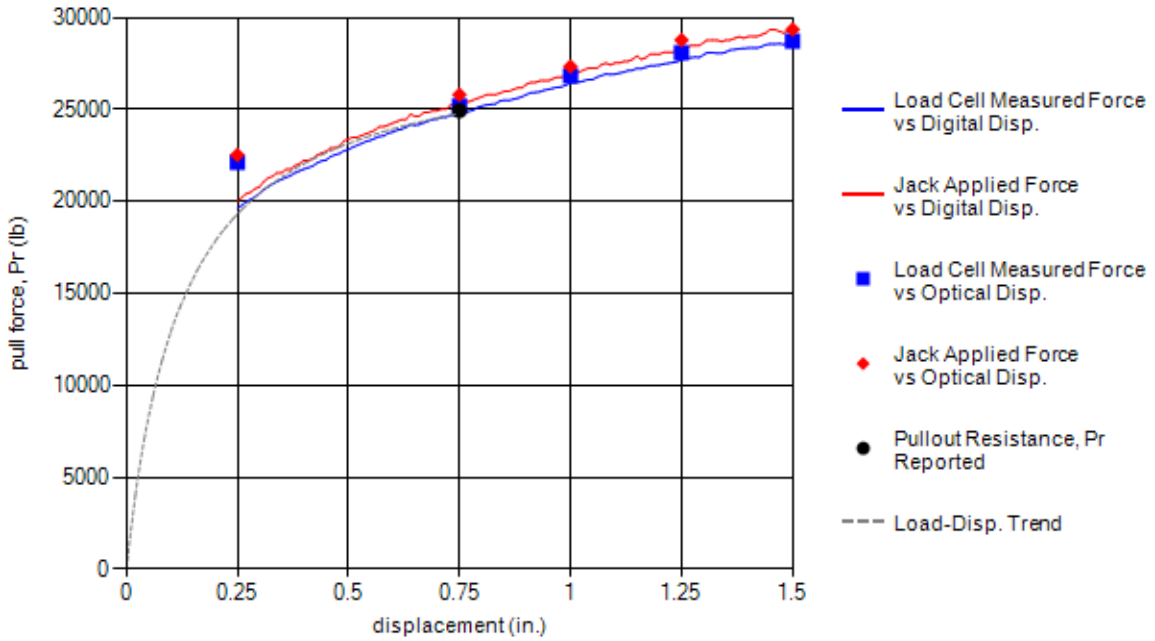
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	120.3	±2.1
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	4.9	±0.6%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	96.6	±1.6%

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	1523	24928	12.1	**0.61**

Load-Displacement Curve



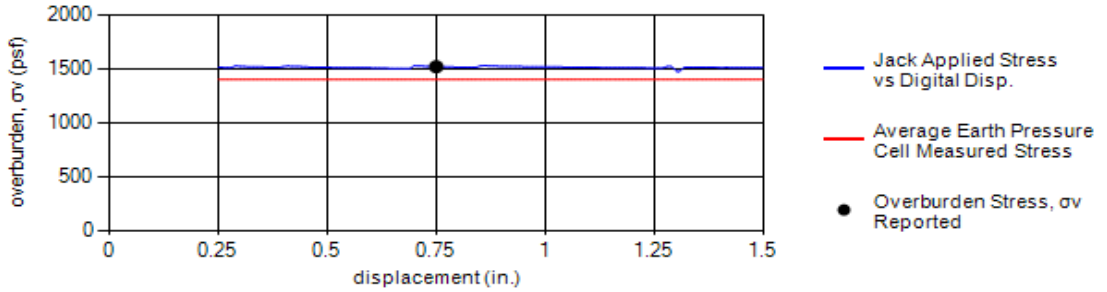
Comments

No incidental skew data.

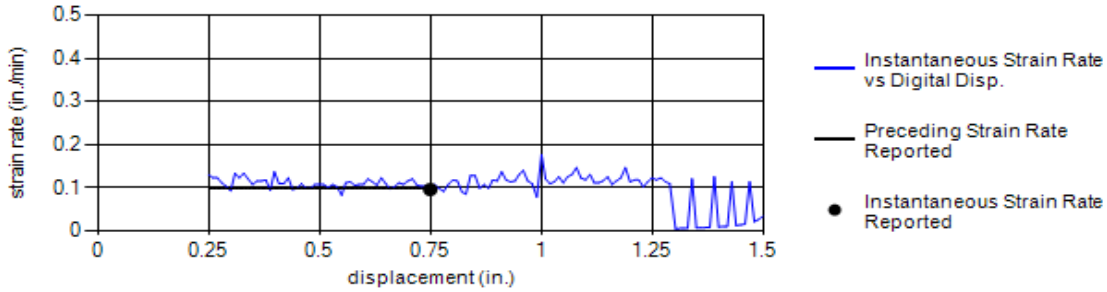
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1724	No Data	1520	1012	1361	1404	1.04	1523



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*
No Data	No Data	No Data	No Data	No Data	No Data

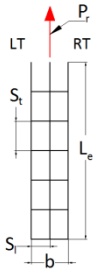
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	9/10/2010 2:24:00 PM
Test Identification:	TS13.03-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

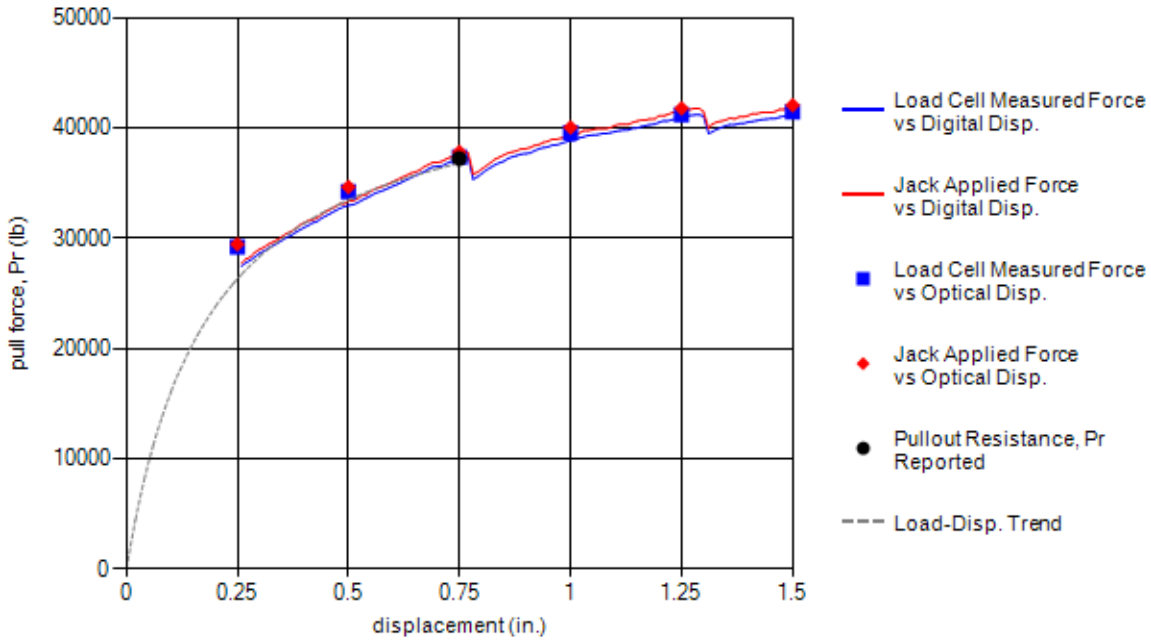
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	120.3	±2.1
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	4.9	±0.6%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	96.6	±1.6%

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	2544	37209	20.2	**0.54**

Load-Displacement Curve

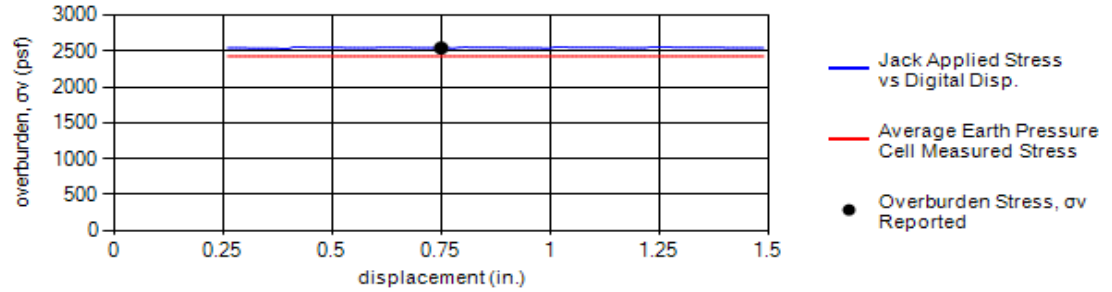


Comments

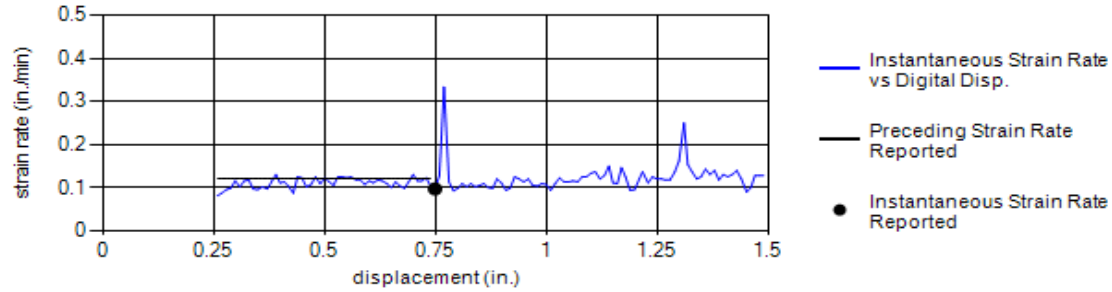
Personnel

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

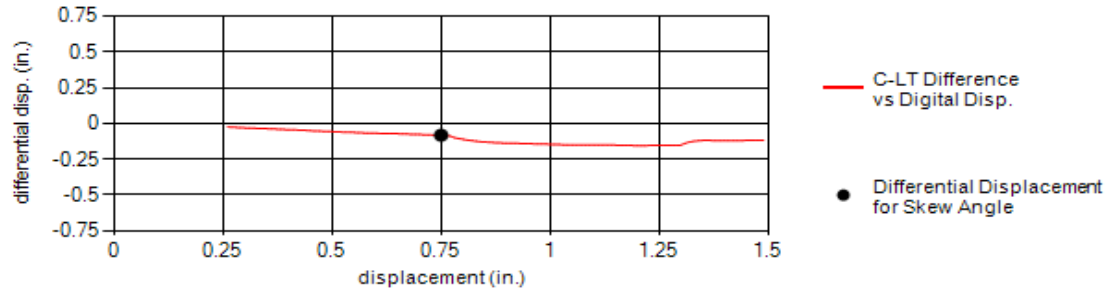
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2602	No Data	2887	1494	2737	2430	1.08	2544



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*
No Data	No Data	-0.08	No Data	-0.13	CW



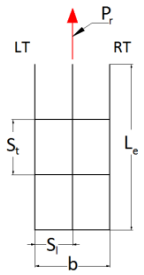
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	9/10/2010 3:10:00 PM
Test Identification:	TS13.04-G-9x18-W20xW11-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.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	18	*Spacing, S_l (in.):*	9

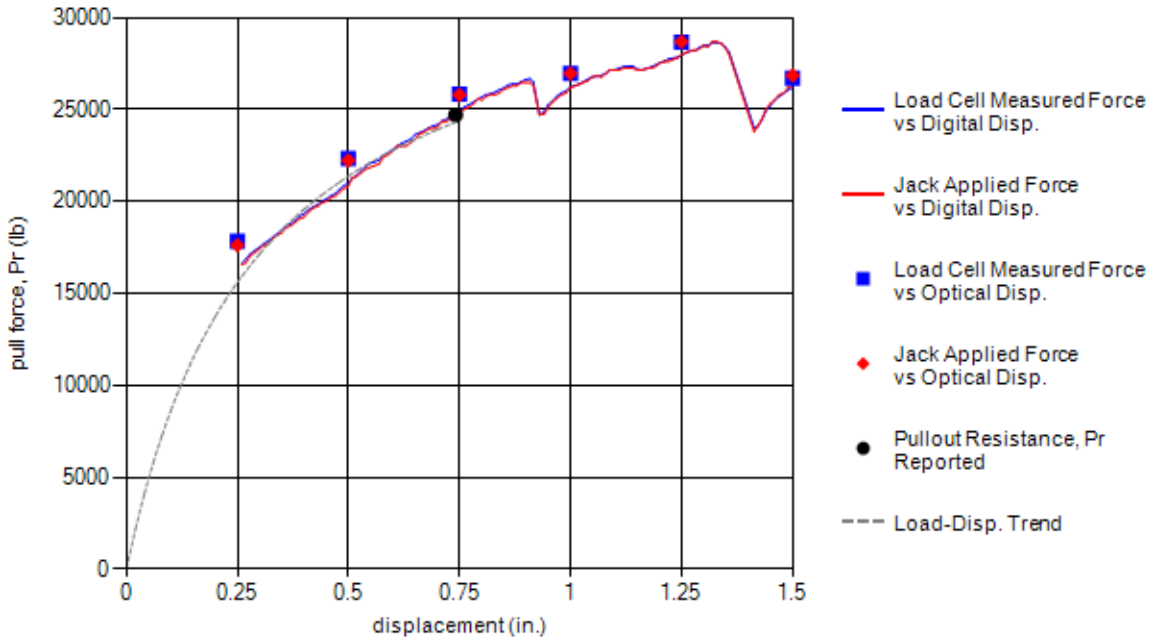
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	120.3 ±2.1
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	4.9 ±0.6%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	96.6 ±1.6%

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	5076	24699	40.2	**0.36**

Load-Displacement Curve

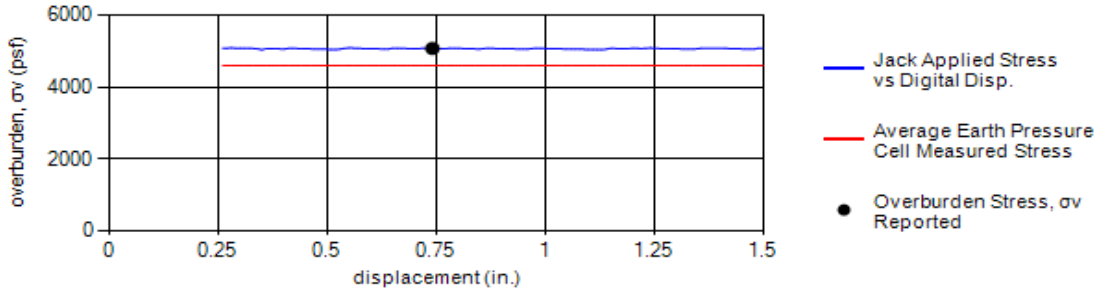


Comments

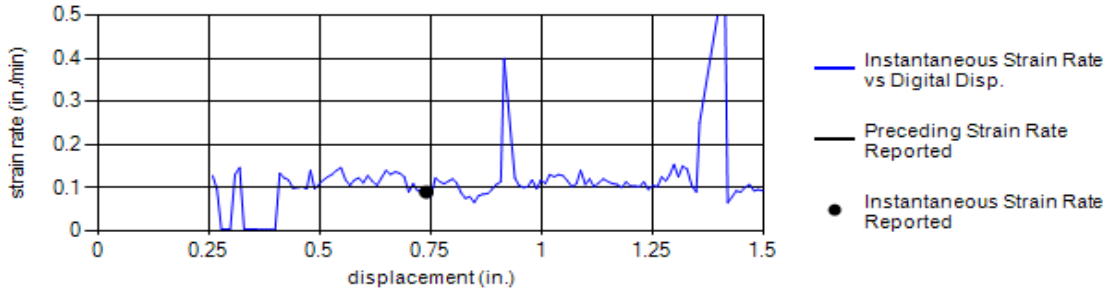
Personnel

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

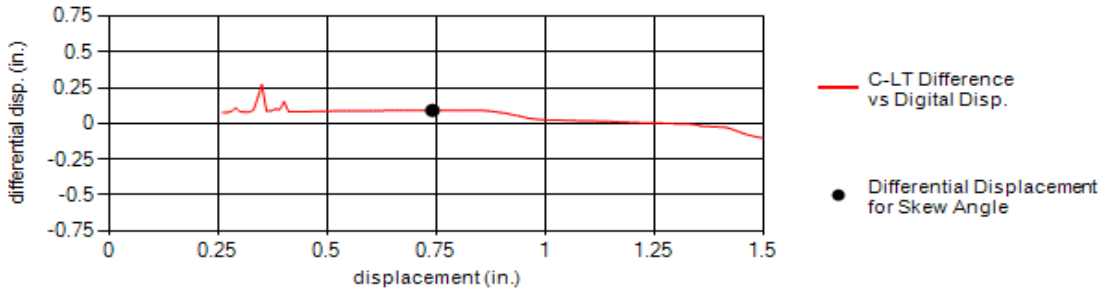
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
4686	No Data	5474	2501	5721	4596	1.01	5076



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.09	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	0.09	No Data	0.15	CCW



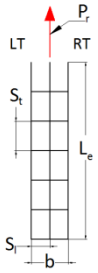
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	9/16/2010 3:31:00 PM
Test Identification:	TS13.05-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

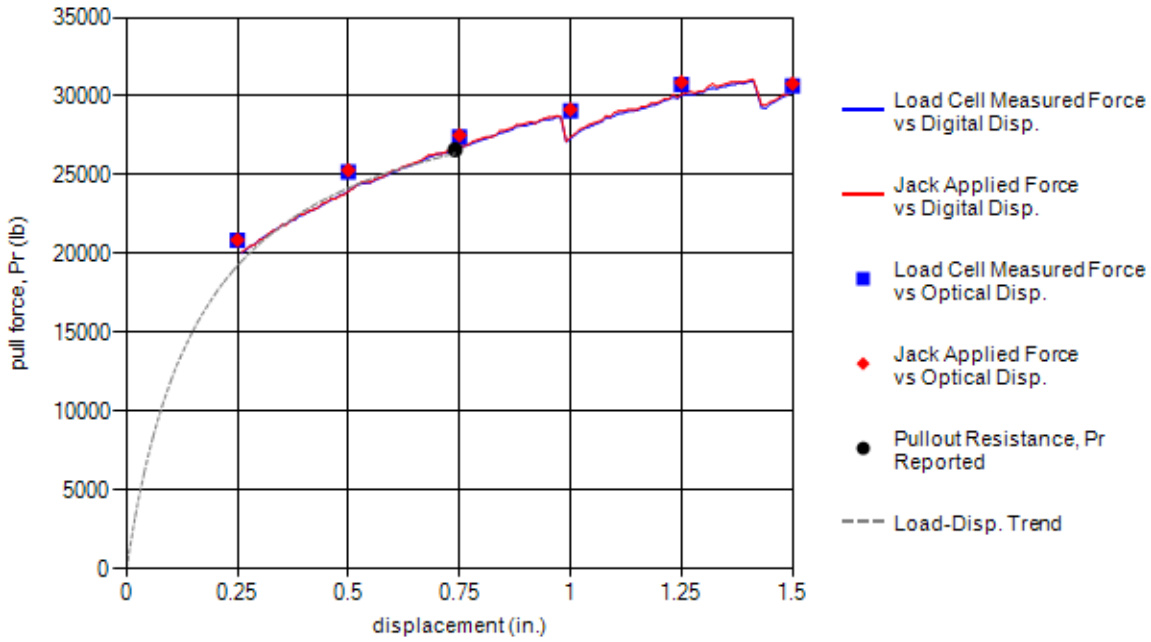
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	120.3	±2.1
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	4.9	±0.6%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	96.6	±1.6%

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)*	***Pullout Resistance Factor, F****
Pullout	0.74	669	26606	5.3	**1.47**

Load-Displacement Curve

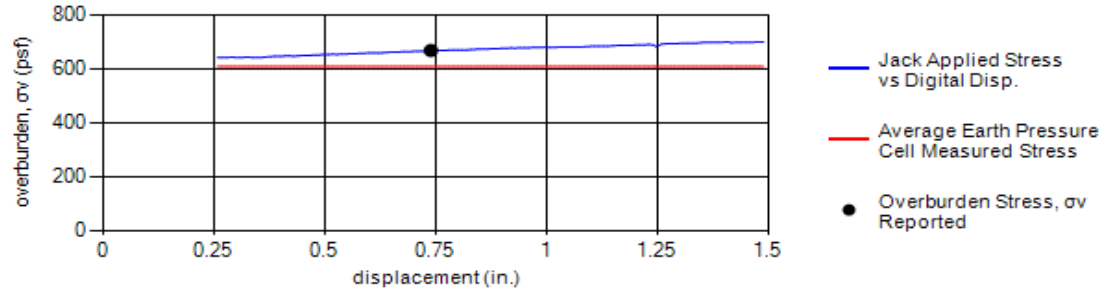


Comments

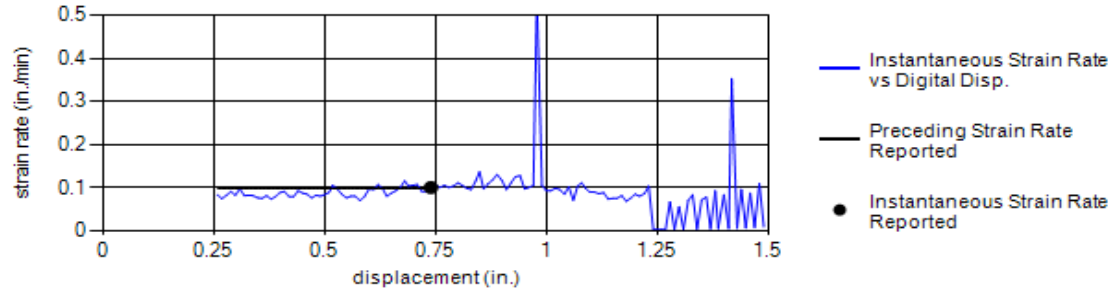
Personnel

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

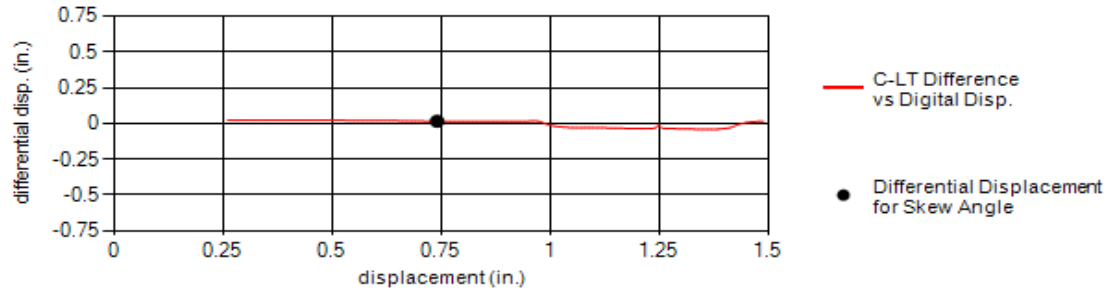
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
840	No Data	621	207	771	610	7.85	669



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.10	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	0.02	No Data	0.03	CCW



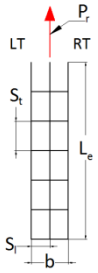
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	9/16/2010 2:22:00 PM
Test Identification:	TS13.06-G-9x18-W20xW11-L9-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):	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

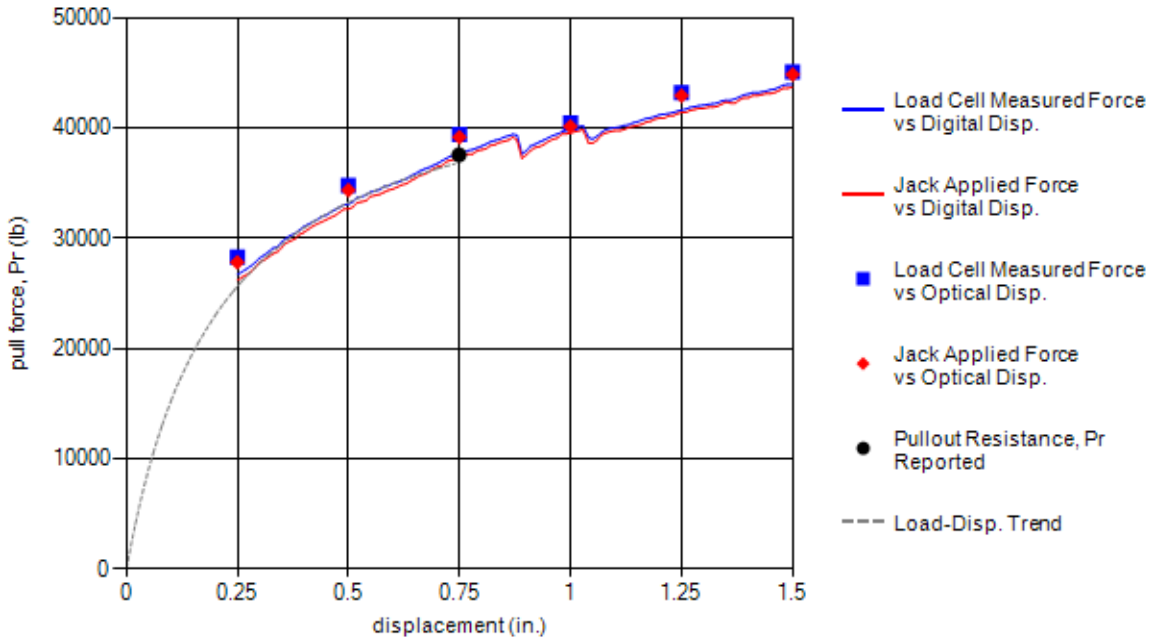
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	120.3 ±2.1
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	4.9 ±0.6%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	96.6 ±1.6%

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	1546	37546	12.3	**0.90**

Load-Displacement Curve



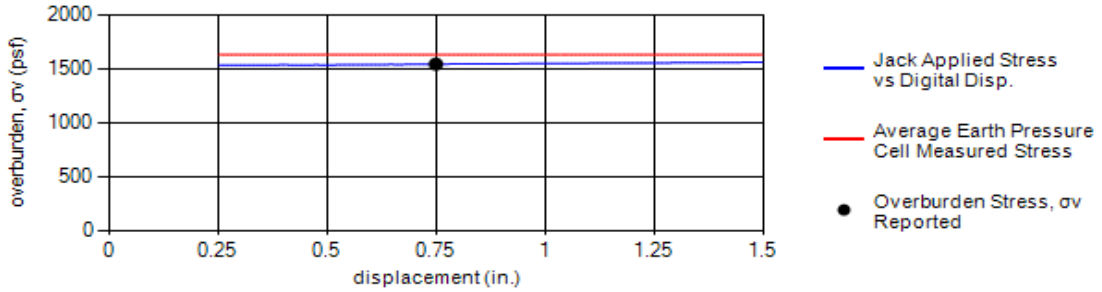
Comments

No incidental skew data.

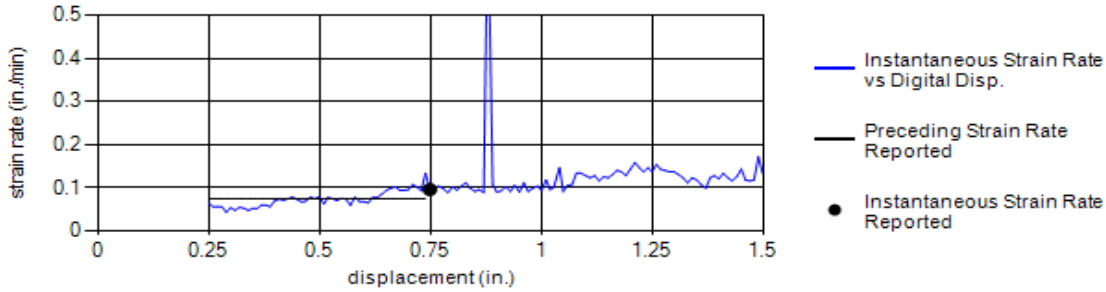
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1393	No Data	2165	793	2180	1633	3.36	1546



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

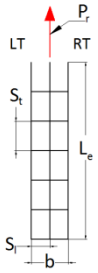
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	9/16/2010 1:36:00 PM
Test Identification:	TS13.07-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

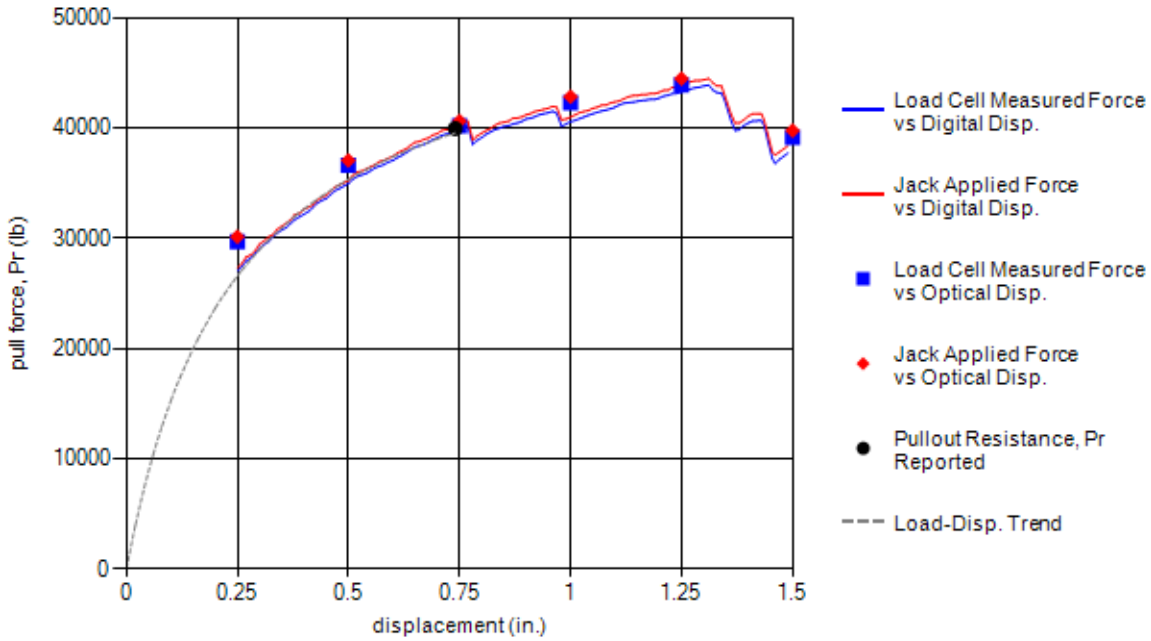
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	120.3	±2.1
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	4.9	±0.6%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	96.6	±1.6%

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)*	***Pullout Resistance Factor, F****
Pullout	0.74	2551	39930	20.2	**0.58**

Load-Displacement Curve

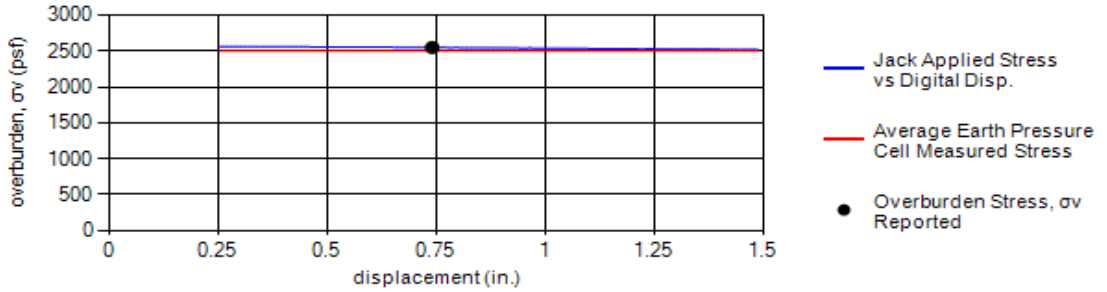


Comments

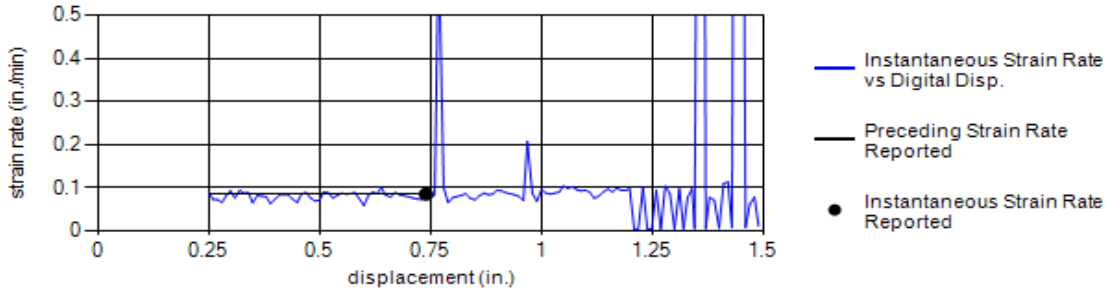
Personnel

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

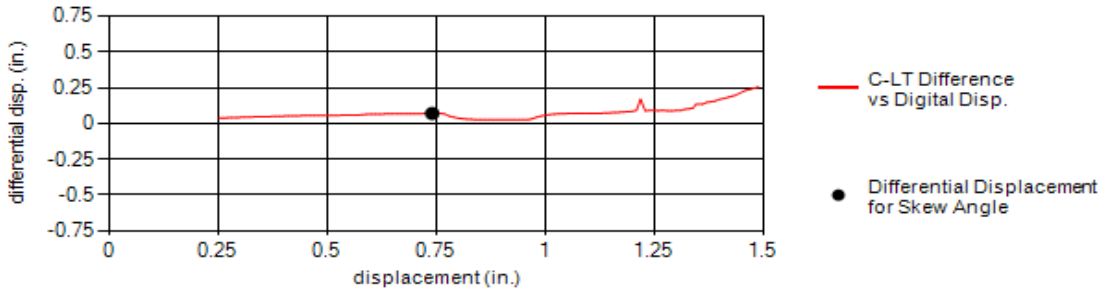
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2344	No Data	3187	1342	3142	2504	2.04	2551



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.08	0.09	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	0.07	No Data	0.11	CCW



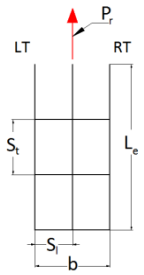
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	9/16/2010 11:44:00 AM
Test Identification:	TS13.08-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

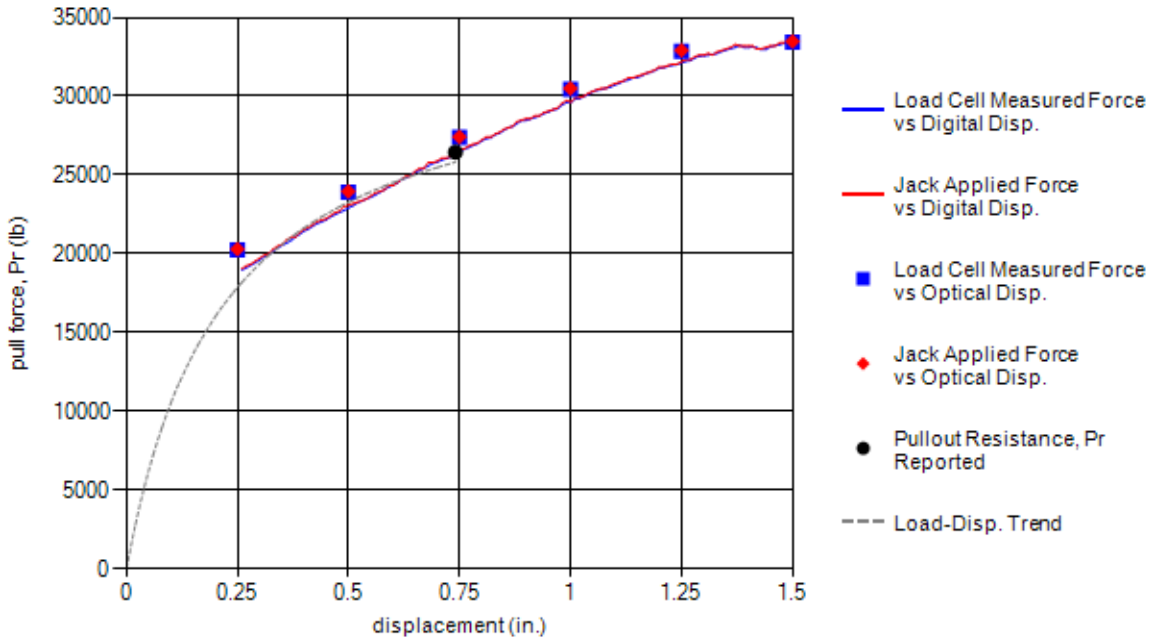
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	120.3 ±2.1
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	4.9 ±0.6%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	96.6 ±1.6%

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	5070	26447	40.2	**0.39**

Load-Displacement Curve

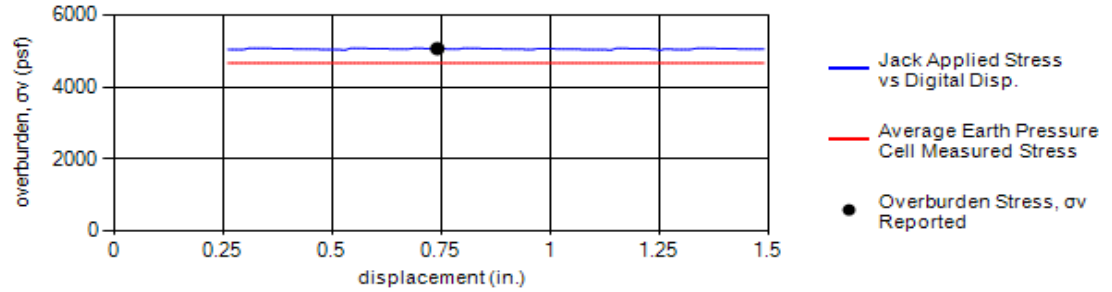


Comments

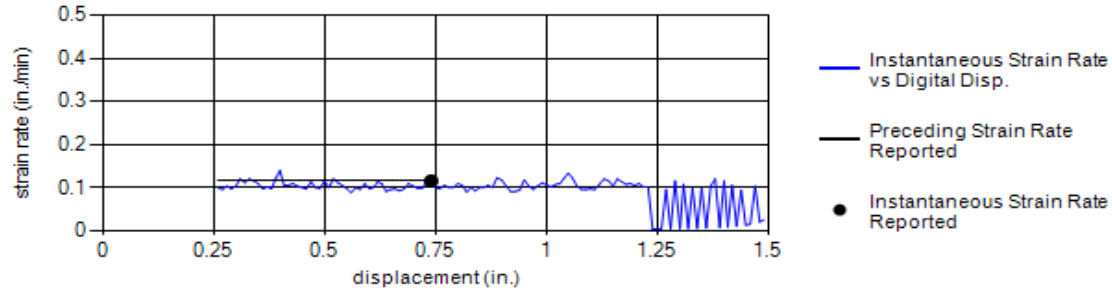
Personnel

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

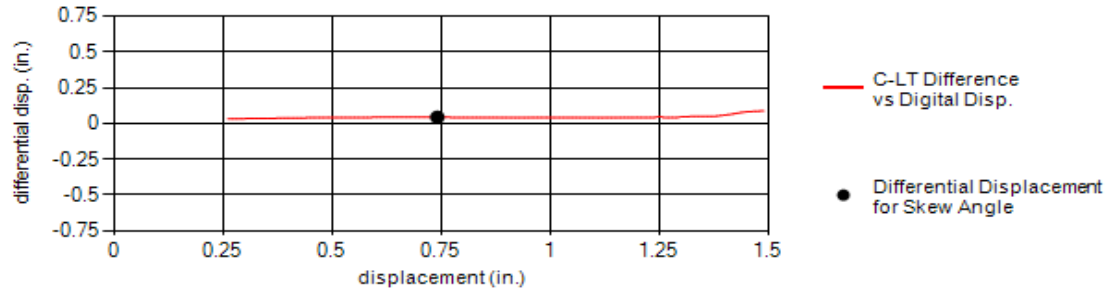
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
4542	No Data	5972	2588	5578	4670	1.03	5070



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.12	0.12	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	0.04	No Data	0.07	CCW



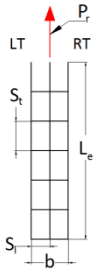
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	9/10/2010 4:11:00 PM
Test Identification:	TS13.09-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

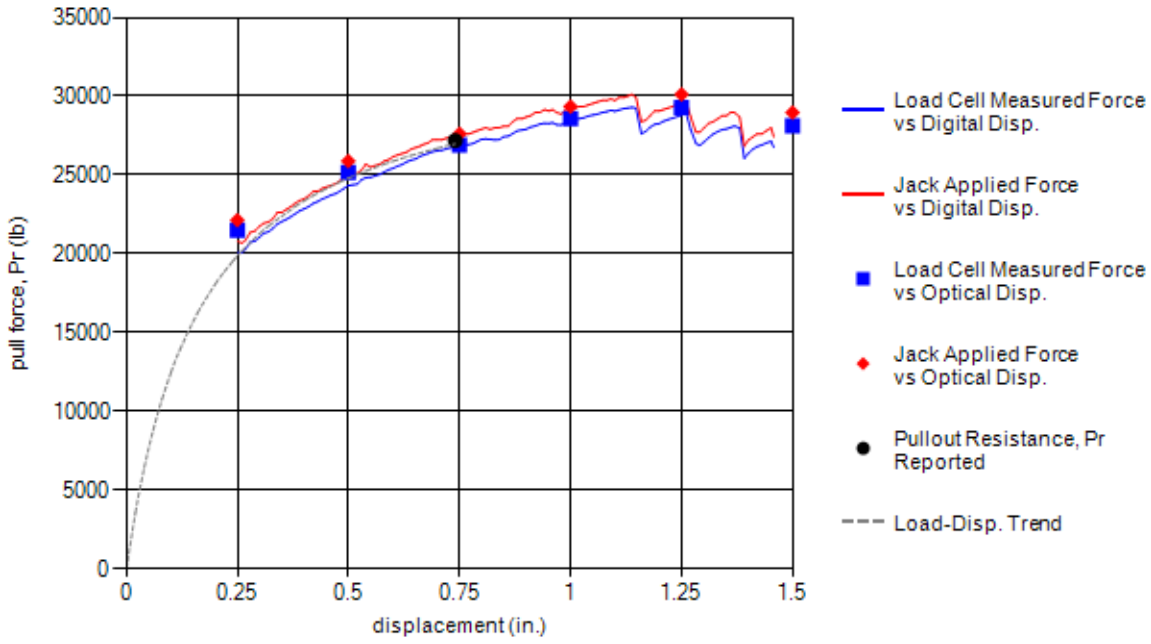
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	120.3	±2.1
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	4.9	±0.6%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	96.6	±1.6%

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	656	27185	5.2	**1.54**

Load-Displacement Curve

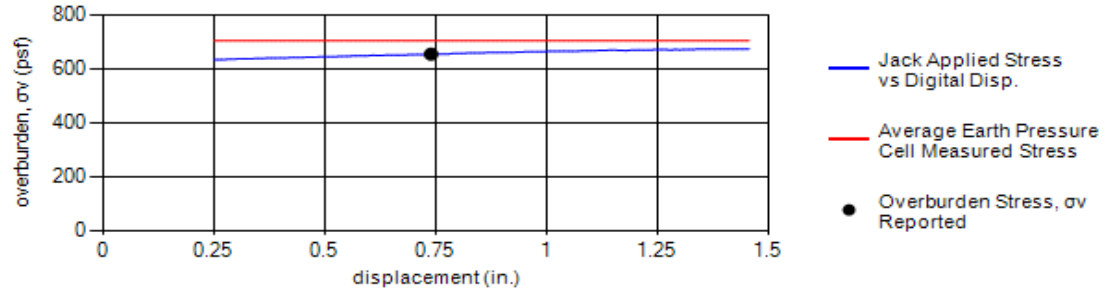


Comments

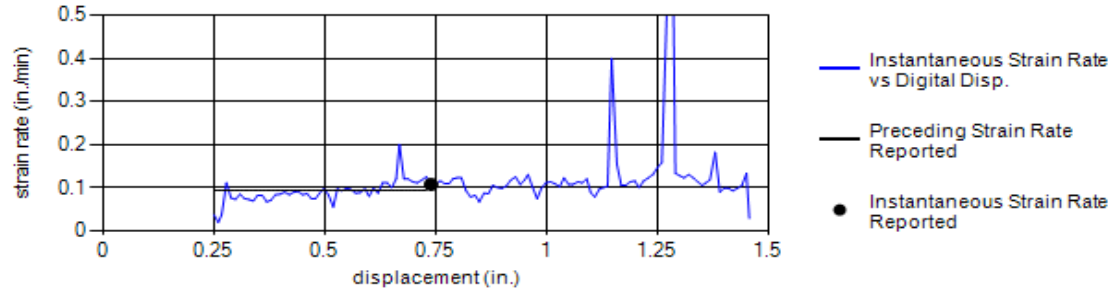
Personnel

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

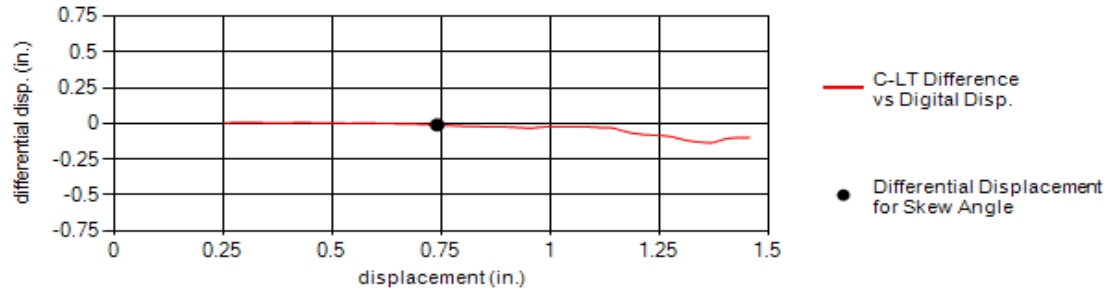
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1673	No Data	397	128	620	705	8.13	656



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	-0.01	No Data	-0.02	CW



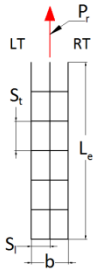
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	9/13/2010 11:34:00 AM
Test Identification:	TS13.10-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

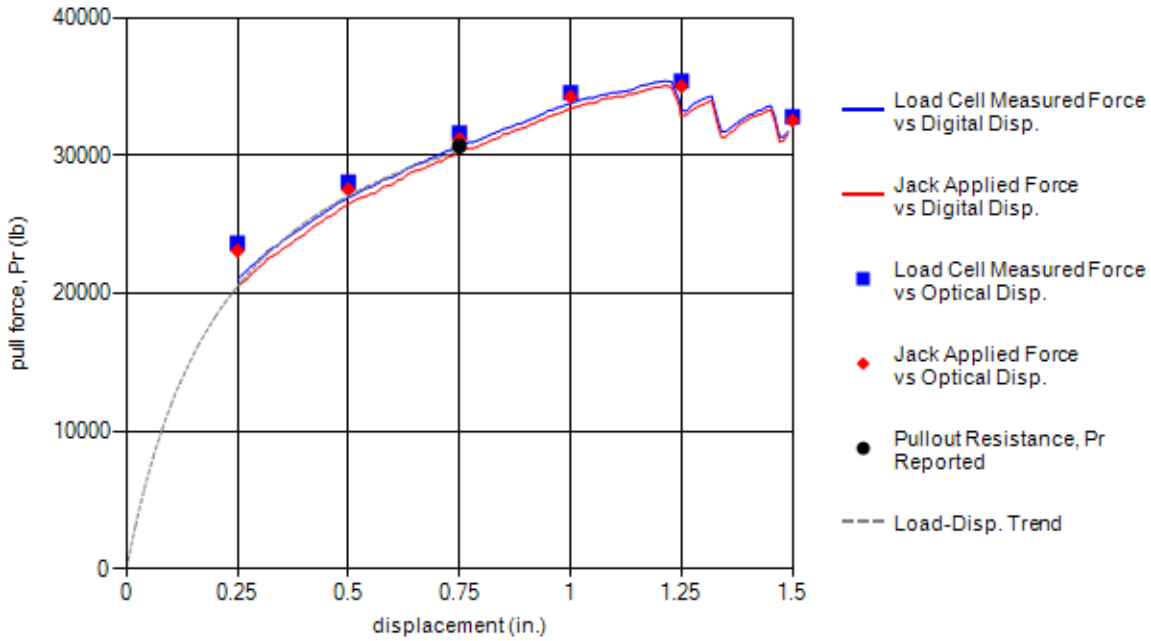
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	120.3	±2.1
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	4.9	±0.6%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	96.6	±1.6%

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	1513	30671	12.0	**0.75**

Load-Displacement Curve



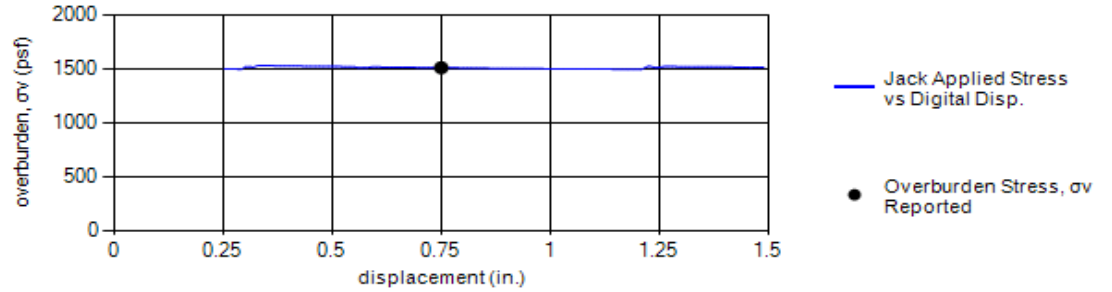
Comments

No earth pressure cell data.

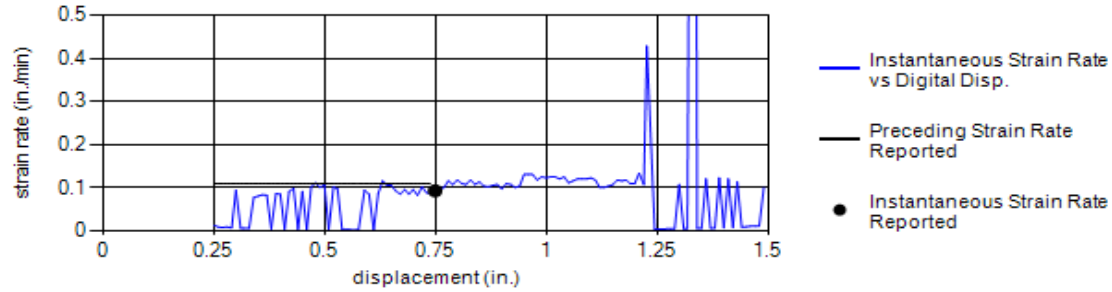
Personnel

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

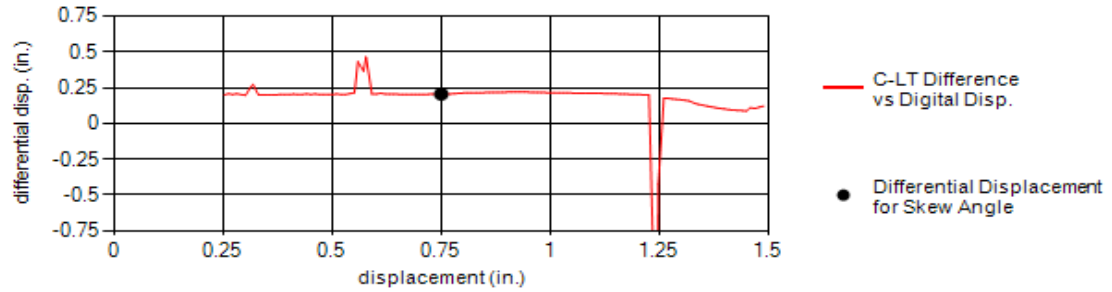
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	3.52	1513



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.09	0.11	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	0.21	No Data	0.33	CCW



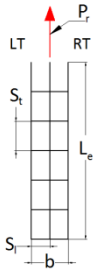
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	9/13/2010 12:18:00 PM
Test Identification:	TS13.11-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

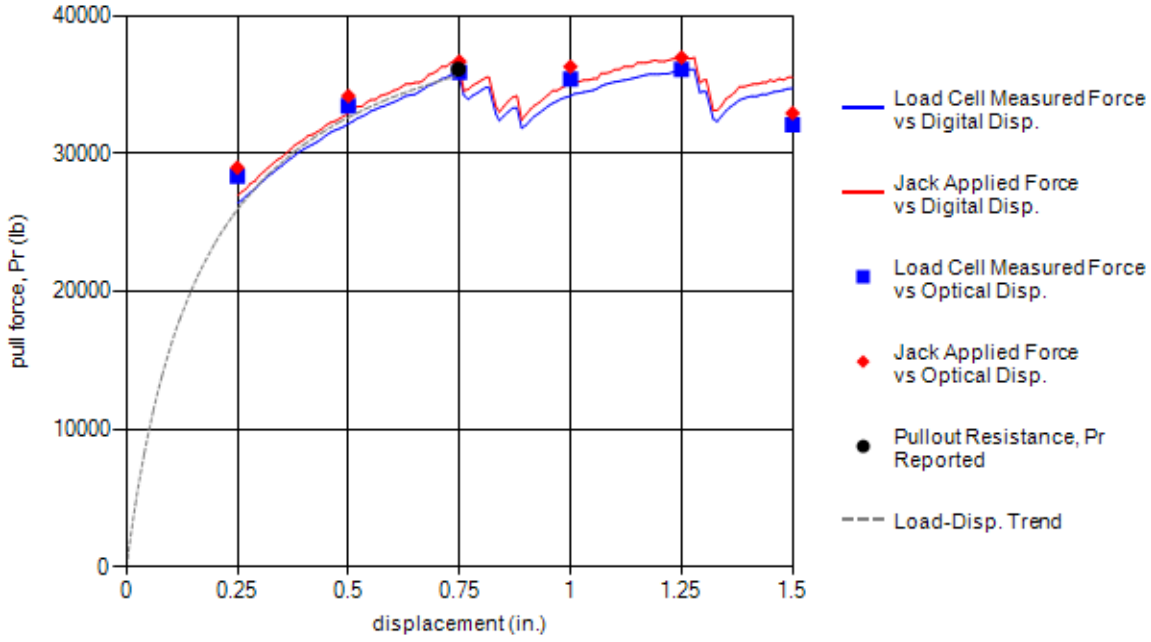
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	120.3	±2.1
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	4.9	±0.6%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	96.6	±1.6%

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	2542	36100	20.1	**0.53**

Load-Displacement Curve



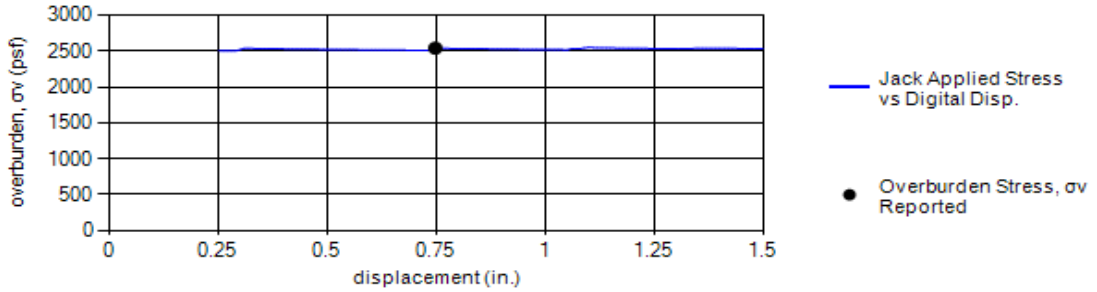
Comments

No earth pressure cell data.

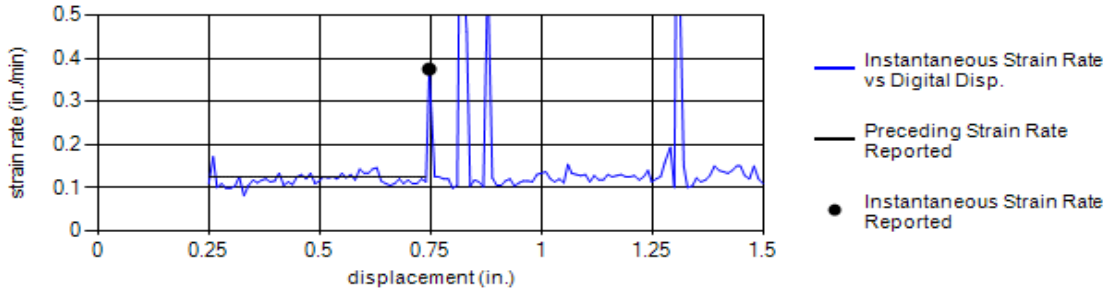
Personnel

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

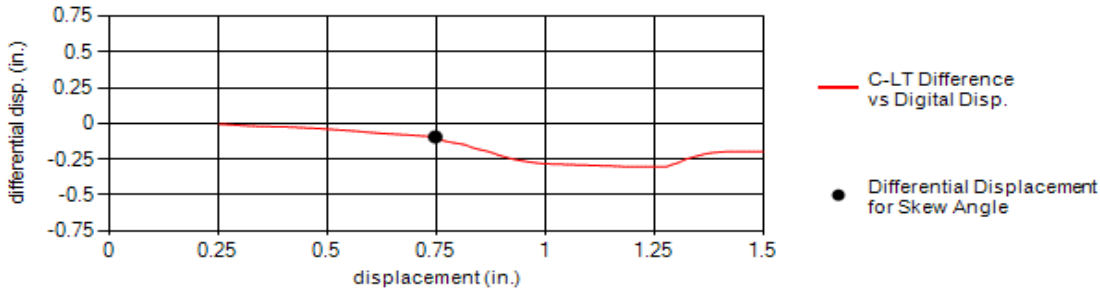
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	2.10	2542



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.37	0.12	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	-0.09	No Data	-0.15	CW



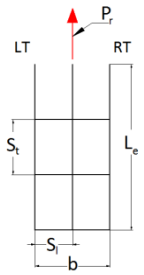
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	9/16/2010 10:25:00 AM
Test Identification:	TS13.12-G-9x18-W20xW11-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.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	18	*Spacing, S_l (in.):*	9

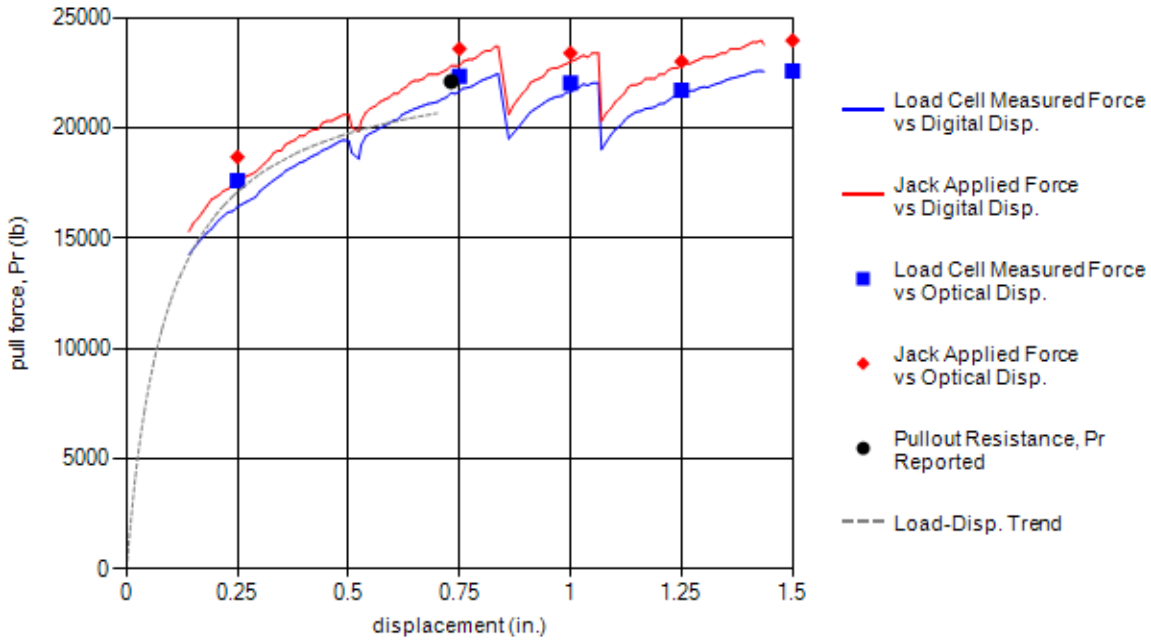
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	120.3 ±2.1
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	4.9 ±0.6%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	96.6 ±1.6%

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	0.73	5052	22095	40.0	**0.32**

Load-Displacement Curve

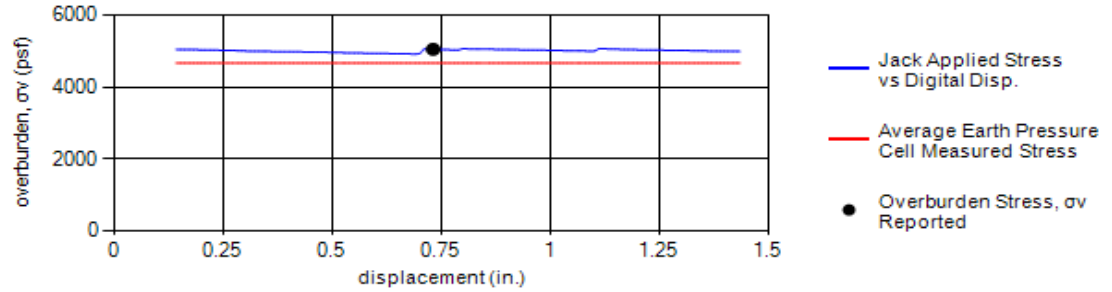


Comments

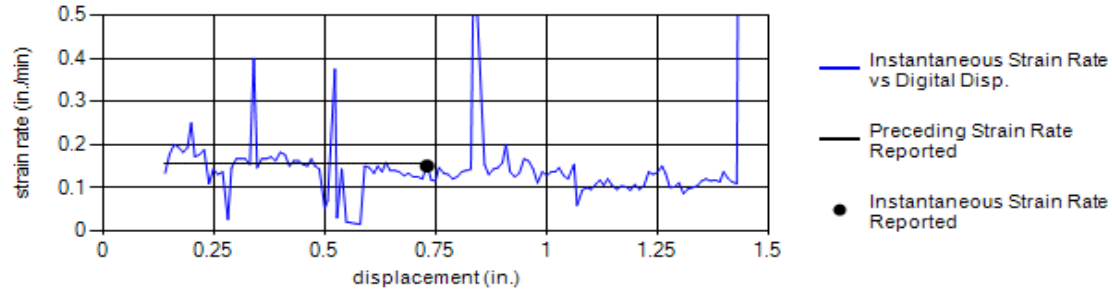
Personnel

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

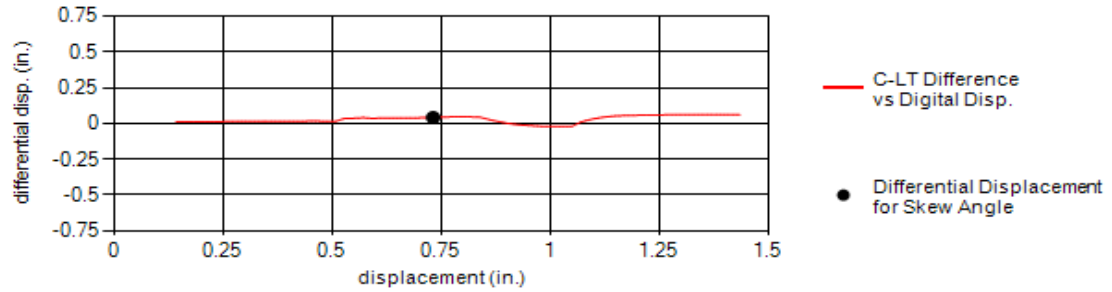
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
4588	No Data	5962	2629	5501	4670	1.05	5052



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.15	0.16	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	0.04	No Data	0.07	CCW



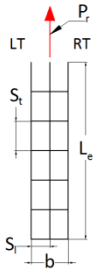
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	9/24/2010 12:20:00 PM
Test Identification:	TS14.01-G-9x24-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:*	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

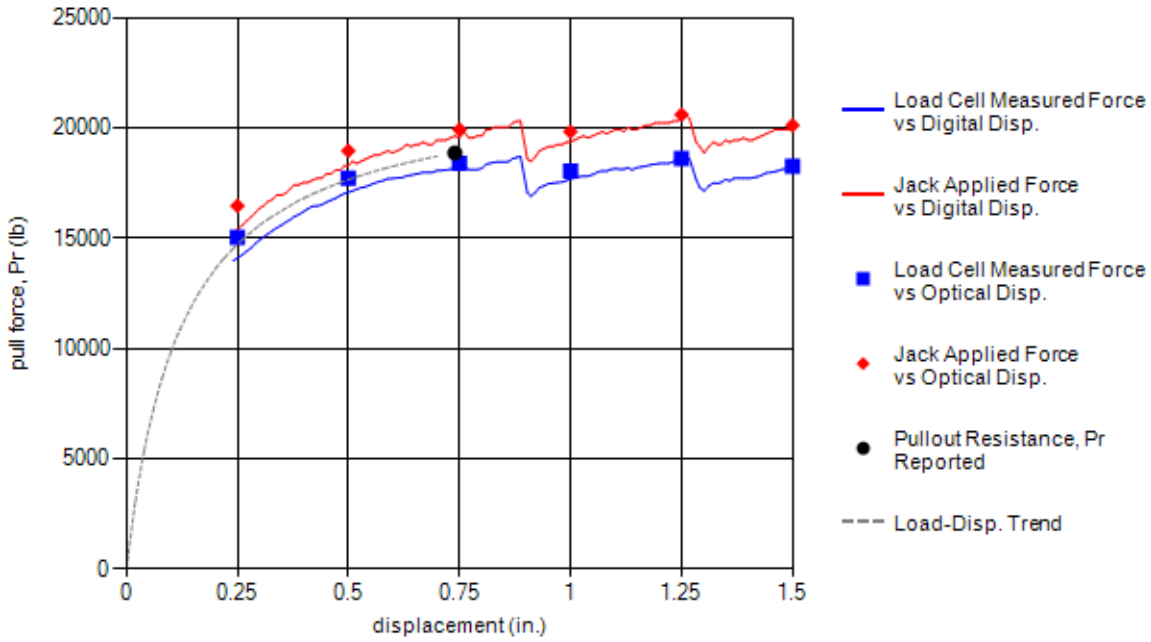
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	120.8	±2.3
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	5.8	±0.3%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	97.0	±1.9%

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****
Pullout	0.74	633	18860	5.0	**0.83**

Load-Displacement Curve

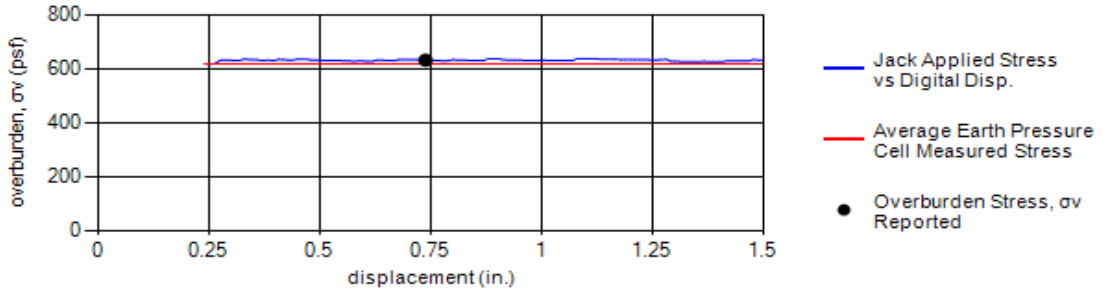


Comments

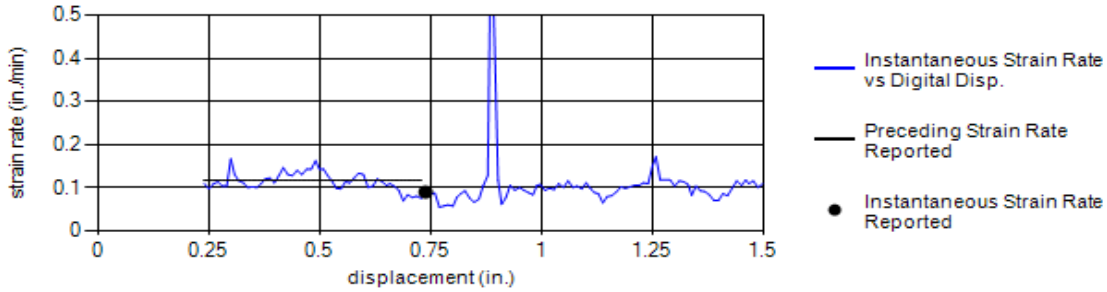
Personnel

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

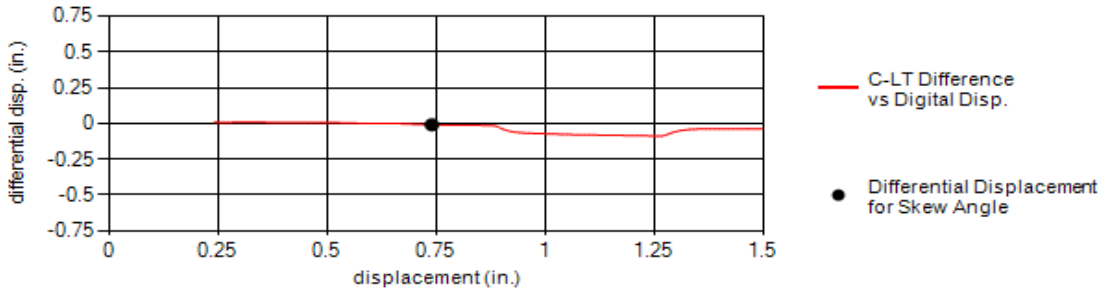
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
728	No Data	700	512	538	620	1.03	633



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.09	0.12	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	-0.01	No Data	-0.01	CW



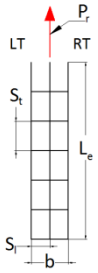
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	9/24/2010 1:53:00 PM
Test Identification:	TS14.02-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

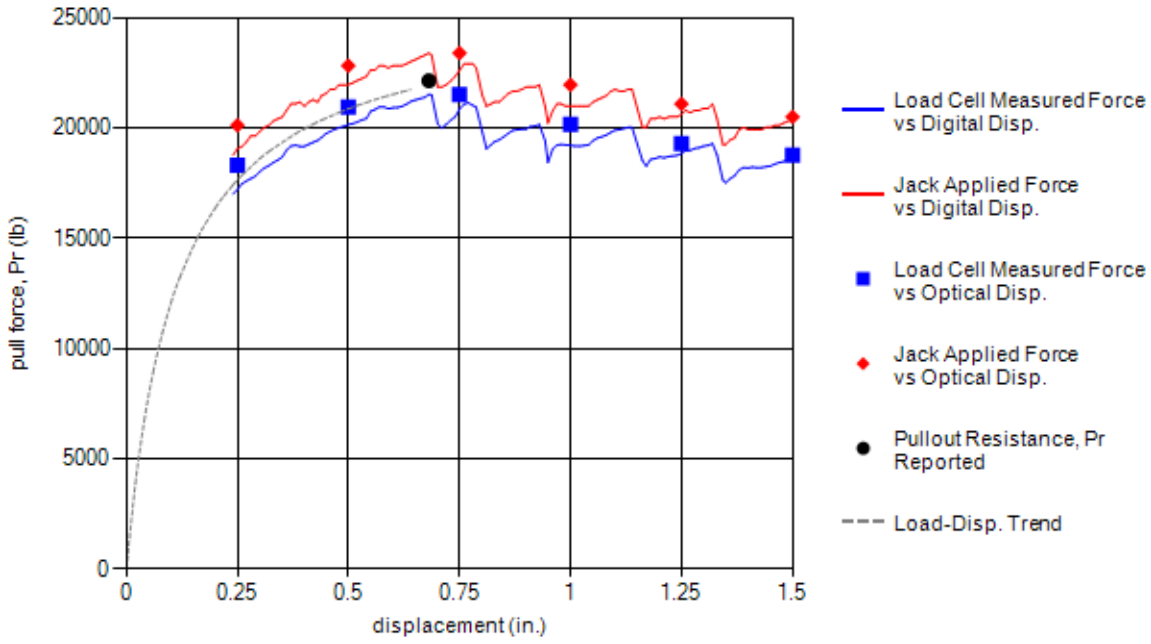
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	120.8	±2.3
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	5.8	±0.3%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	97.0	±1.9%

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	0.68	1508	22130	11.8	**0.41**

Load-Displacement Curve

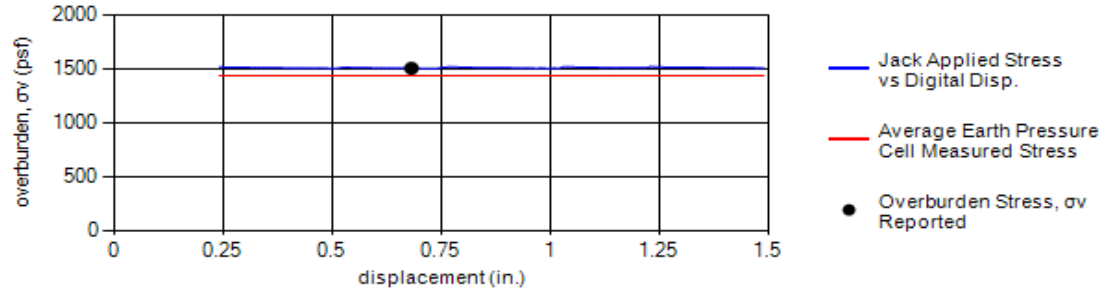


Comments

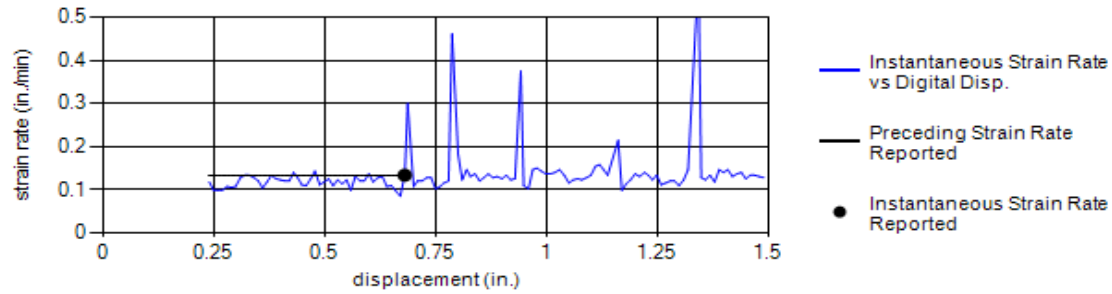
Personnel

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

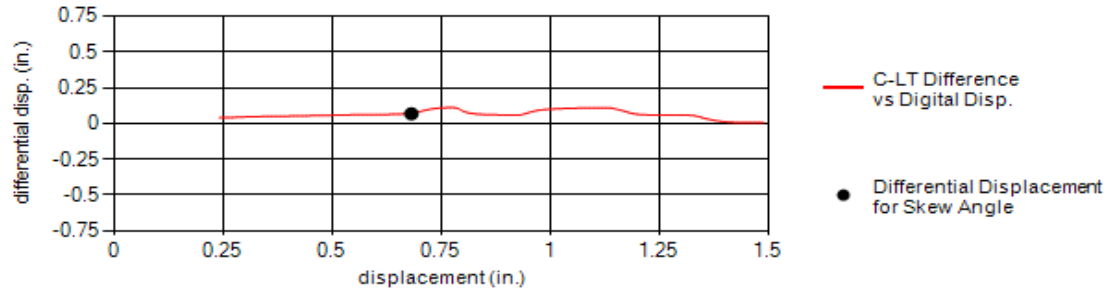
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1480	No Data	1598	1315	1360	1438	1.02	1508



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.13	0.13	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	0.07	No Data	0.11	CCW



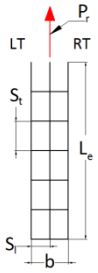
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	9/24/2010 2:30:00 PM
Test Identification:	TS14.03-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

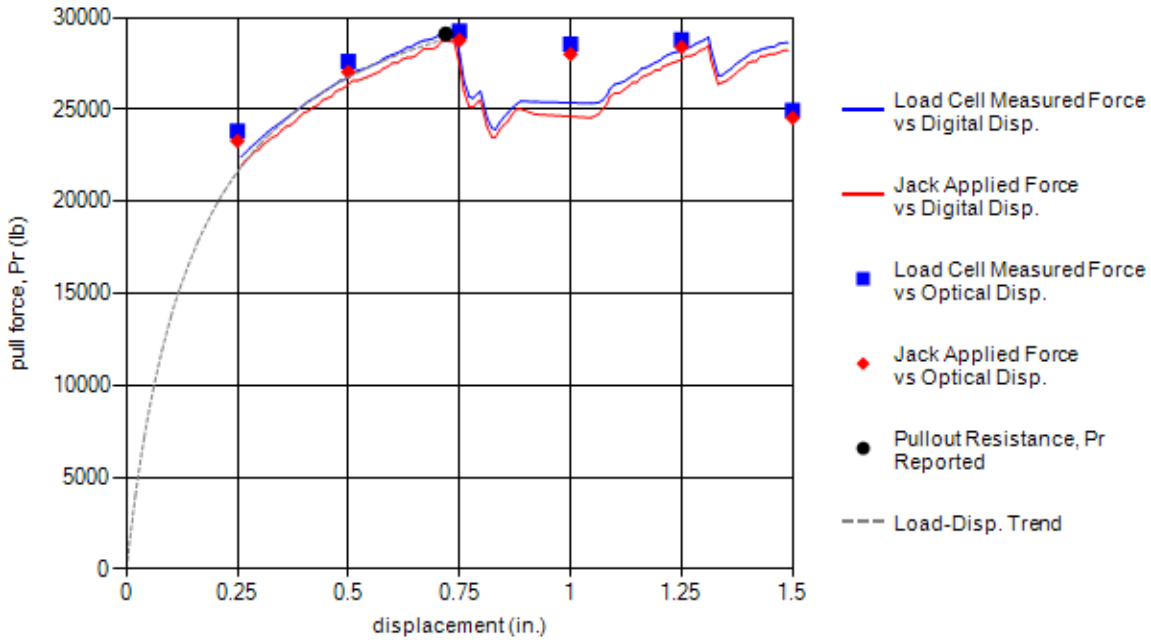
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	120.8	±2.3
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	5.8	±0.3%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	97.0	±1.9%

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	2535	29098	19.8	**0.32**

Load-Displacement Curve

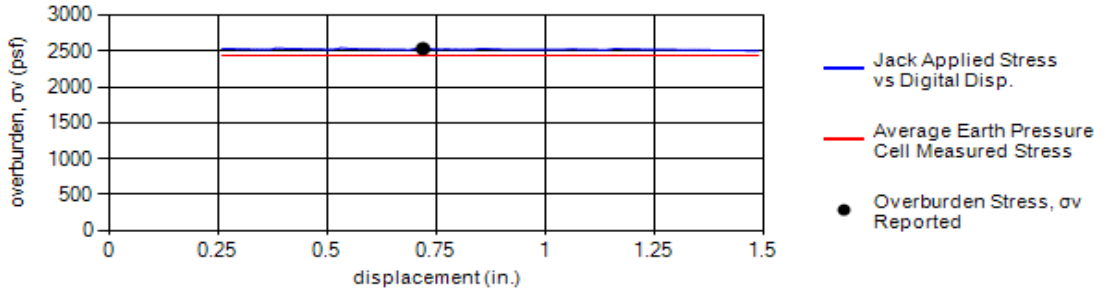


Comments

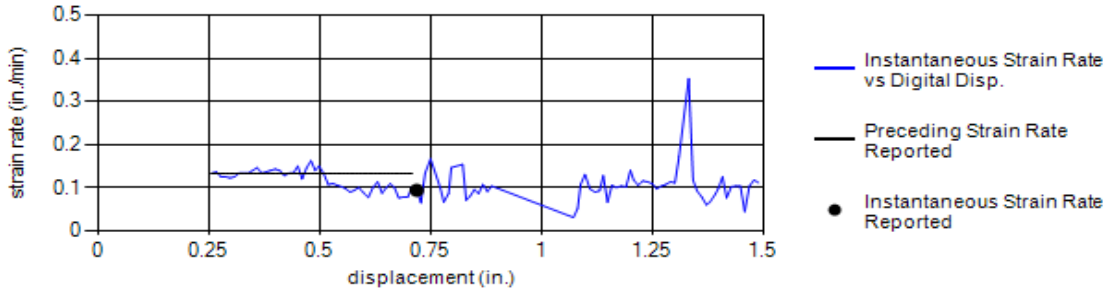
Personnel

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

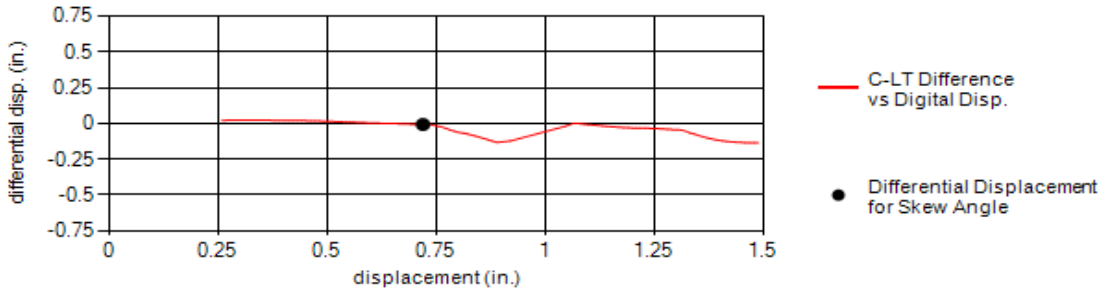
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2336	No Data	2719	2275	2440	2442	1.01	2535



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.09	0.13	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	-0.01	No Data	-0.01	CW



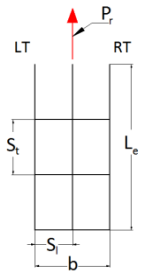
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	9/24/2010 3:04:00 PM
Test Identification:	TS14.04-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

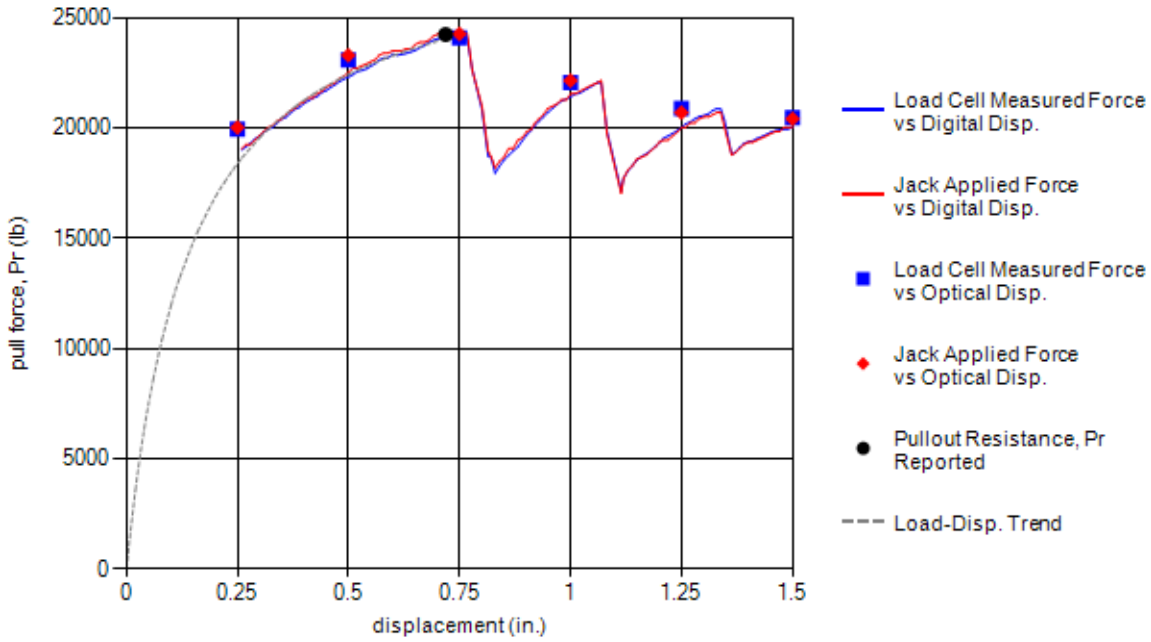
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	120.8	±2.3
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	5.8	±0.3%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	97.0	±1.9%

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	5015	24225	39.2	**0.27**

Load-Displacement Curve

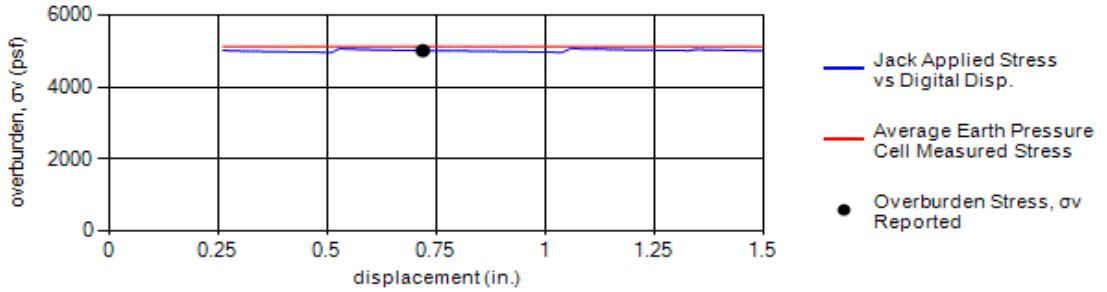


Comments

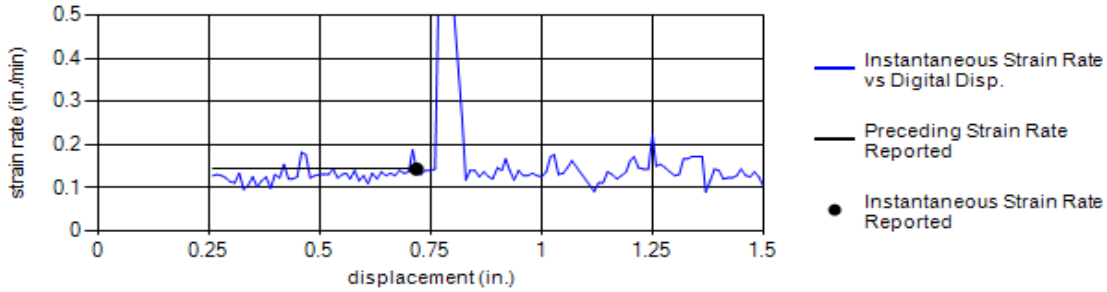
Personnel

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

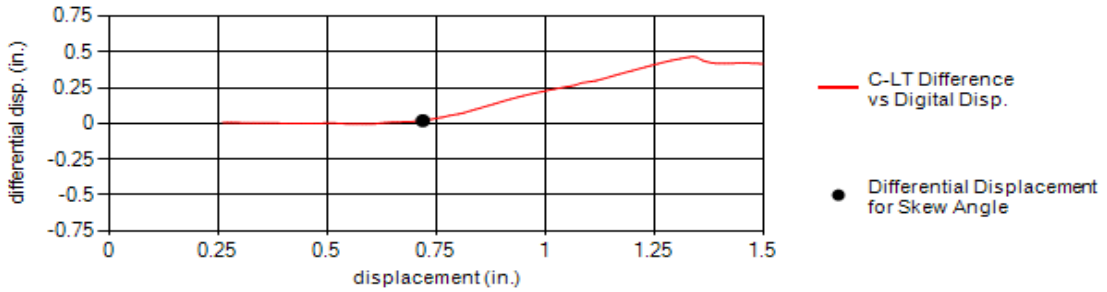
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
4638	No Data	5600	4708	5582	5132	1.01	5015



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.14	0.14	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	0.02	No Data	0.03	CCW



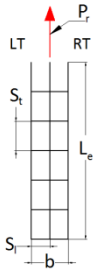
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	9/27/2010 3:02:00 PM
Test Identification:	TS14.05-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

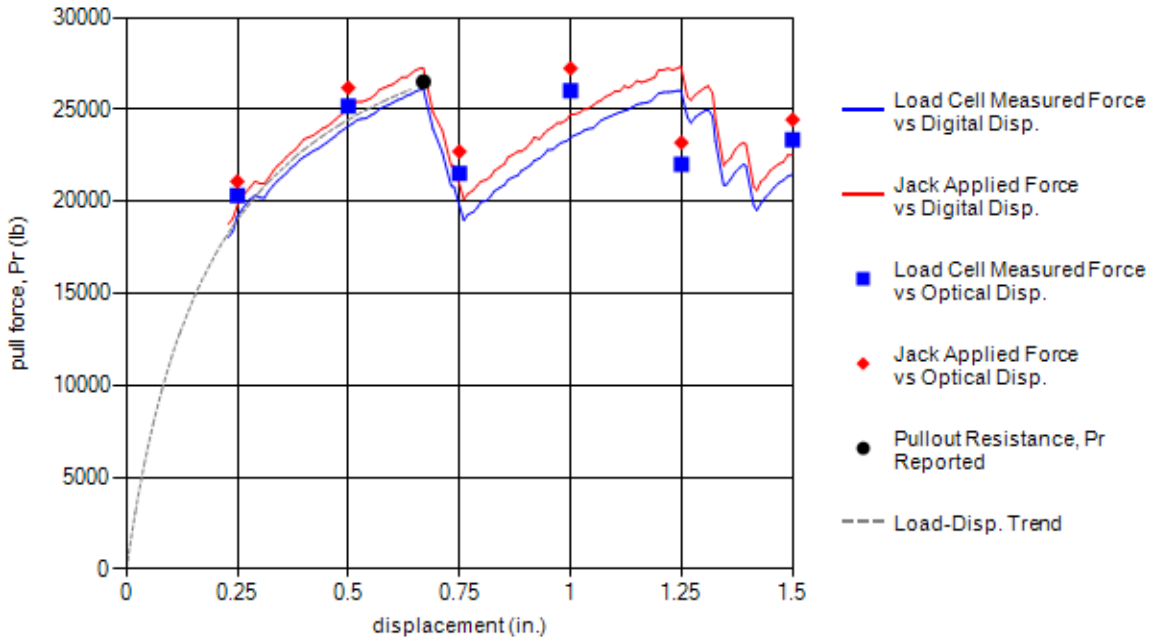
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	120.8	±2.3
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	5.8	±0.3%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	97.0	±1.9%

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	646	26500	5.1	**1.14**

Load-Displacement Curve

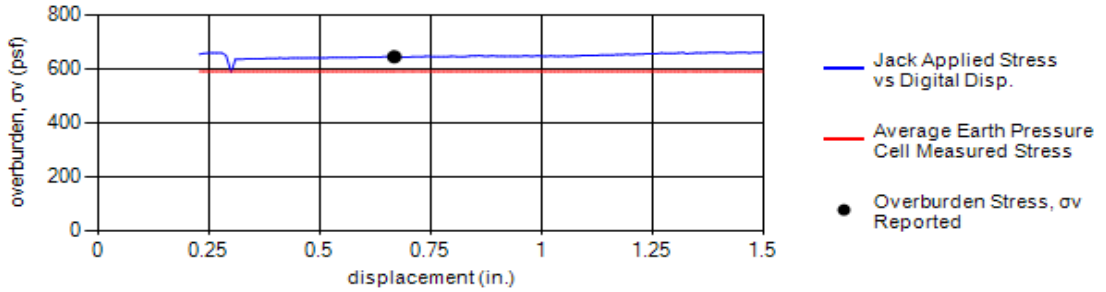


Comments

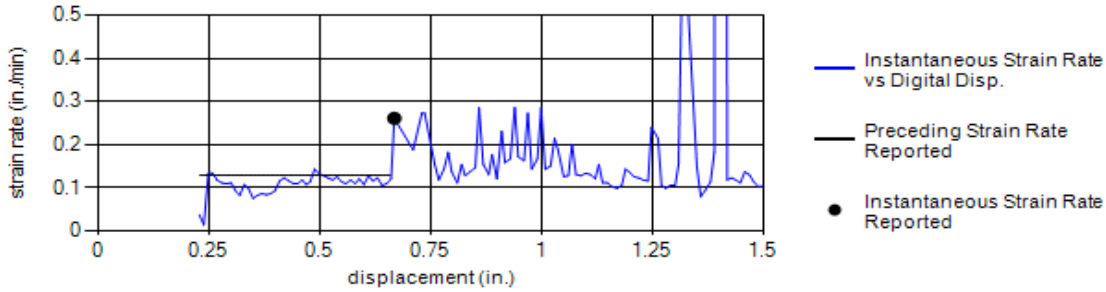
Personnel

Tested:	SH SH JL
Prepared:	SB TW
Checked:	WL PJ

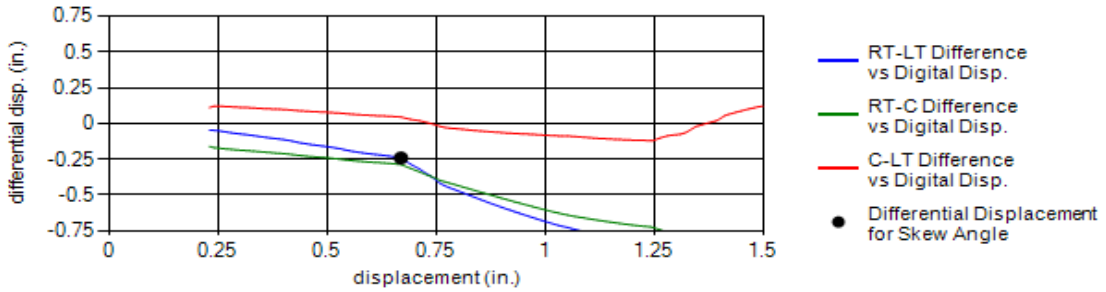
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
531	No Data	542	678	611	591	8.85	646



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.26	0.13	0.12



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	CW



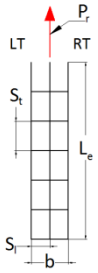
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	9/27/2010 3:41:00 PM
Test Identification:	TS14.06-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

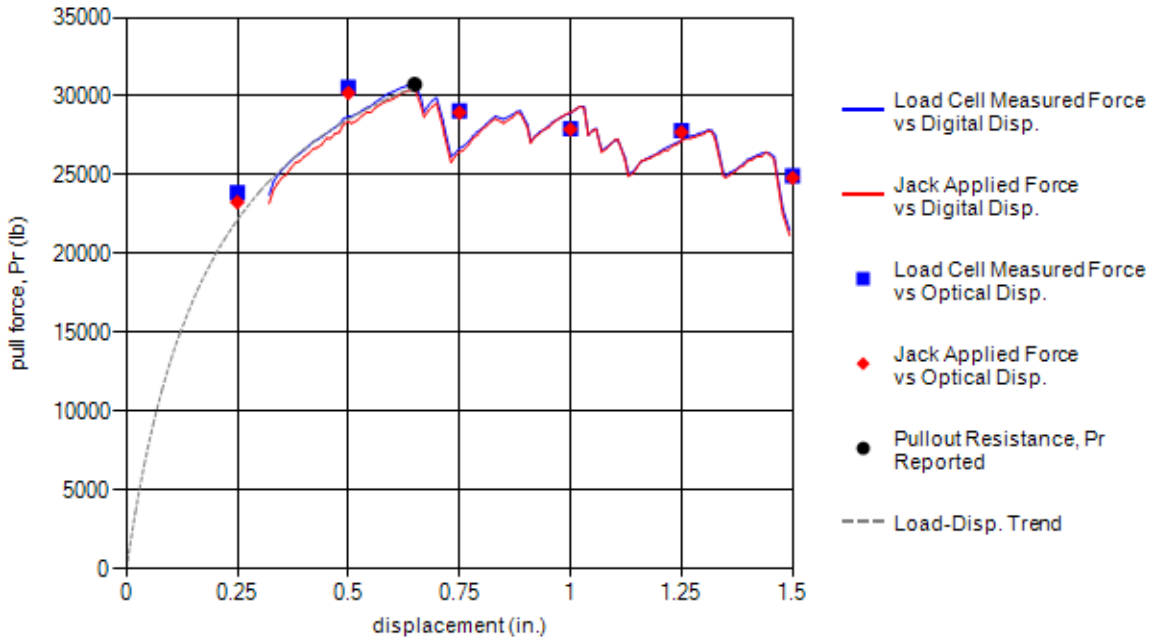
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	120.8	±2.3
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	5.8	±0.3%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	97.0	±1.9%

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	1547	30750	12.1	**0.55**

Load-Displacement Curve

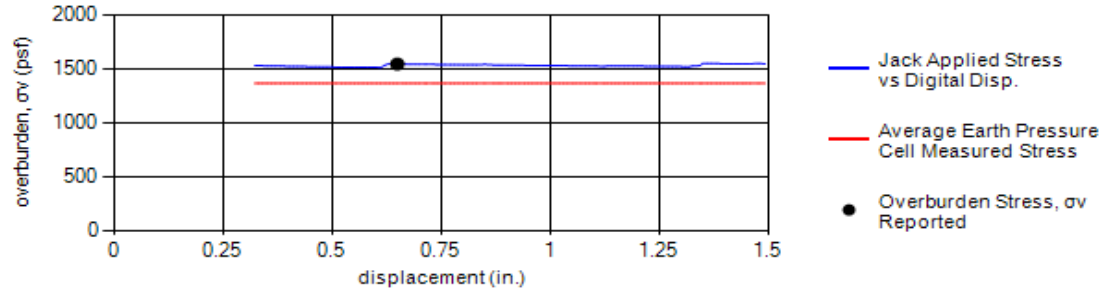


Comments

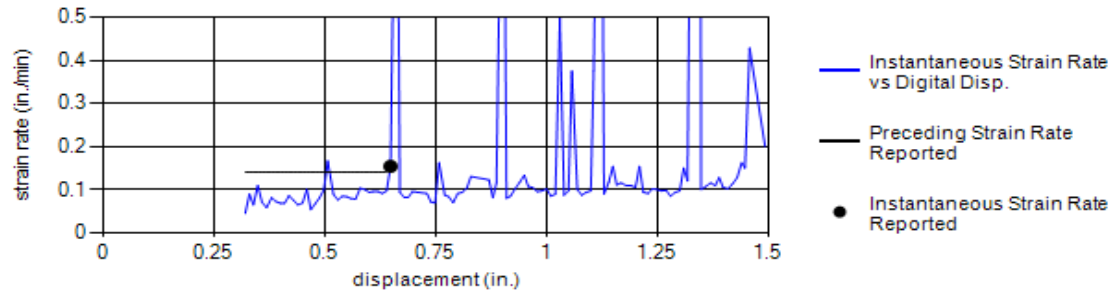
Personnel

Tested:	MB JL SH
Prepared:	SB TW
Checked:	WL PJ

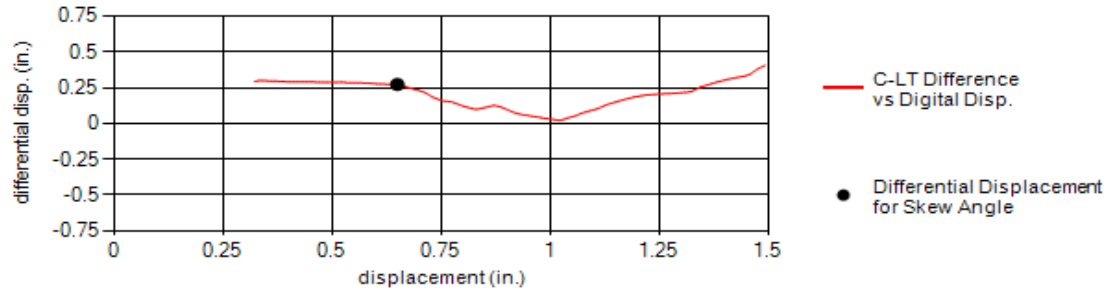
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1106	No Data	1544	1333	1488	1368	3.82	1547



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.15	0.14	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	0.27	No Data	0.43	CCW



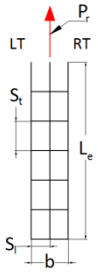
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	9/29/2010 11:39:00 AM
Test Identification:	TS14.07-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

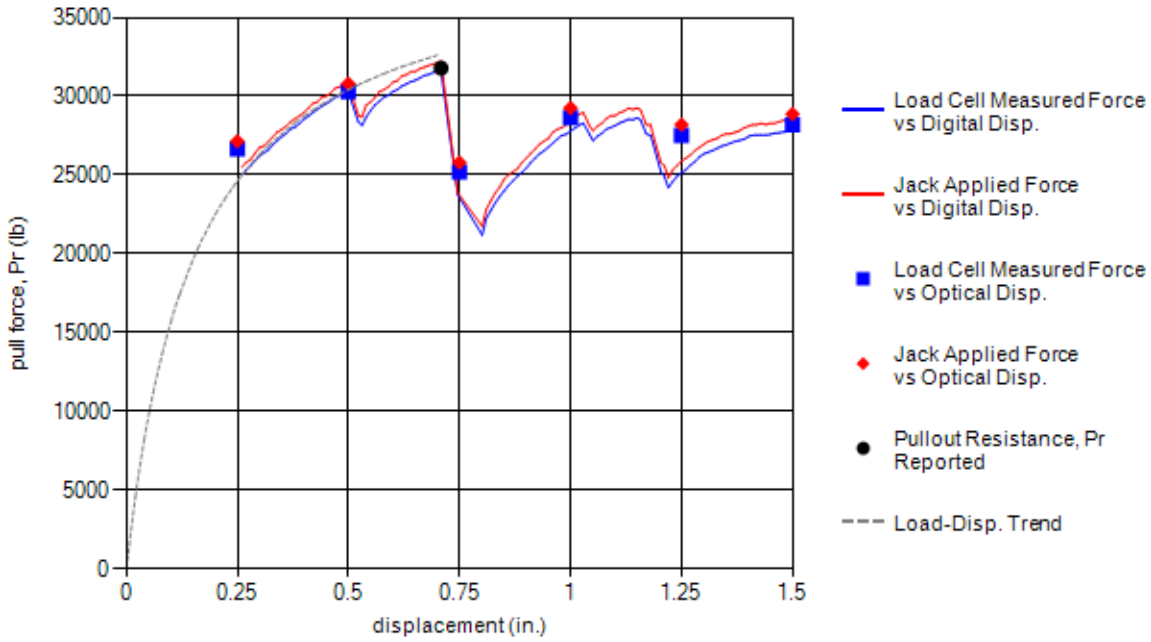
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	120.8	±2.3
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	5.8	±0.3%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	97.0	±1.9%

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	2524	31778	19.8	**0.35**

Load-Displacement Curve

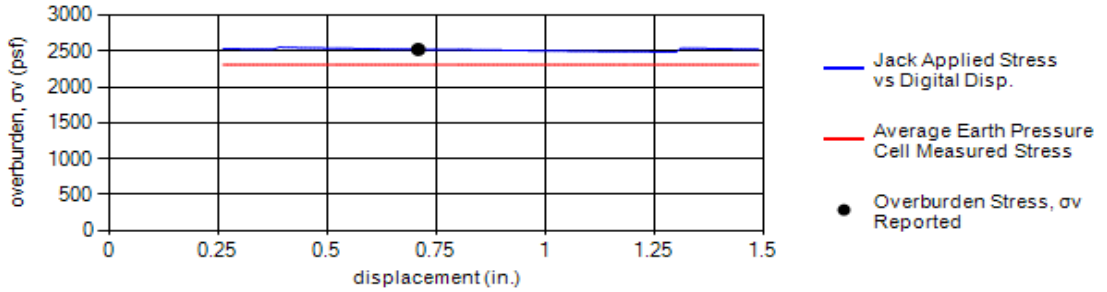


Comments

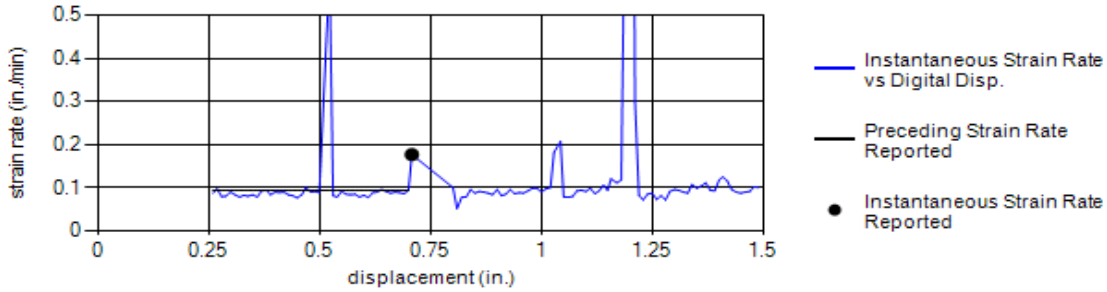
Personnel

Tested:	TW JL SH
Prepared:	SB TW
Checked:	WL PJ

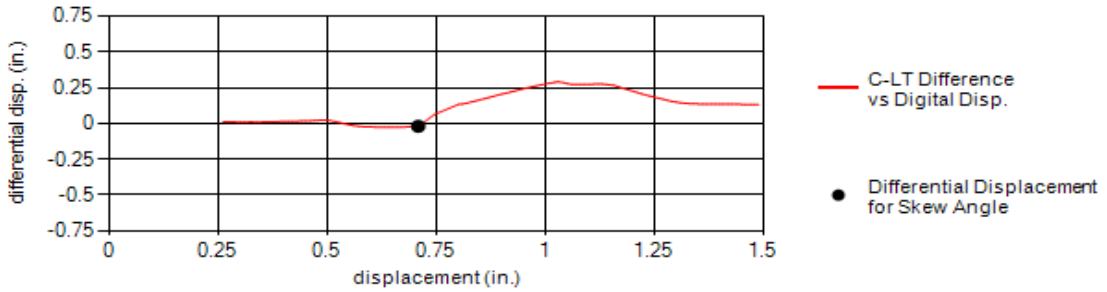
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2014	No Data	2604	2105	2527	2312	2.26	2524



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.18	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	-0.02	No Data	-0.03	CW



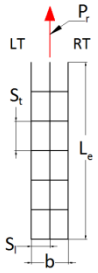
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	9/29/2010 1:02:00 PM
Test Identification:	TS14.08-G-9x24-W20xW11-L12-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):	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

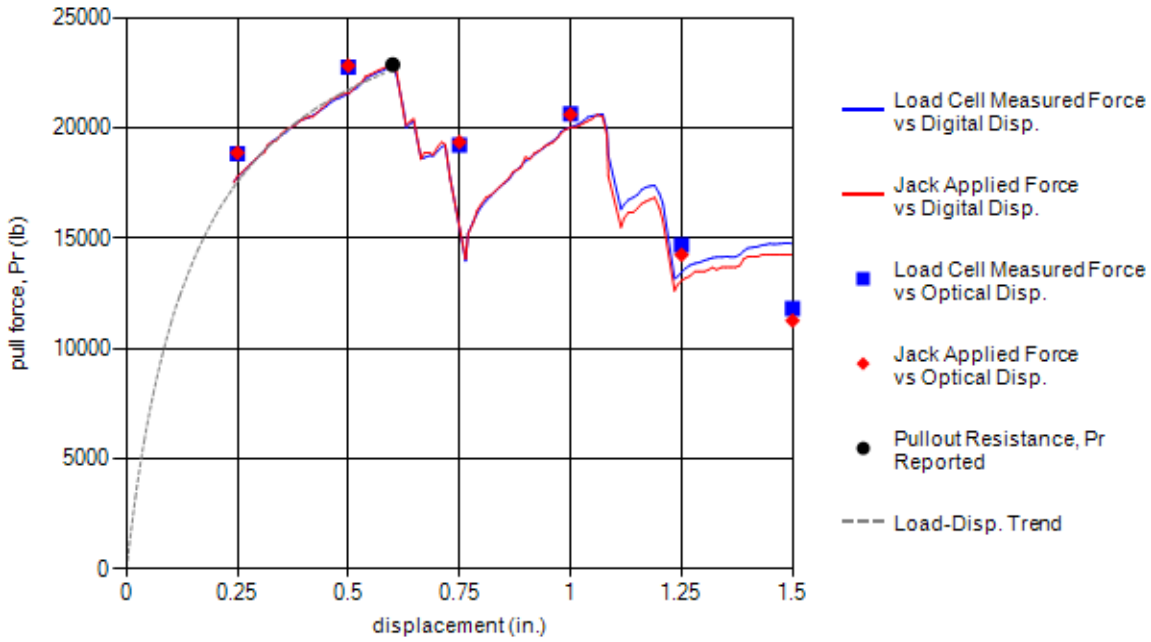
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	120.8	±2.3
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	5.8	±0.3%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	97.0	±1.9%

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	4971	22856	38.9	**0.13**

Load-Displacement Curve

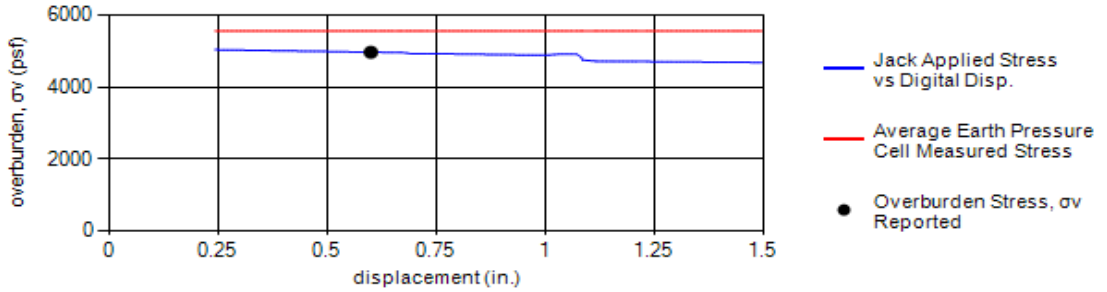


Comments

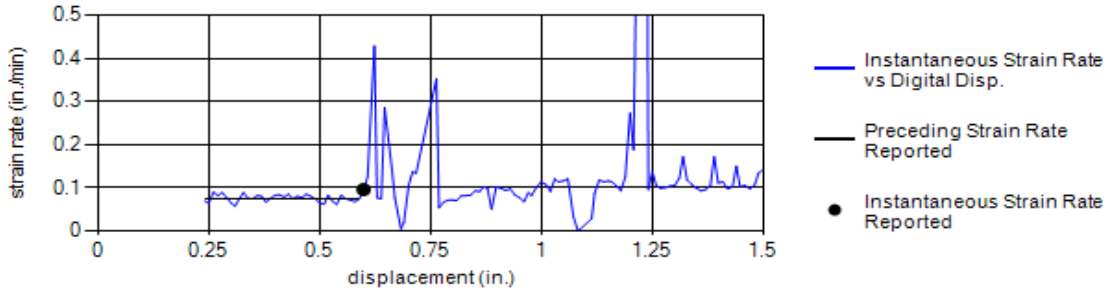
Personnel

Tested:	TW JL SH
Prepared:	SB TW
Checked:	WL PJ

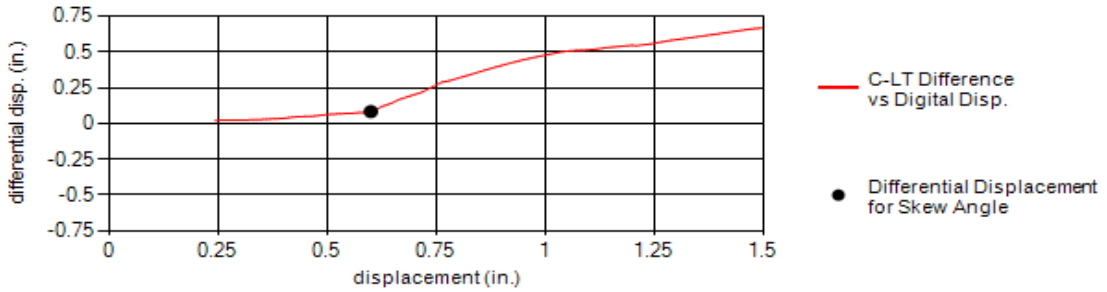
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
5148	No Data	6039	4949	6124	5565	1.10	4971



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.10	0.07	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	0.08	No Data	0.13	CCW



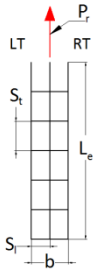
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	9/24/2010 4:30:00 PM
Test Identification:	TS14.09-G-9x24-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:*	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

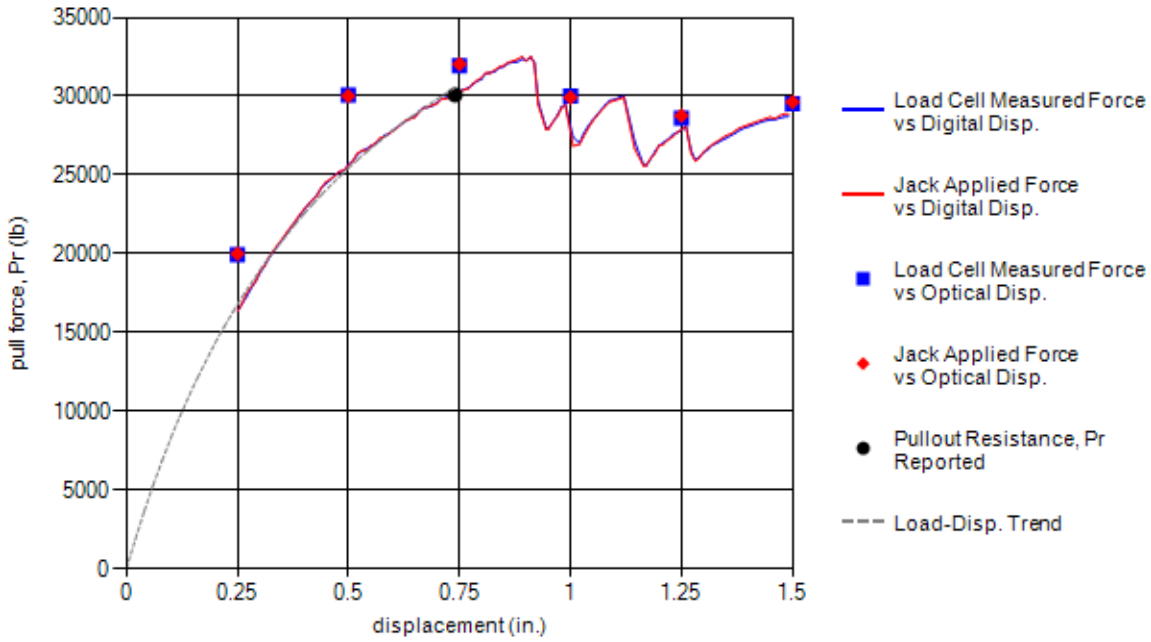
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	120.8	±2.3
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	5.8	±0.3%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	97.0	±1.9%

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****
Pullout	0.74	658	30084	5.2	**1.27**

Load-Displacement Curve

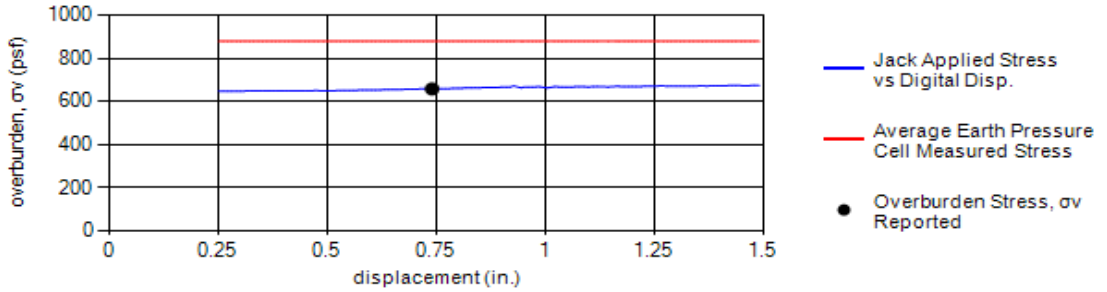


Comments

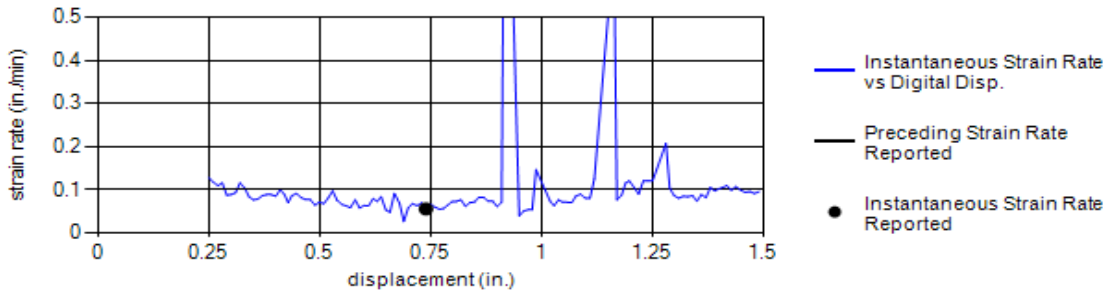
Personnel

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

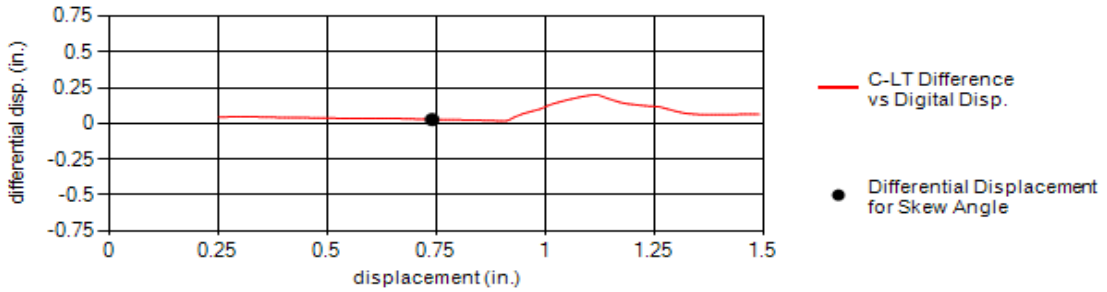
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1411	No Data	478	1047	580	879	8.01	658



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.06	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	0.03	No Data	0.04	CCW



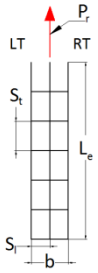
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	9/24/2010 1:37:00 PM
Test Identification:	TS14.10-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

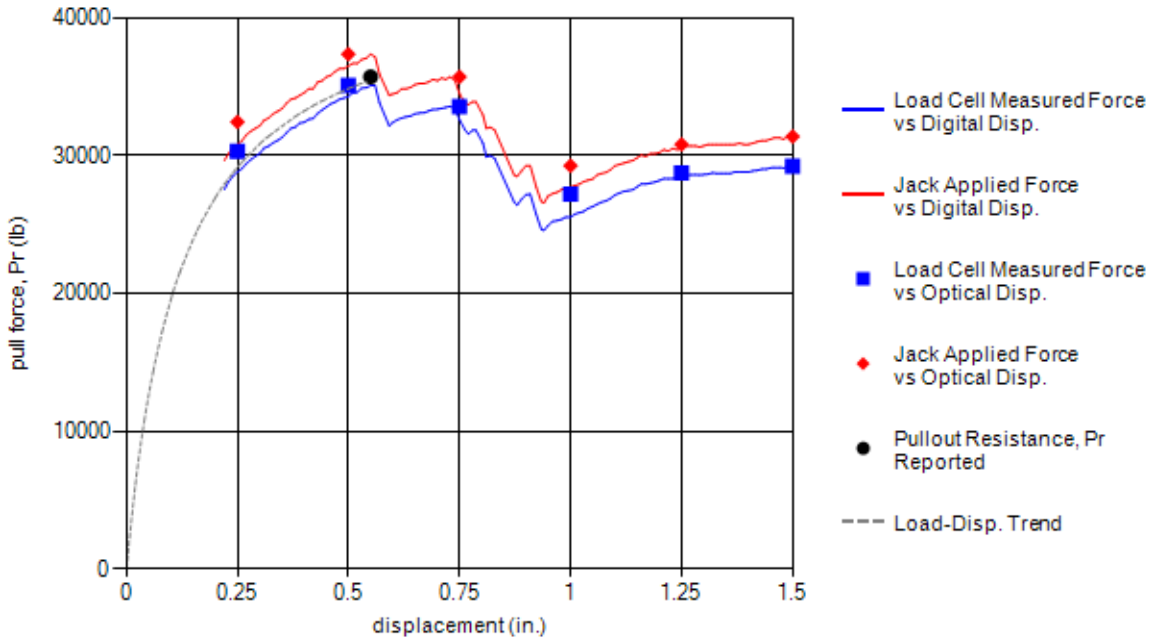
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	120.8	±2.3
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	5.8	±0.3%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	97.0	±1.9%

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	1522	35689	11.9	**0.65**

Load-Displacement Curve

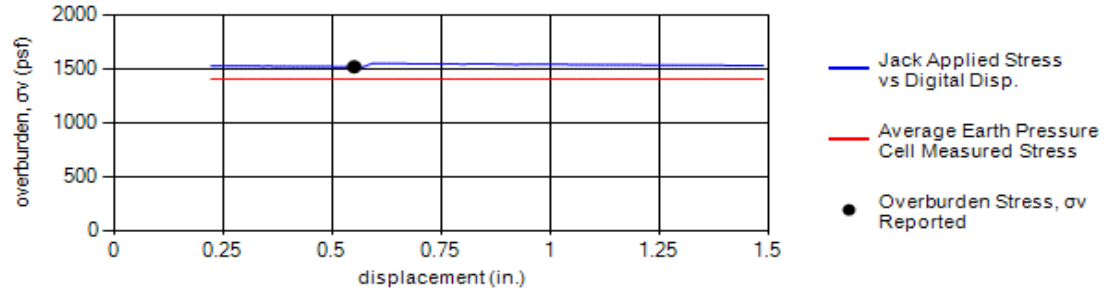


Comments

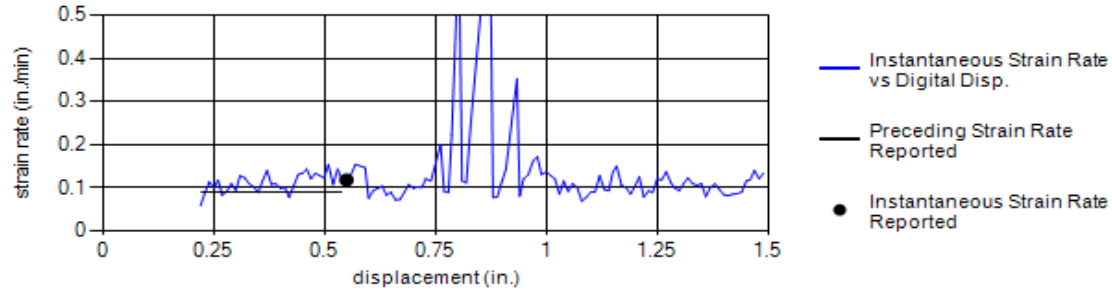
Personnel

Tested:	MF WL SH
Prepared:	SB TW
Checked:	WL PJ

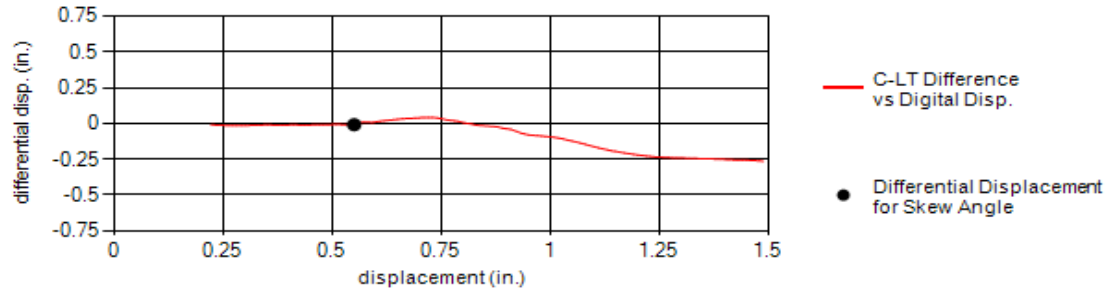
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1534	No Data	1559	1278	1261	1408	1.16	1522



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.12	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	-0.01	No Data	-0.01	CW



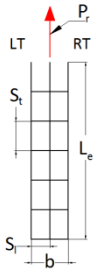
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	9/27/2010 11:28:00 AM
Test Identification:	TS14.11-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

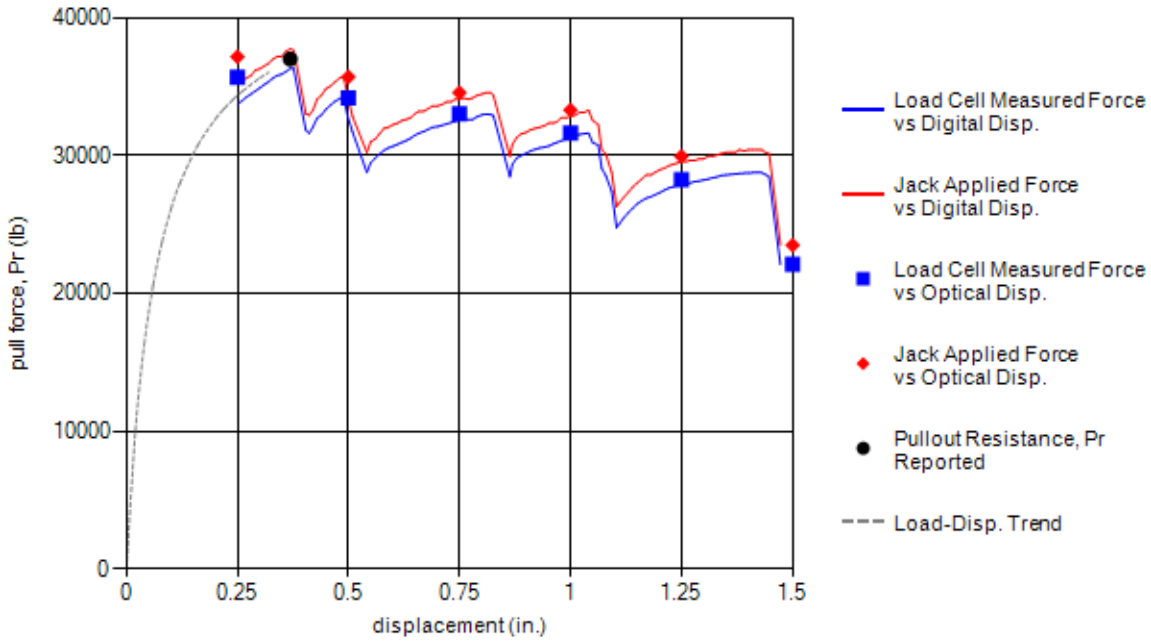
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	120.8	±2.3
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	5.8	±0.3%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	97.0	±1.9%

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	2525	36983	19.8	**0.41**

Load-Displacement Curve

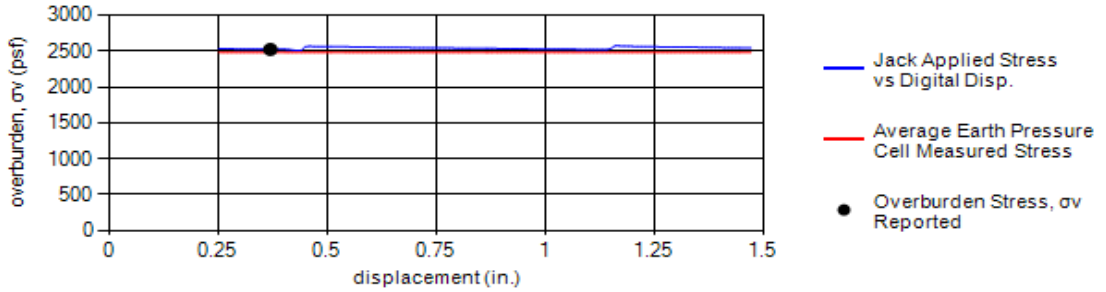


Comments

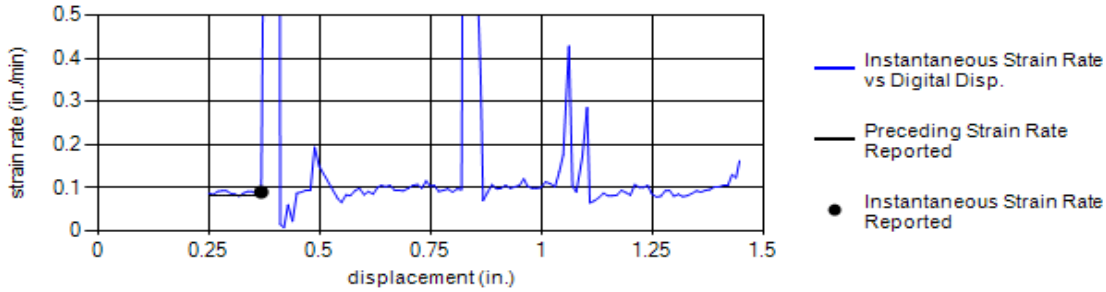
Personnel

Tested:	MF SH WL
Prepared:	SB TW
Checked:	WL PJ

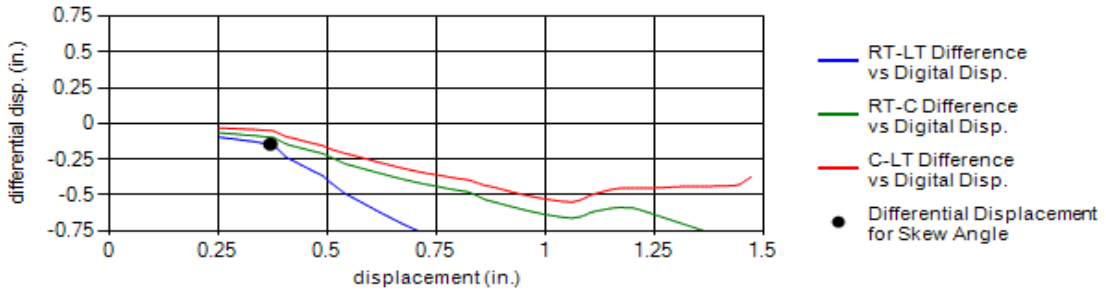
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2501	No Data	2458	2460	2495	2479	2.17	2526



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*
-0.14	-0.10	-0.05	No Data	-0.46	CW



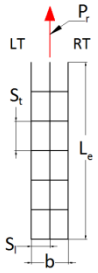
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	9/27/2010 2:17:00 PM
Test Identification:	TS14.12-G-9x24-W20xW11-L12-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):	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

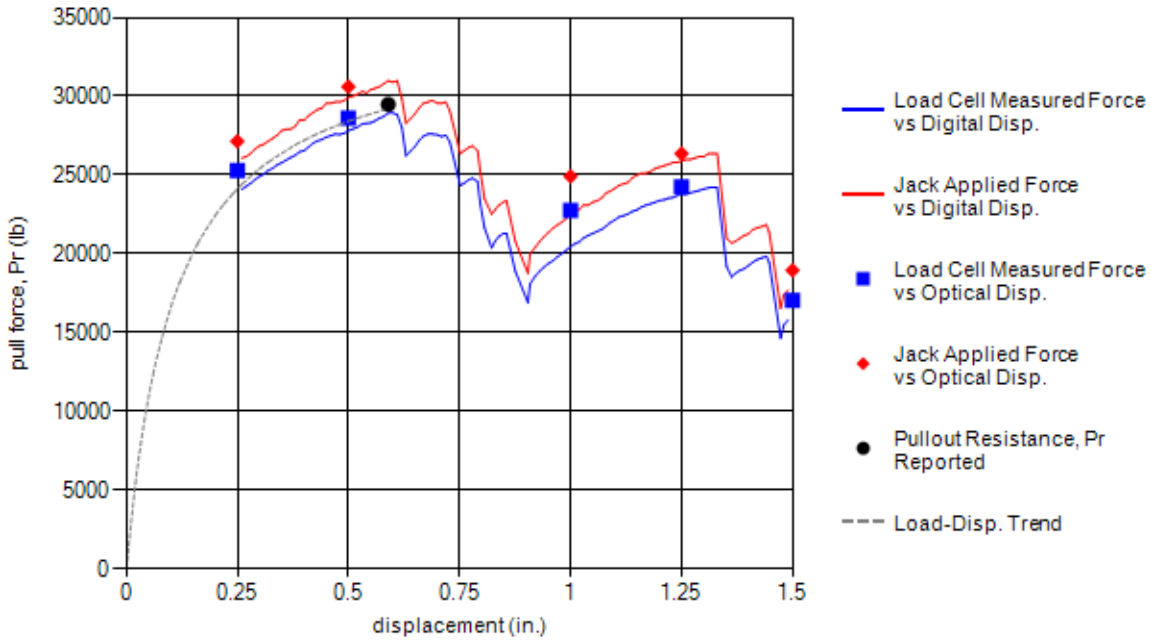
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	120.8	±2.3
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	5.8	±0.3%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	97.0	±1.9%

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	5017	29480	39.3	**0.16**

Load-Displacement Curve

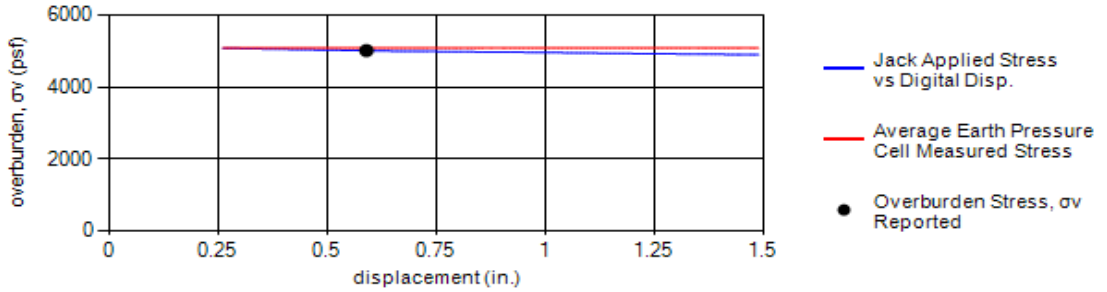


Comments

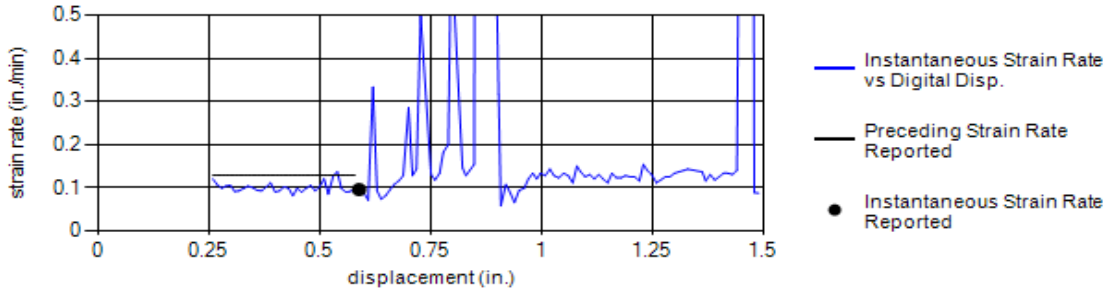
Personnel

Tested:	AS JL MF
Prepared:	SB TW
Checked:	WL PJ

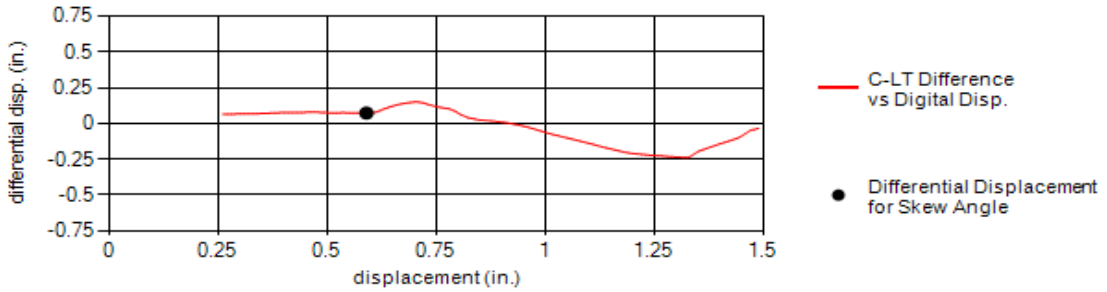
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
4974	No Data	5594	4337	5446	5088	1.06	5017



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.10	0.13	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	0.07	No Data	0.12	CCW



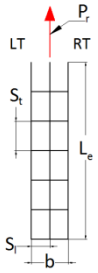
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	10/15/2010 8:59:00 AM
Test Identification:	TS15.01-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

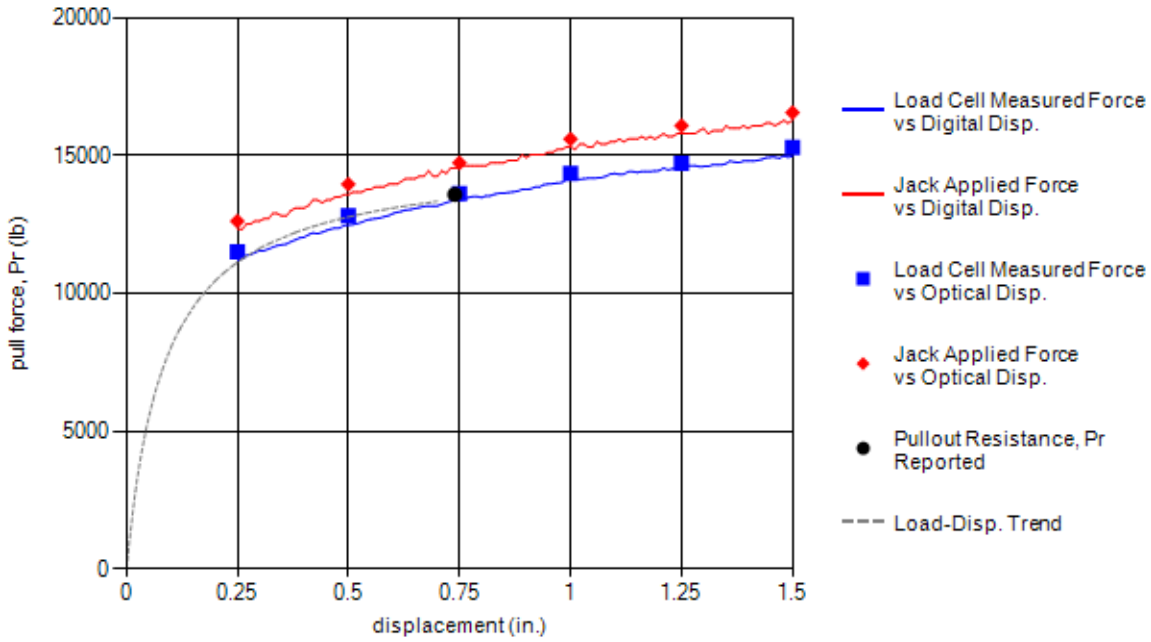
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	117.0	±1.4
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	4.4	±0.3%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	94.0	±1.1%

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	628	13582	5.1	**1.20**

Load-Displacement Curve

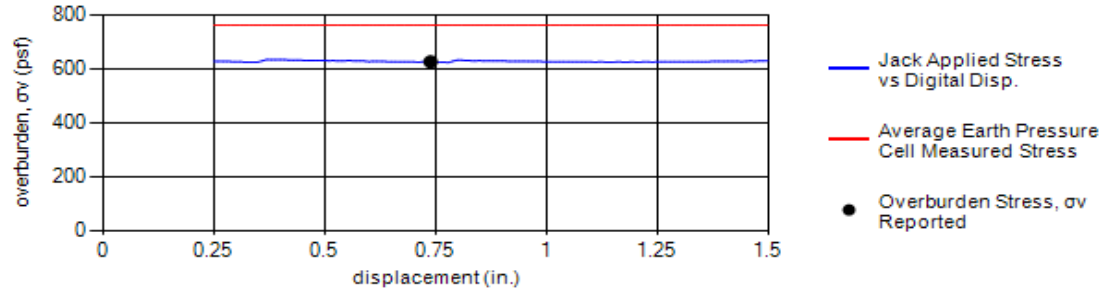


Comments

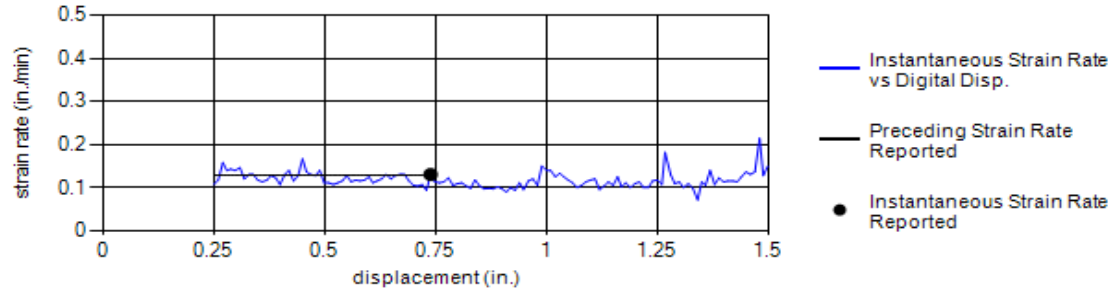
Personnel

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

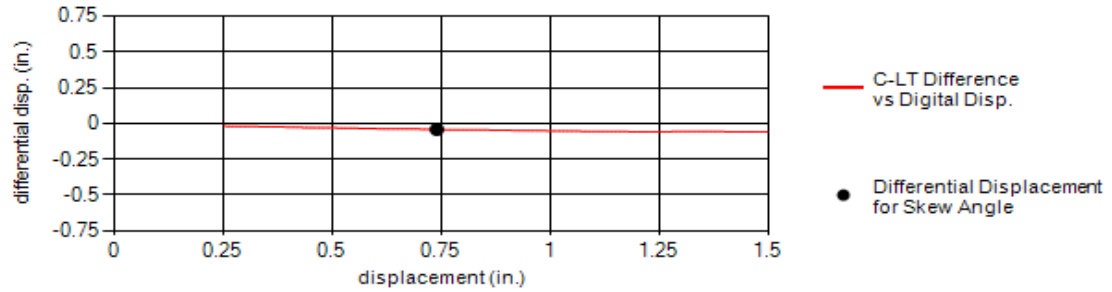
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
800	No Data	826	663	764	763	1.00	627



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.13	0.13	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	-0.04	No Data	-0.07	CW



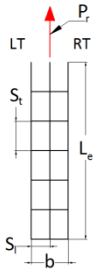
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	10/15/2010 9:35:00 AM
Test Identification:	TS15.02-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

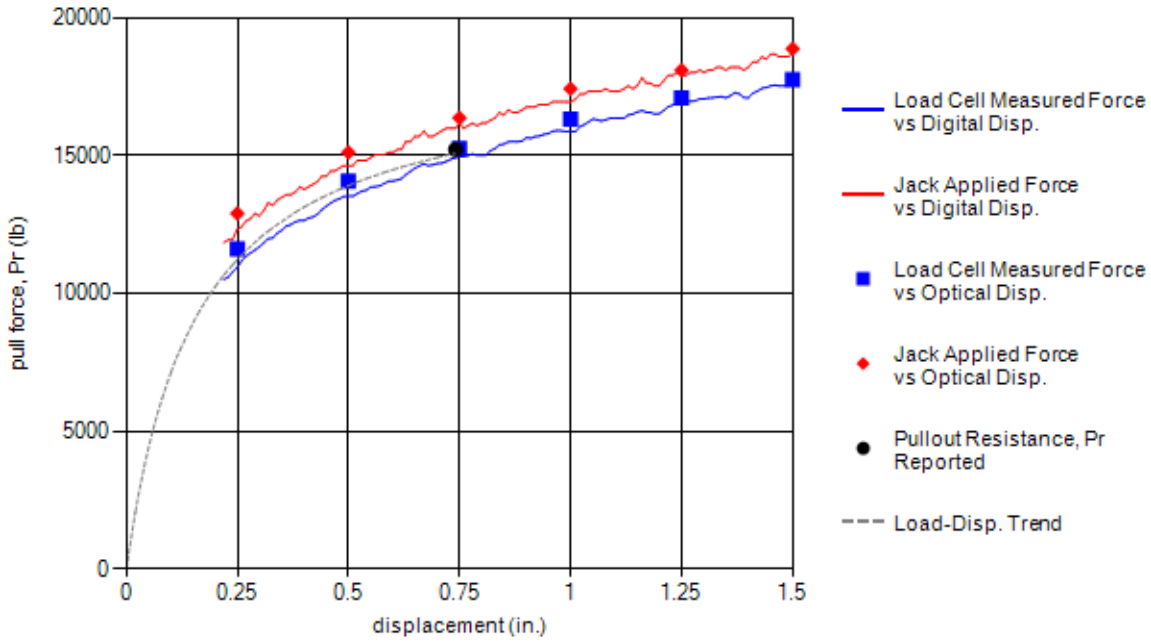
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	117.0	±1.4
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	4.4	±0.3%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	94.0	±1.1%

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	1525	15215	12.5	**0.55**

Load-Displacement Curve

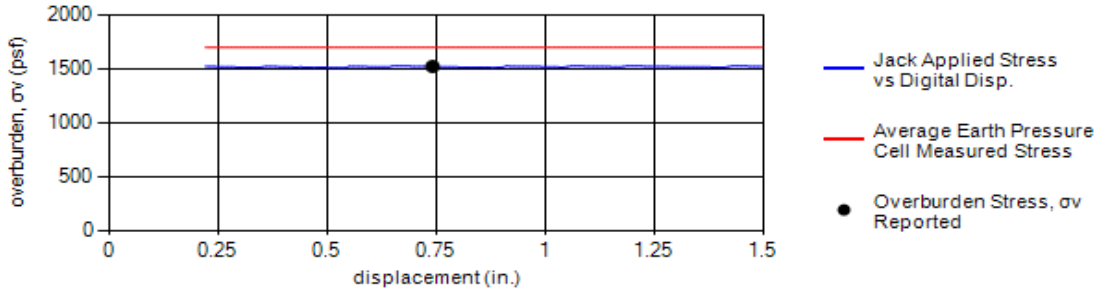


Comments

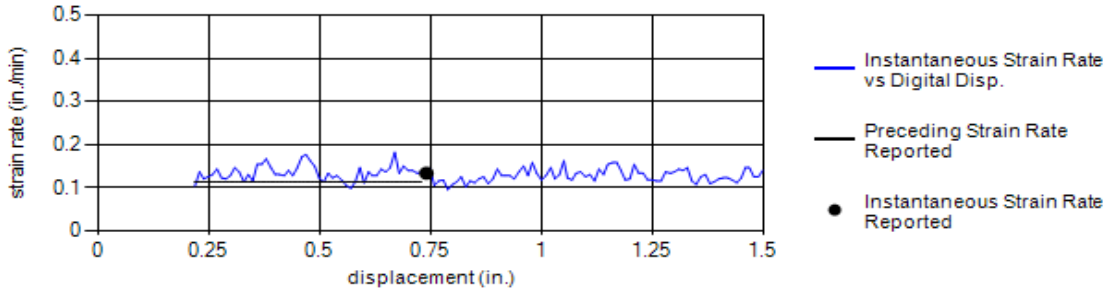
Personnel

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

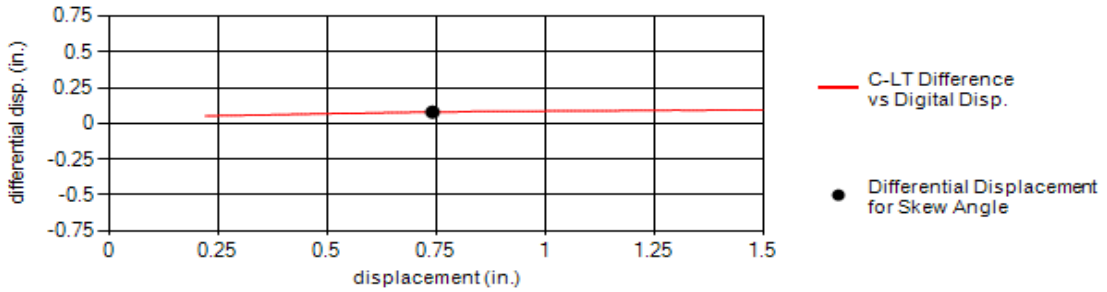
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1886	No Data	1698	1570	1657	1703	1.02	1524



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.13	0.11	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	0.08	No Data	0.13	CCW



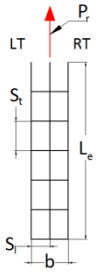
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	10/15/2010 10:10:00 AM
Test Identification:	TS15.03-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

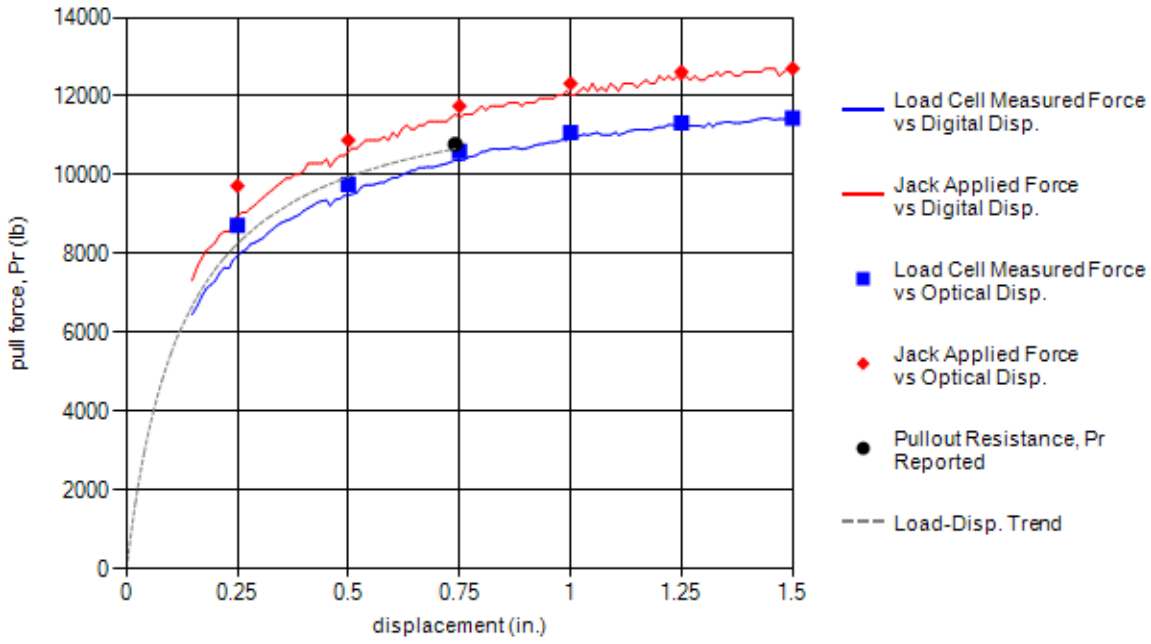
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	117.0	±1.4
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	4.4	±0.3%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	94.0	±1.1%

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	637	10780	5.2	**1.88**

Load-Displacement Curve

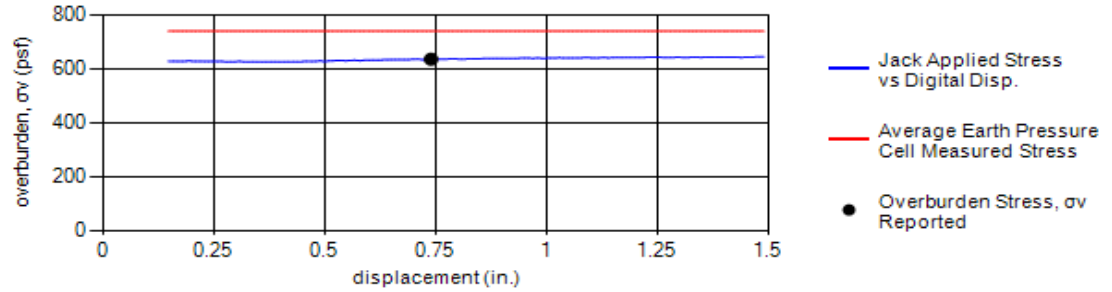


Comments

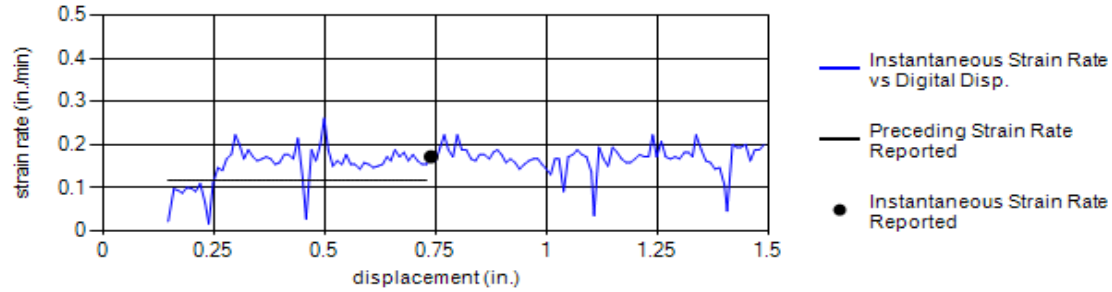
Personnel

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

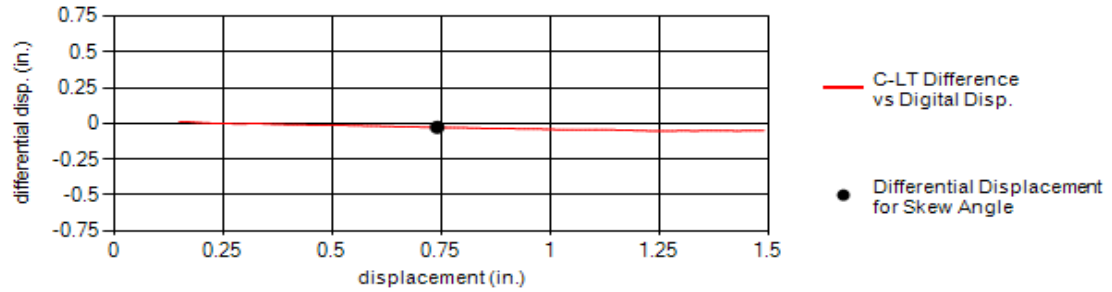
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
795	No Data	714	690	765	741	2.39	636



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.17	0.12	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	-0.03	No Data	-0.04	CW



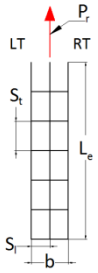
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	10/15/2010 10:43:00 AM
Test Identification:	TS15.04-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

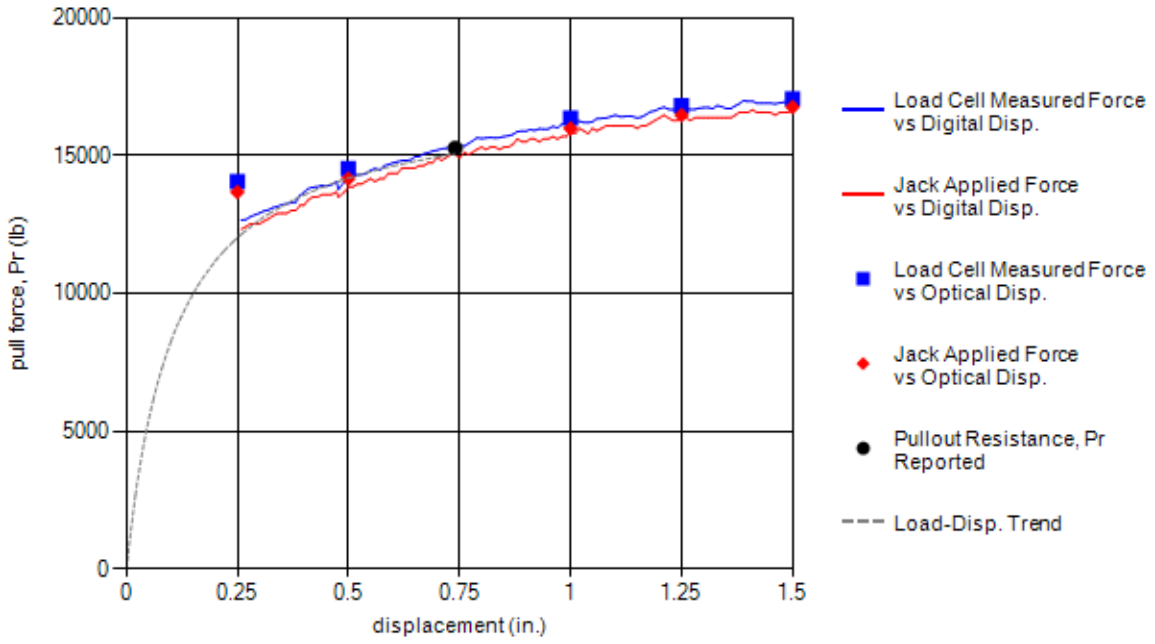
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	117.0	±1.4
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	4.4	±0.3%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	94.0	±1.1%

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	1533	15260	12.5	**1.11**

Load-Displacement Curve

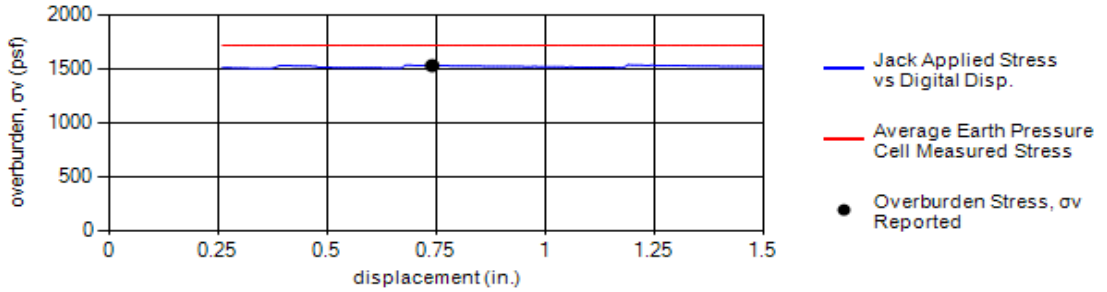


Comments

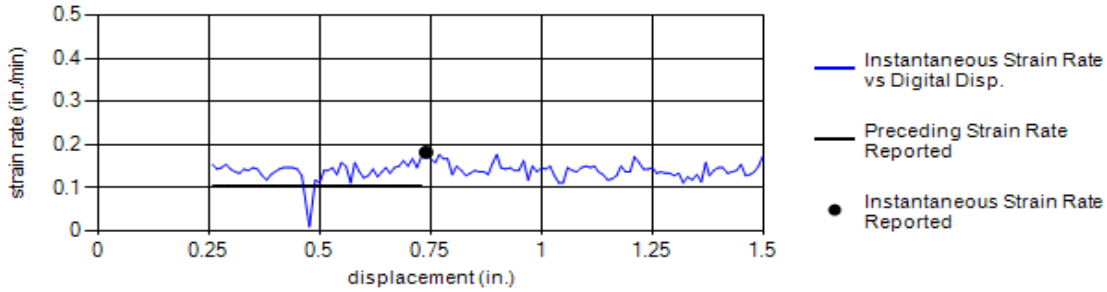
Personnel

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

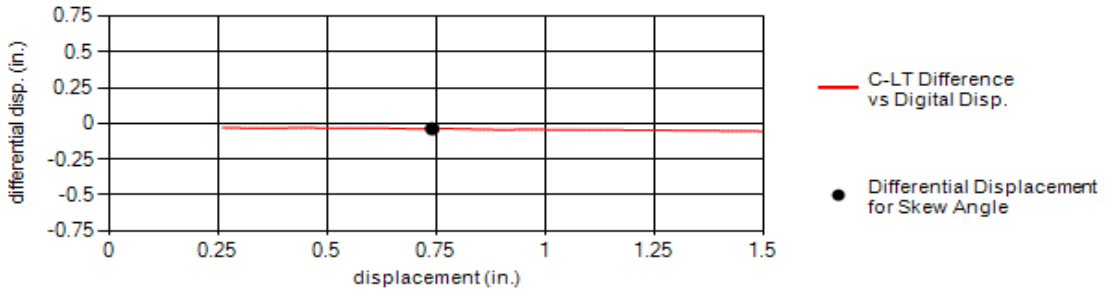
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1820	No Data	1810	1570	1678	1720	1.03	1532



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.18	0.10	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	-0.04	No Data	-0.06	CW



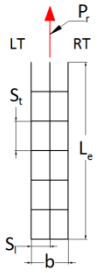
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	10/15/2010 1:52:00 PM
Test Identification:	TS15.05-G-9x12-W20xW15-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.):*	0.44	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

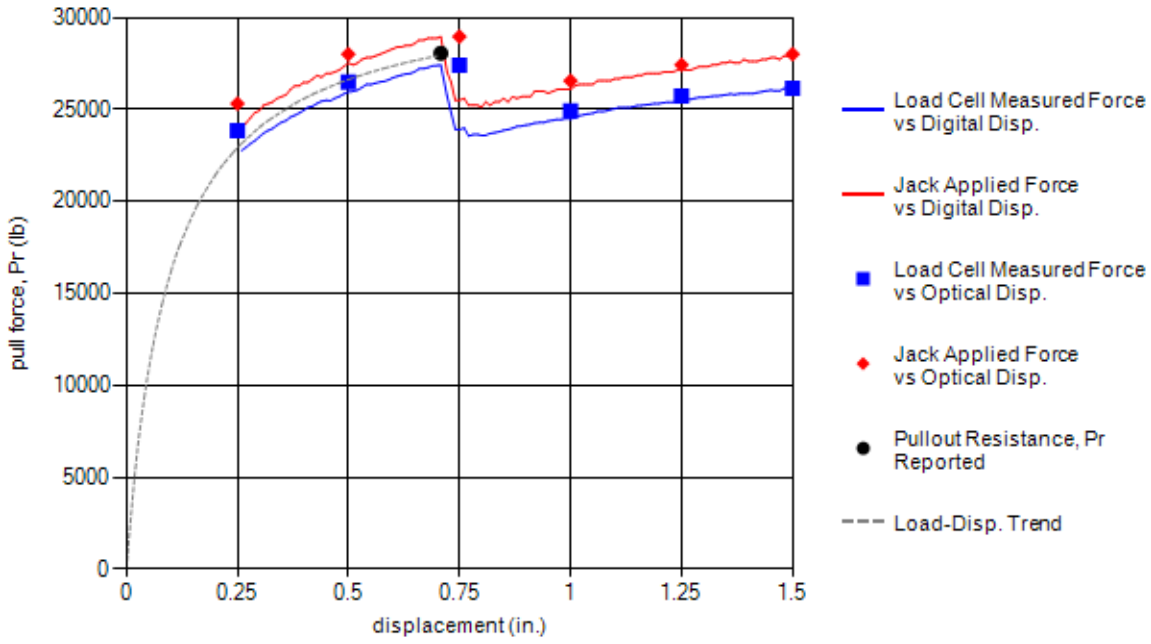
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	117.0	±1.4
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	4.4	±0.3%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	94.0	±1.1%

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	661	28049	5.4	**2.36**

Load-Displacement Curve

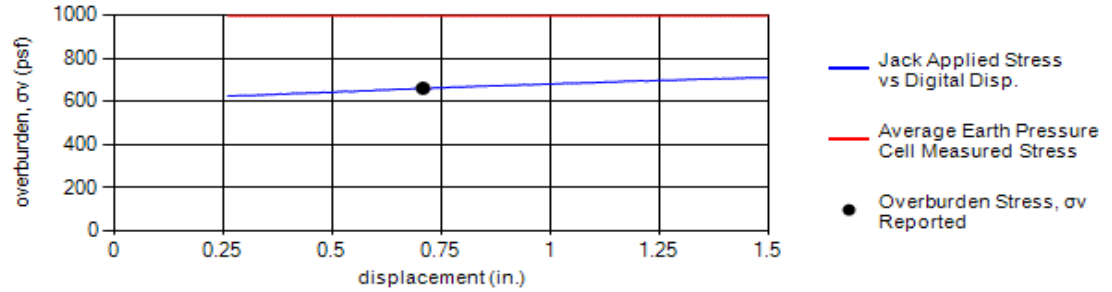


Comments

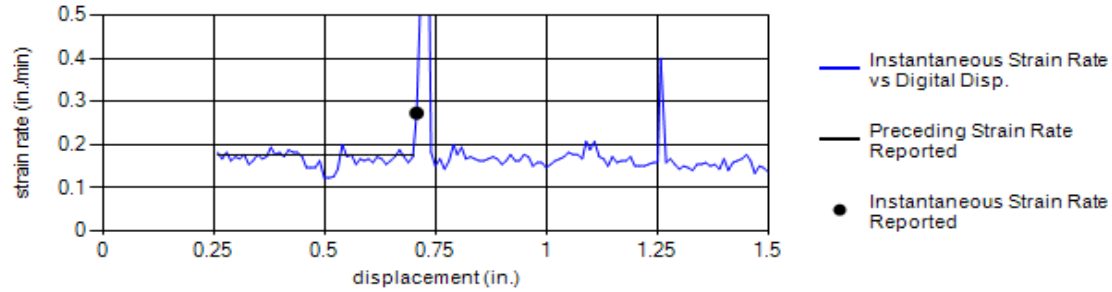
Personnel

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

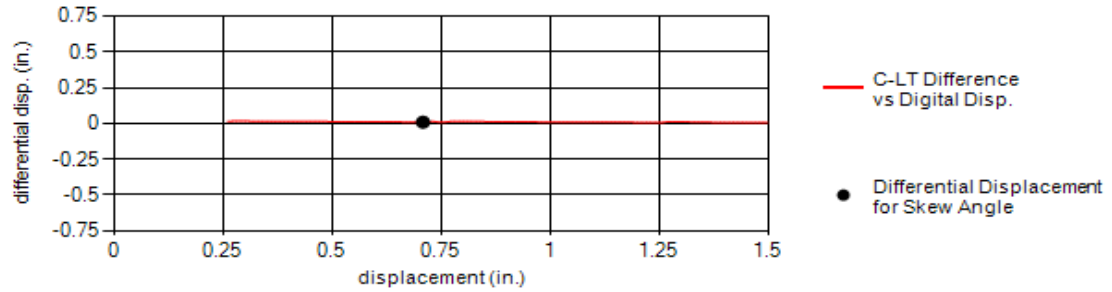
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1889	No Data	712	621	766	997	2.50	661



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.27	0.18	0.16



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	No Data	0.01	No Data	0.02	CCW



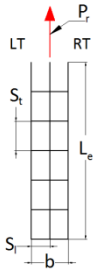
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	10/15/2010 2:27:00 PM
Test Identification:	TS15.06-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

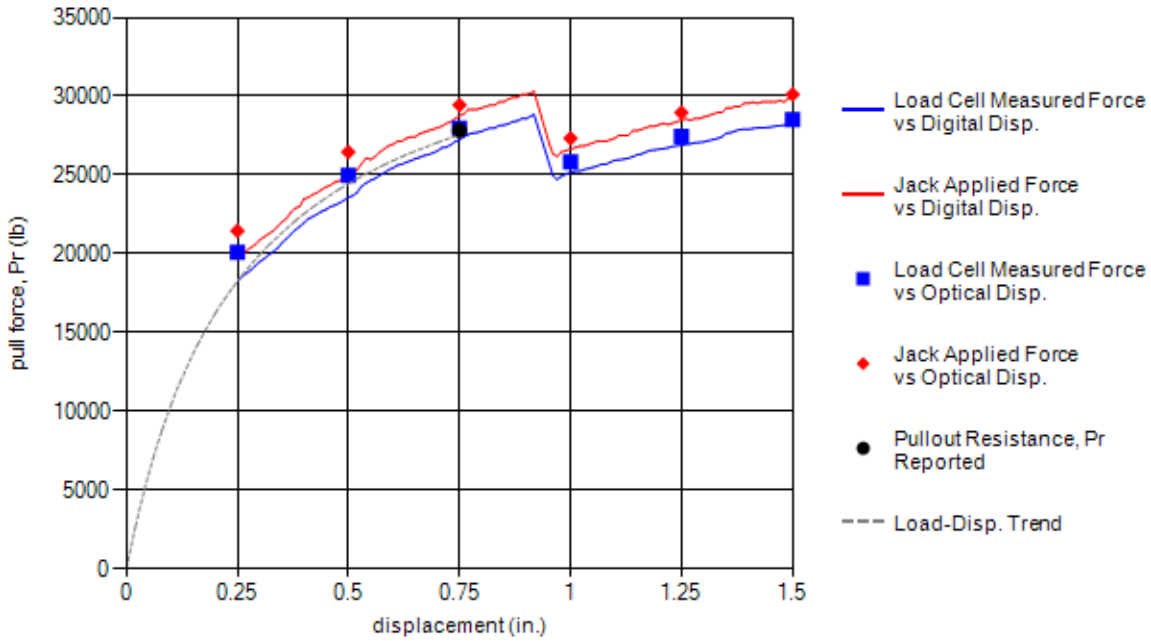
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	117.0	±1.4
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	4.4	±0.3%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	94.0	±1.1%

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	1512	27835	12.4	**1.02**

Load-Displacement Curve

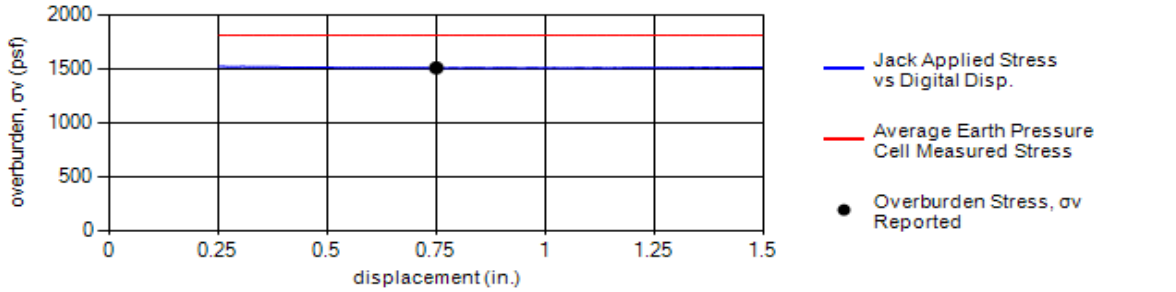


Comments

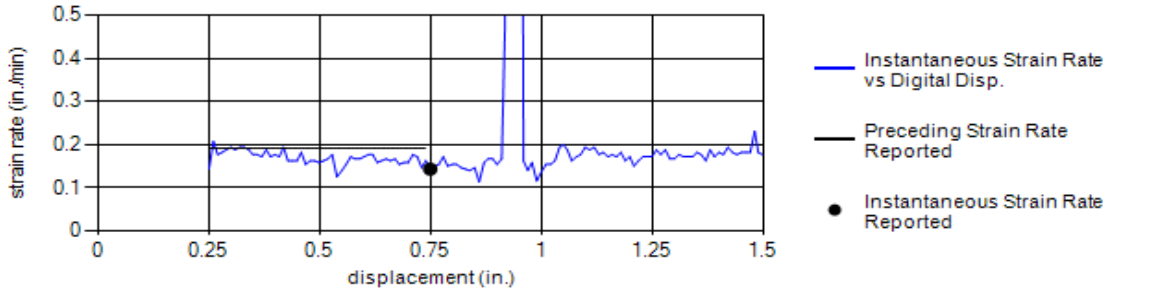
Personnel

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

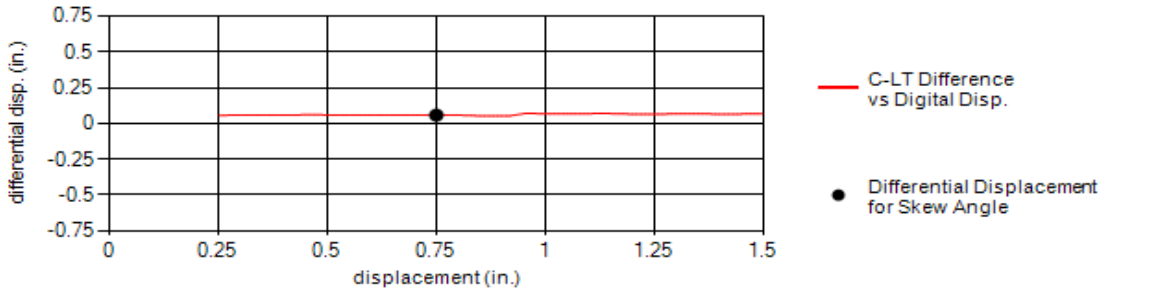
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2411	No Data	1738	1466	1642	1814	1.10	1511



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.14	0.19	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	0.06	No Data	0.09	CCW



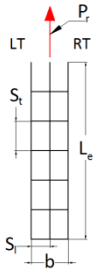
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	10/15/2010 2:54:00 PM
Test Identification:	TS15.07-G-9x12-W20xW15-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.):*	0.44	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

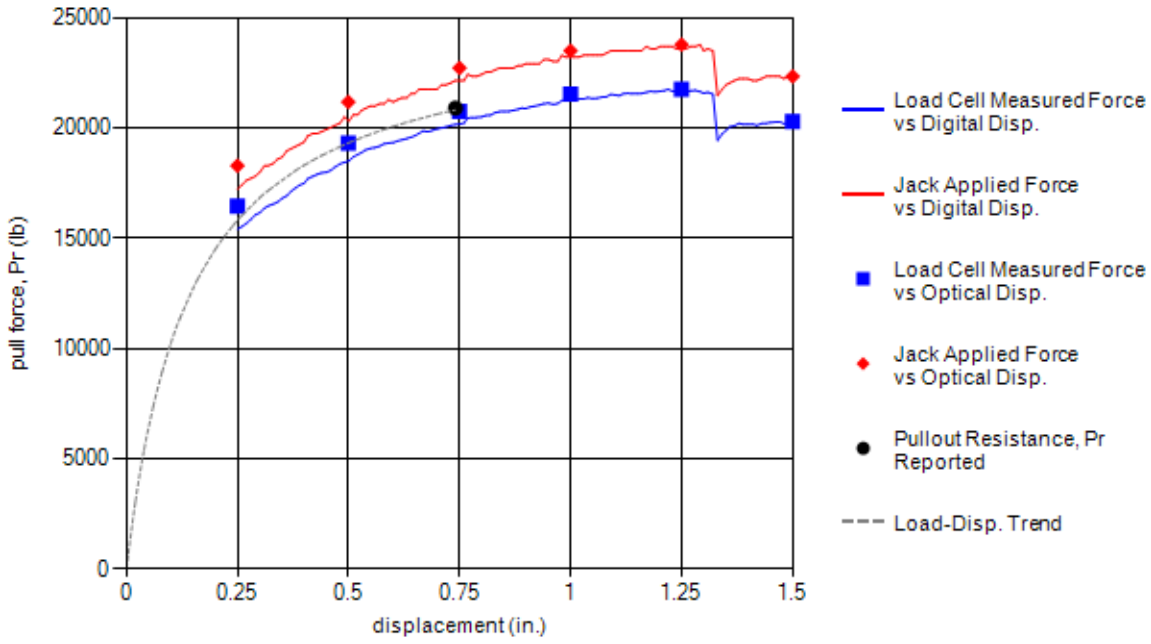
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	117.0	±1.4
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	4.4	±0.3%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	94.0	±1.1%

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	646	20893	5.3	**1.80**

Load-Displacement Curve

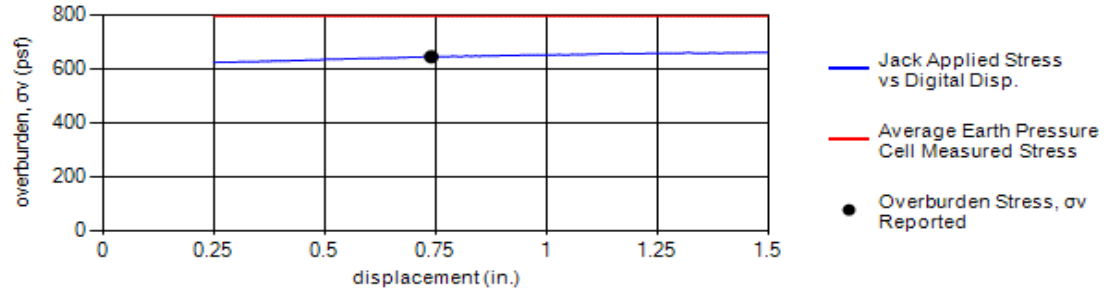


Comments

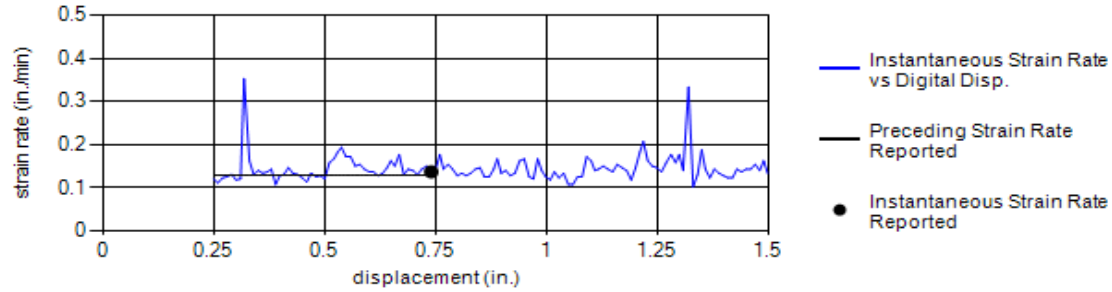
Personnel

Tested:	TW MB JL
Prepared:	SB TW
Checked:	WL PJ

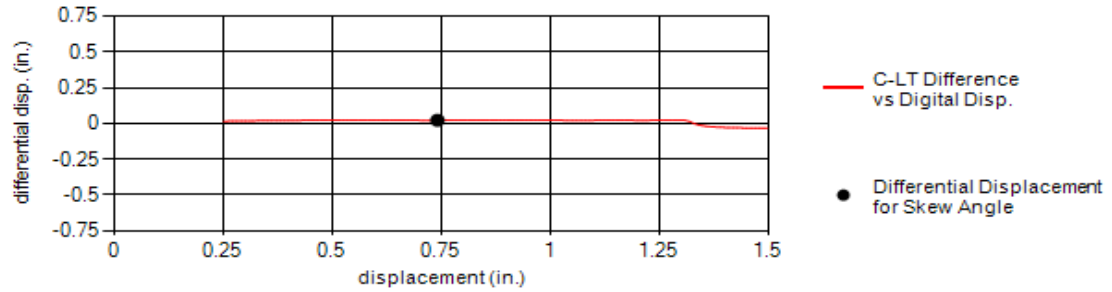
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1106	No Data	729	610	740	796	2.56	646



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.14	0.13	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	0.02	No Data	0.04	CCW



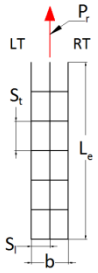
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	10/15/2010 3:21:00 PM
Test Identification:	TS15.08-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

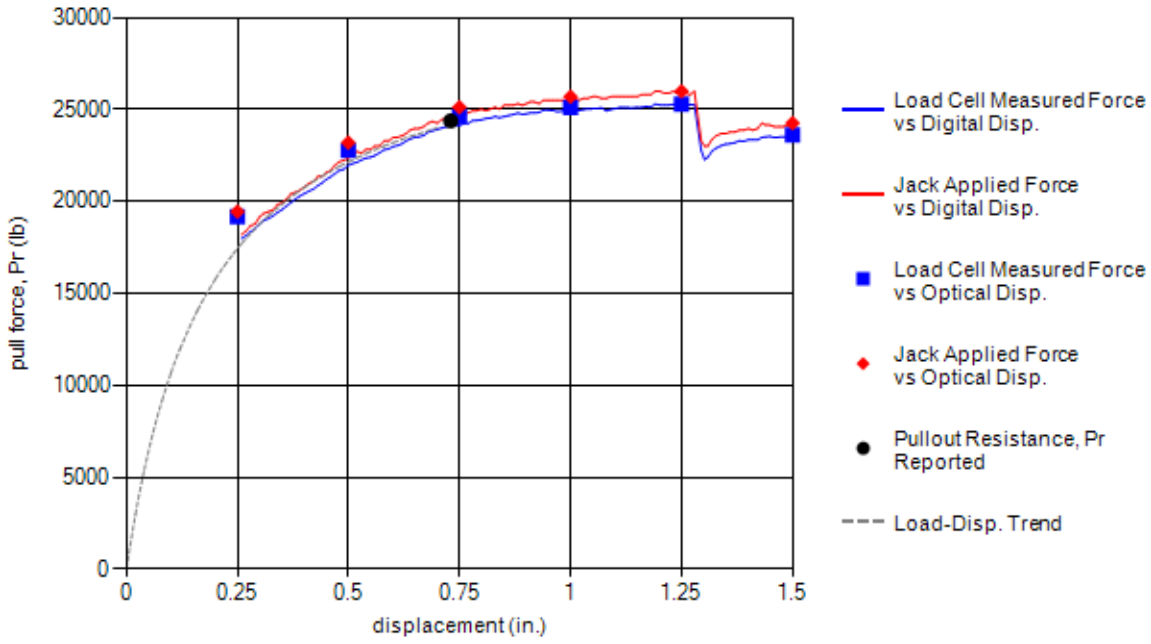
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	117.0 ±1.4
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	4.4 ±0.3%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	94.0 ±1.1%

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	1519	24373	12.4	**1.78**

Load-Displacement Curve

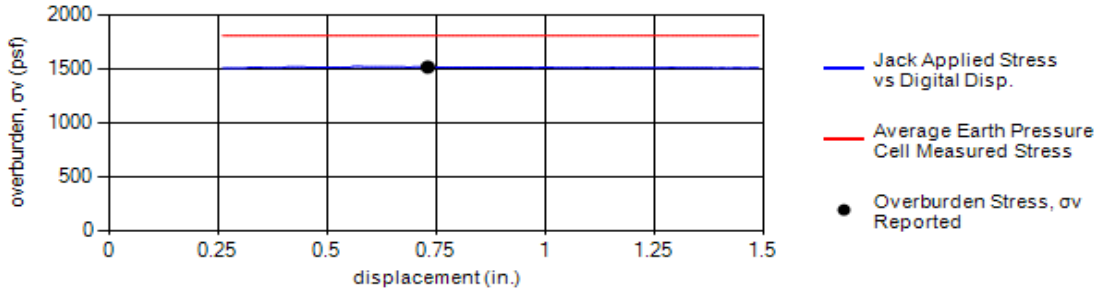


Comments

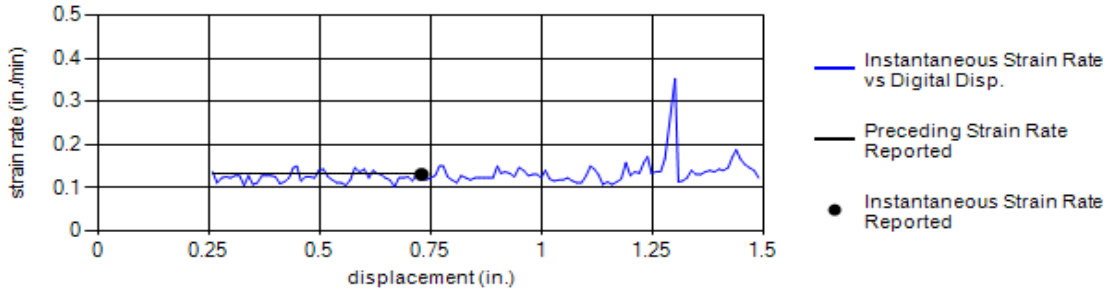
Personnel

Tested:	TW MB JL
Prepared:	SB TW
Checked:	WL PJ

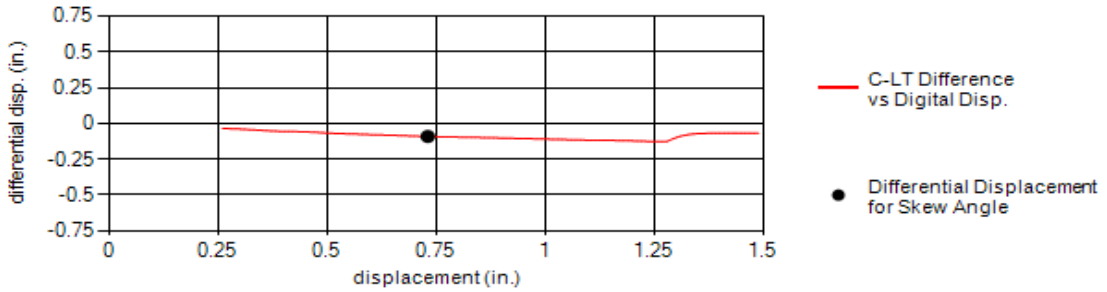
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2290	No Data	1873	1447	1632	1811	1.10	1519



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.13	0.13	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	-0.09	No Data	-0.14	CW



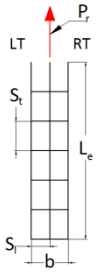
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	10/15/2010 1:16:00 PM
Test Identification:	TS15.09-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

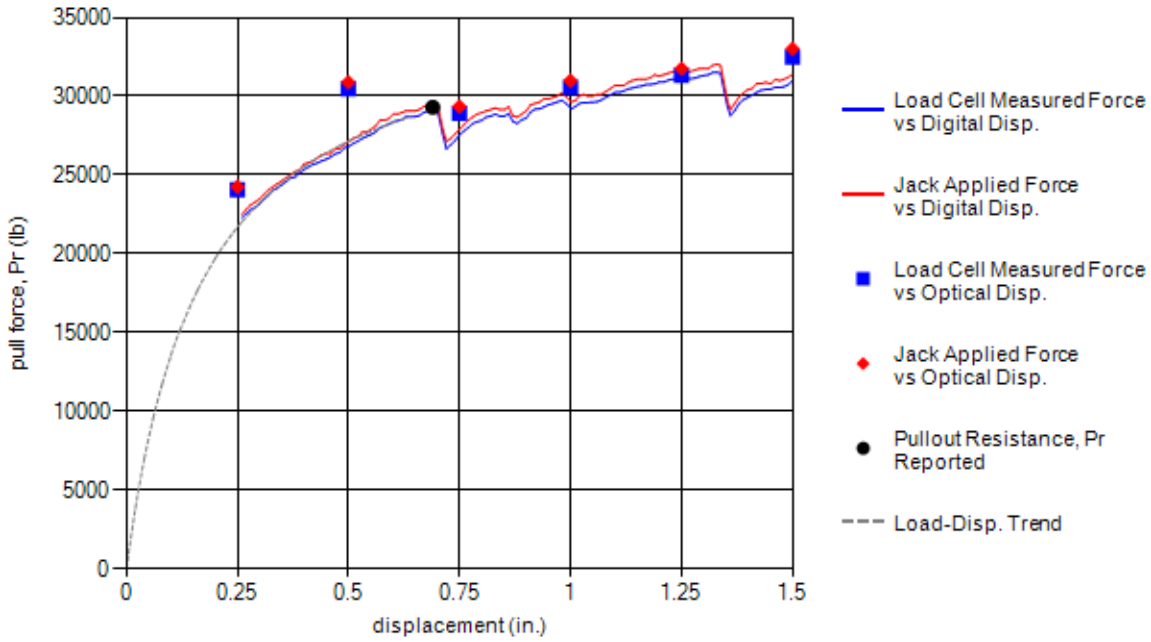
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	117.0	±1.4
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	4.4	±0.3%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	94.0	±1.1%

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	656	29296	5.4	**2.48**

Load-Displacement Curve

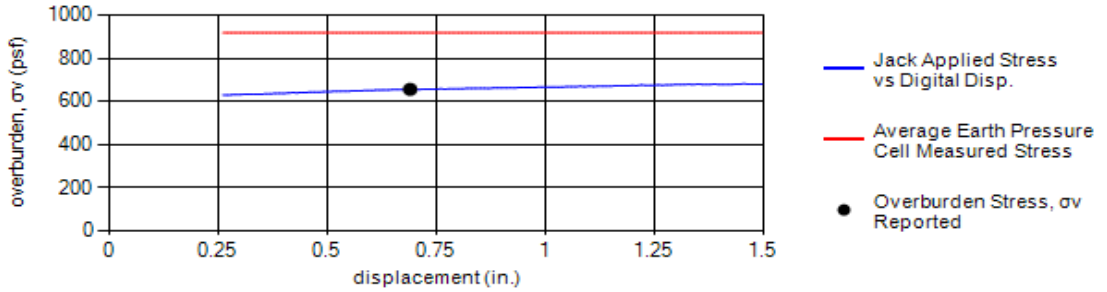


Comments

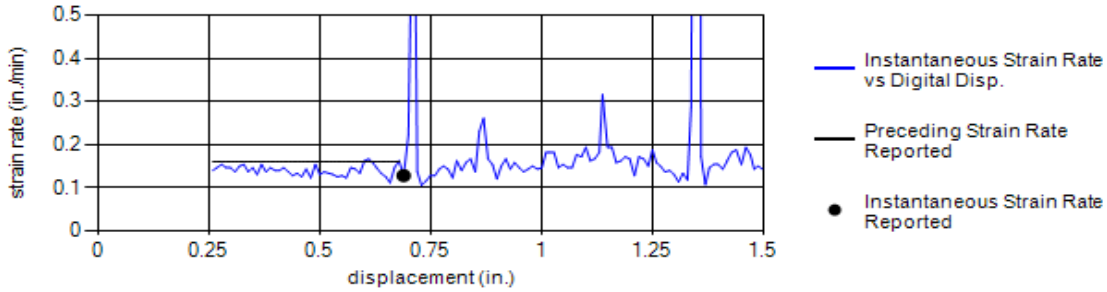
Personnel

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

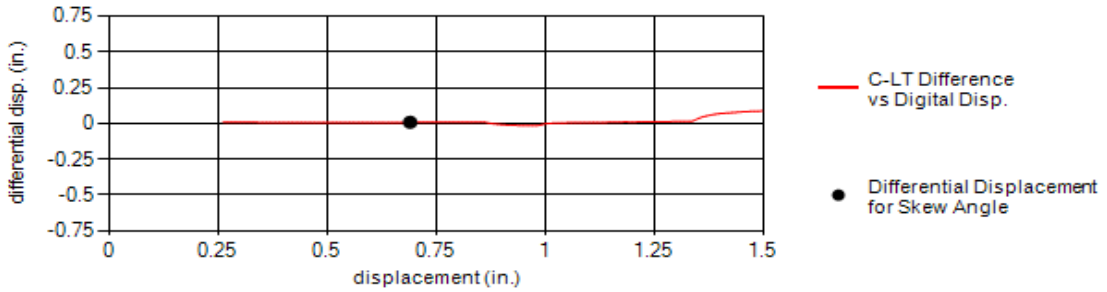
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1672	No Data	640	588	776	919	2.71	656



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.13	0.16	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	0.01	No Data	0.01	CCW



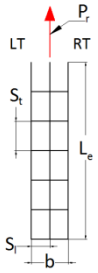
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	10/15/2010 12:47:00 PM
Test Identification:	TS15.10-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

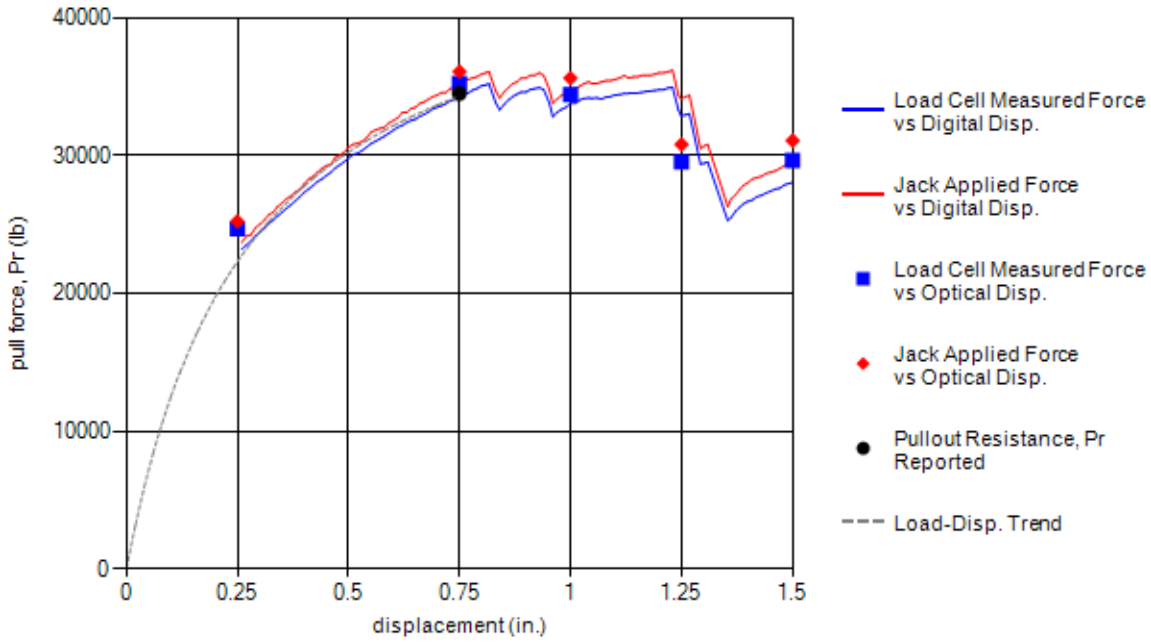
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	117.0	±1.4
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	4.4	±0.3%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	94.0	±1.1%

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	34492	12.4	**1.27**

Load-Displacement Curve

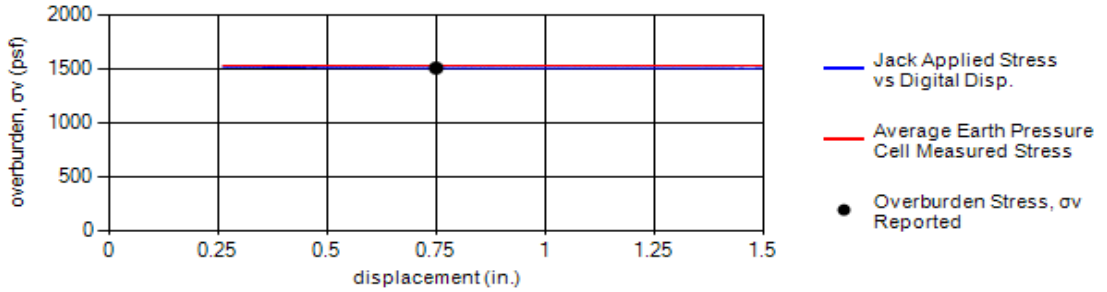


Comments

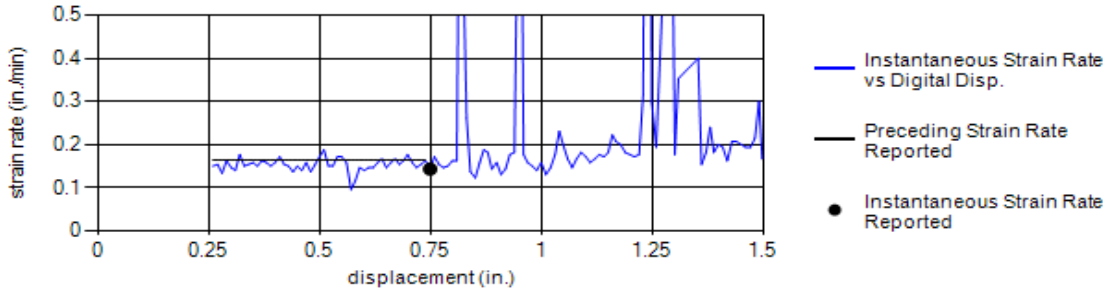
Personnel

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

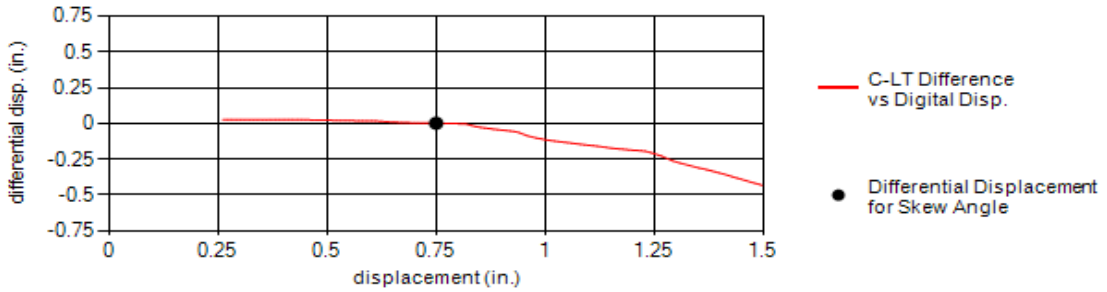
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1446	No Data	1614	1429	1645	1533	1.30	1510



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



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	No Data	0.00	No Data	0.00	CCW



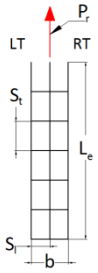
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	10/15/2010 12:14:00 PM
Test Identification:	TS15.11-G-9x6-W20xW15-L3-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):	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

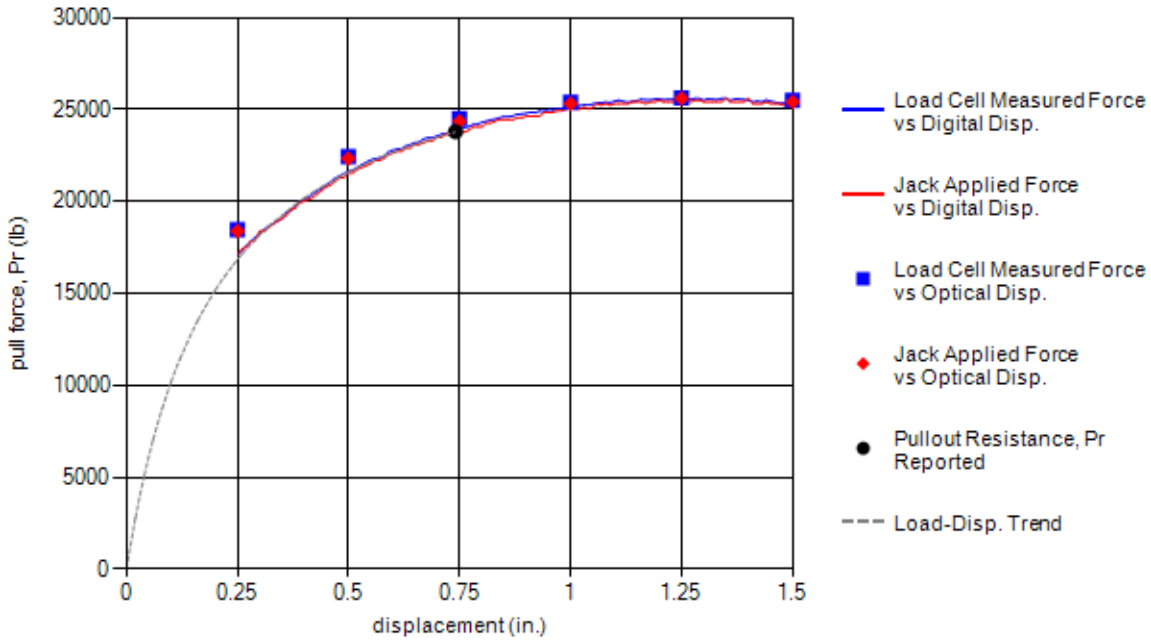
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	117.0	±1.4
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	4.4	±0.3%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	94.0	±1.1%

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****
Pullout	0.74	640	23790	5.2	**4.13**

Load-Displacement Curve

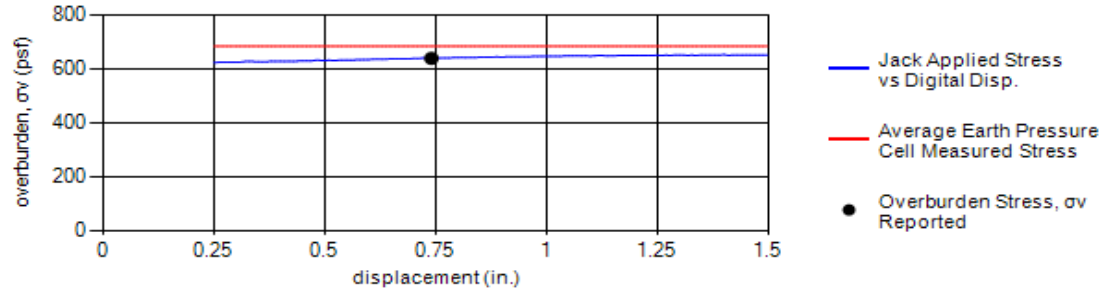


Comments

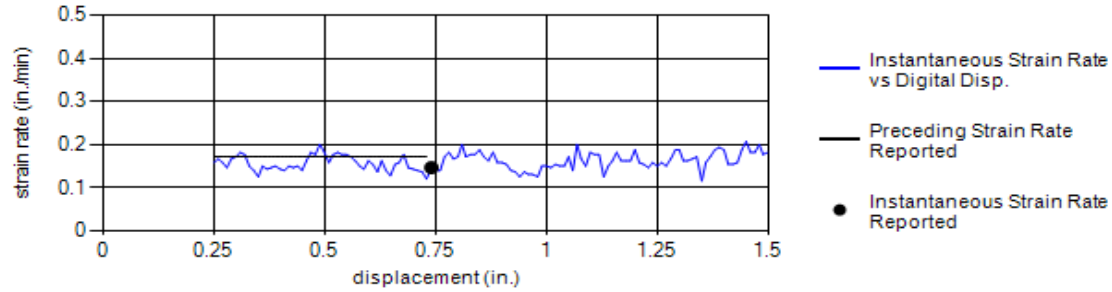
Personnel

Tested:	TW JL MB
Prepared:	SB TW
Checked:	WL PJ

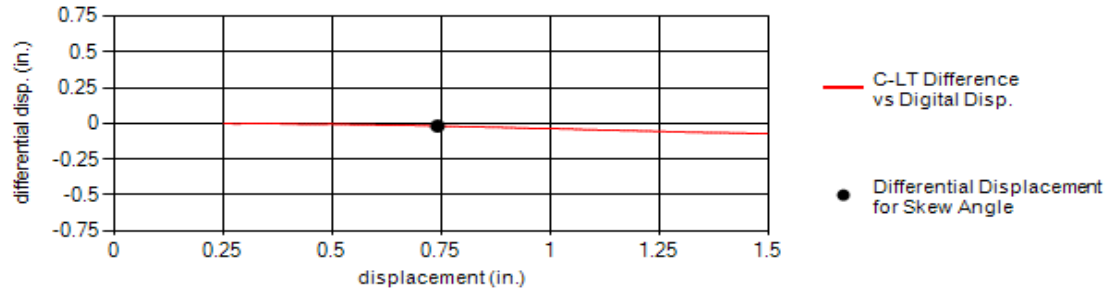
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
699	No Data	674	600	766	685	2.90	640



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.15	0.17	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	-0.02	No Data	-0.03	CW



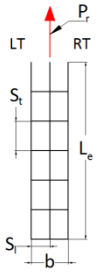
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	10/15/2010 11:37:00 AM
Test Identification:	TS15.12-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

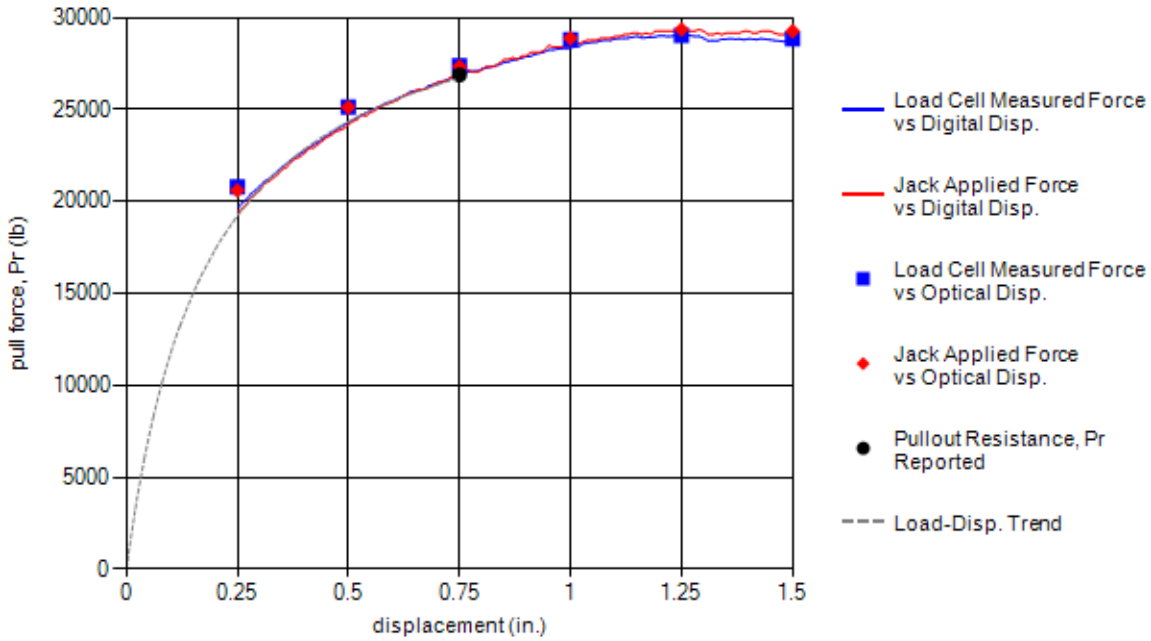
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	117.0	±1.4
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	4.4	±0.3%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	94.0	±1.1%

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****
Pullout	0.75	1509	26872	12.3	**1.98**

Load-Displacement Curve

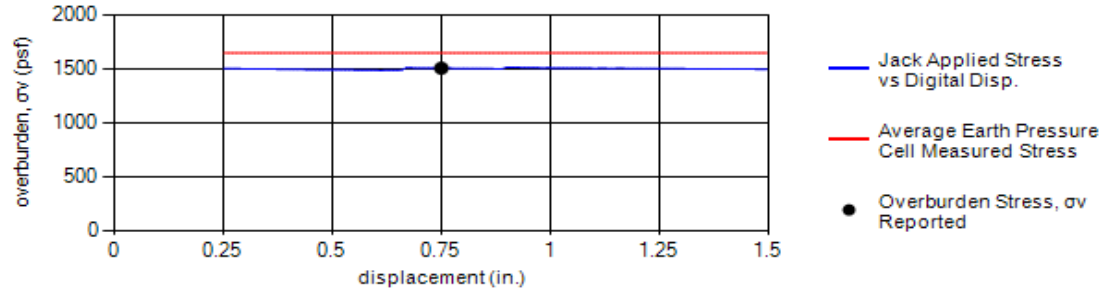


Comments

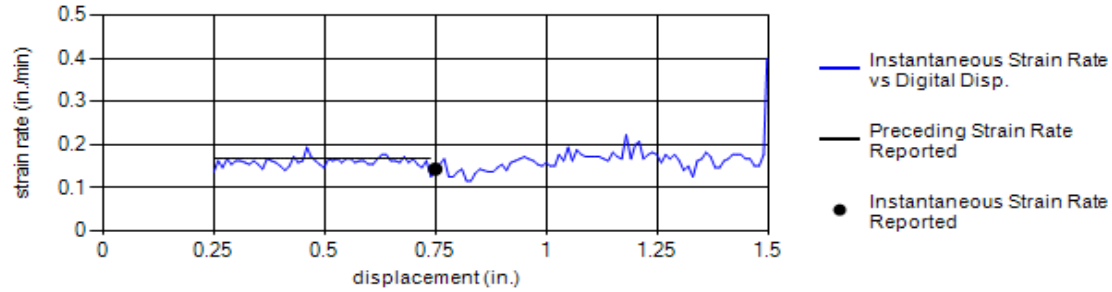
Personnel

Tested:	TW JL MB
Prepared:	SB TW
Checked:	WL PJ

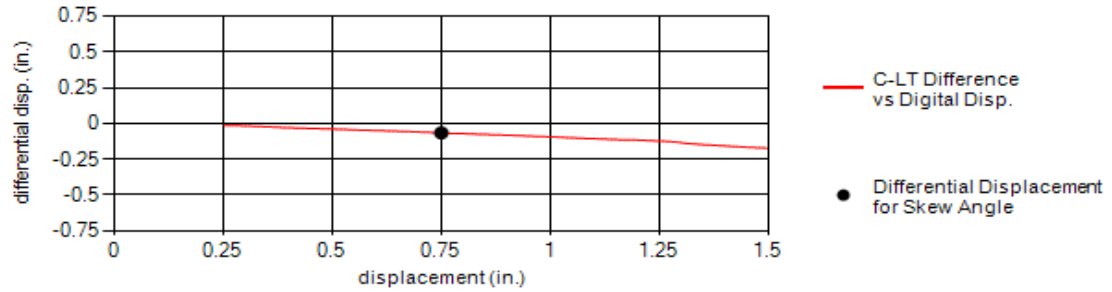
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1783	No Data	1764	1432	1620	1650	1.21	1508



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.14	0.17	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	-0.07	No Data	-0.10	CW



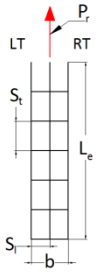
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	10/25/2010 12:07:00 PM
Test Identification:	TS16.01-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

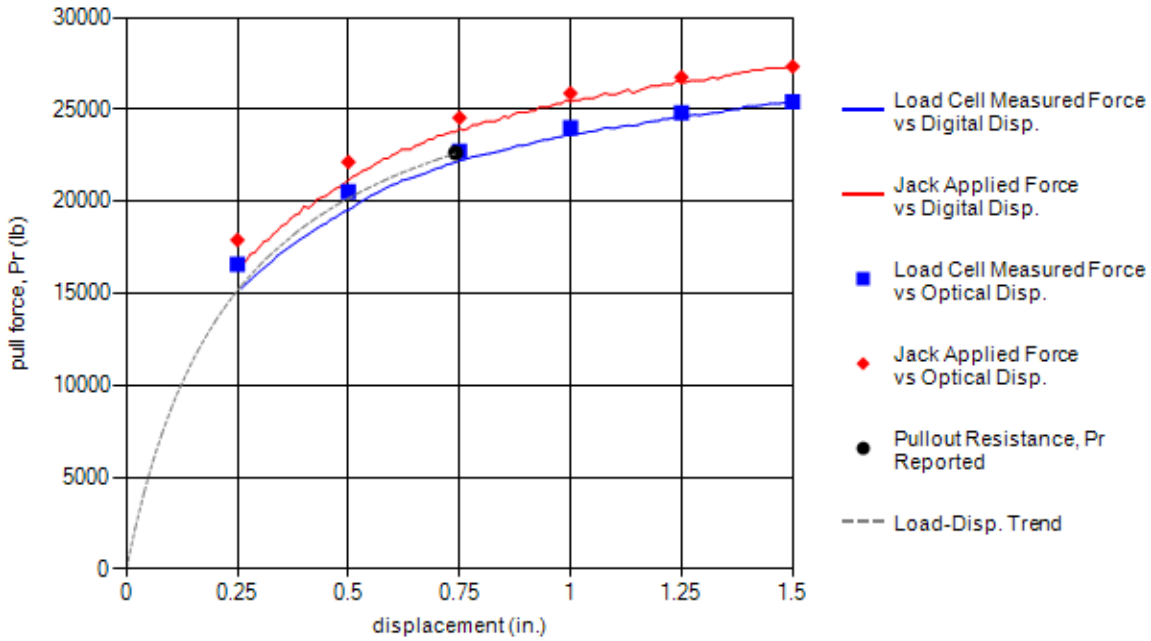
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	119.8	±2.4
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	5.7	±0.2%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	96.2	±1.9%

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****
Pullout	0.74	672	22636	5.3	**1.25**

Load-Displacement Curve

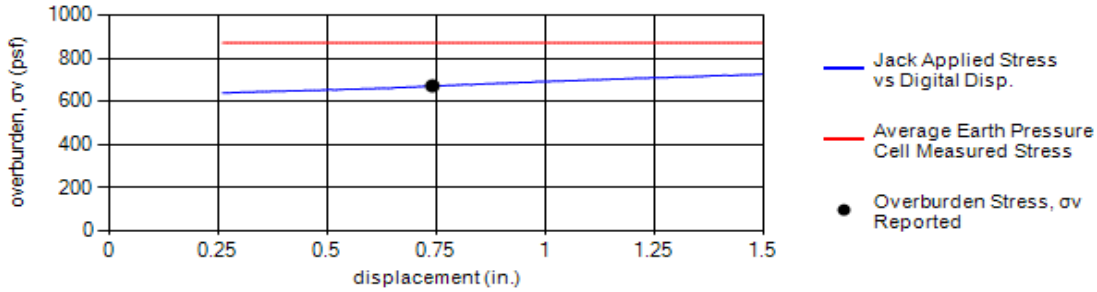


Comments

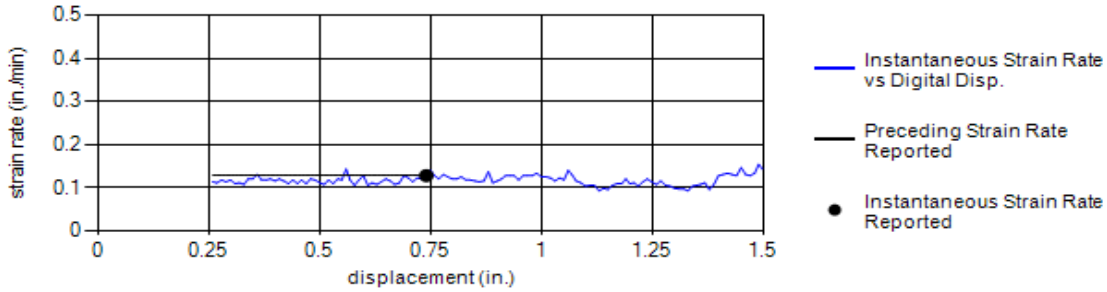
Personnel

Tested:	TW JL SH
Prepared:	SB TW
Checked:	WL PJ

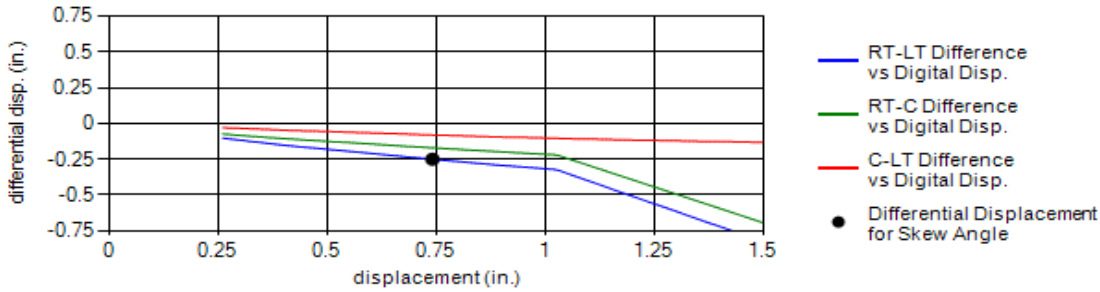
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1240	No Data	766	556	926	872	7.56	672



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



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
-0.25	-0.17	-0.08	No Data	-0.79	CW



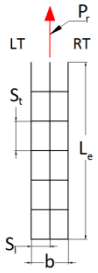
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	10/25/2010 11:32:00 AM
Test Identification:	TS16.02-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

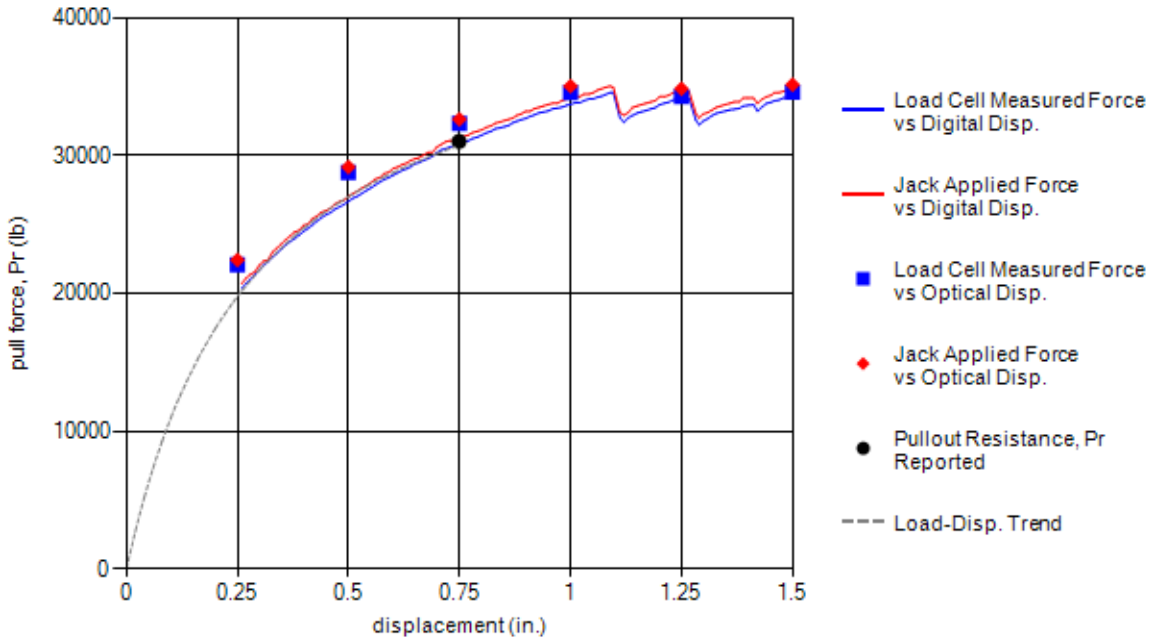
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	119.8	±2.4
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	5.7	±0.2%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	96.2	±1.9%

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	1555	31007	12.3	**0.74**

Load-Displacement Curve

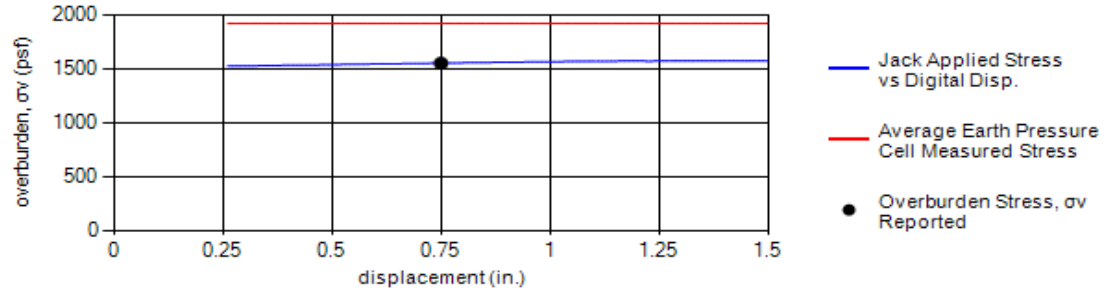


Comments

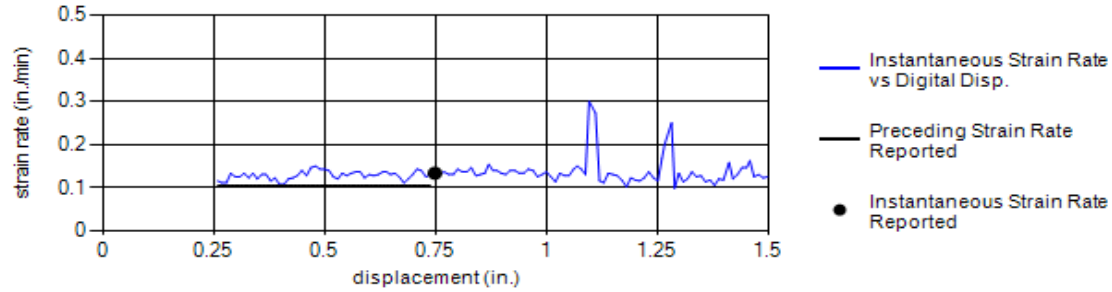
Personnel

Tested:	MB TW JL
Prepared:	SB TW
Checked:	WL PJ

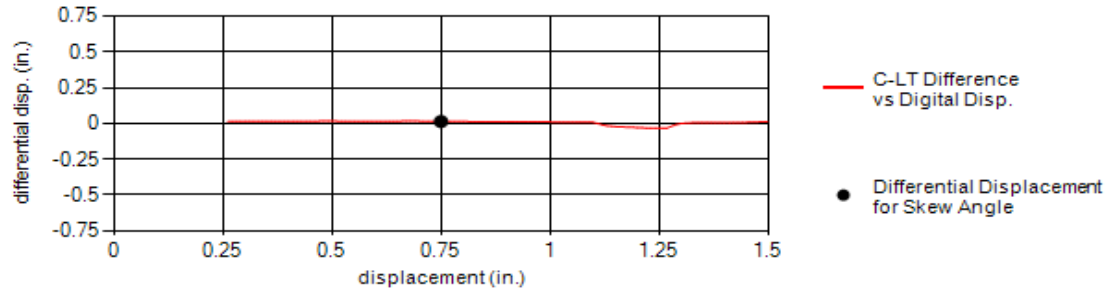
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2104	No Data	1839	1526	2224	1923	3.27	1555



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.13	0.11	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	0.01	No Data	0.02	CCW



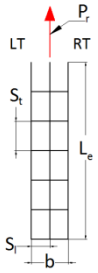
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	10/25/2010 10:52:00 AM
Test Identification:	TS16.03-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

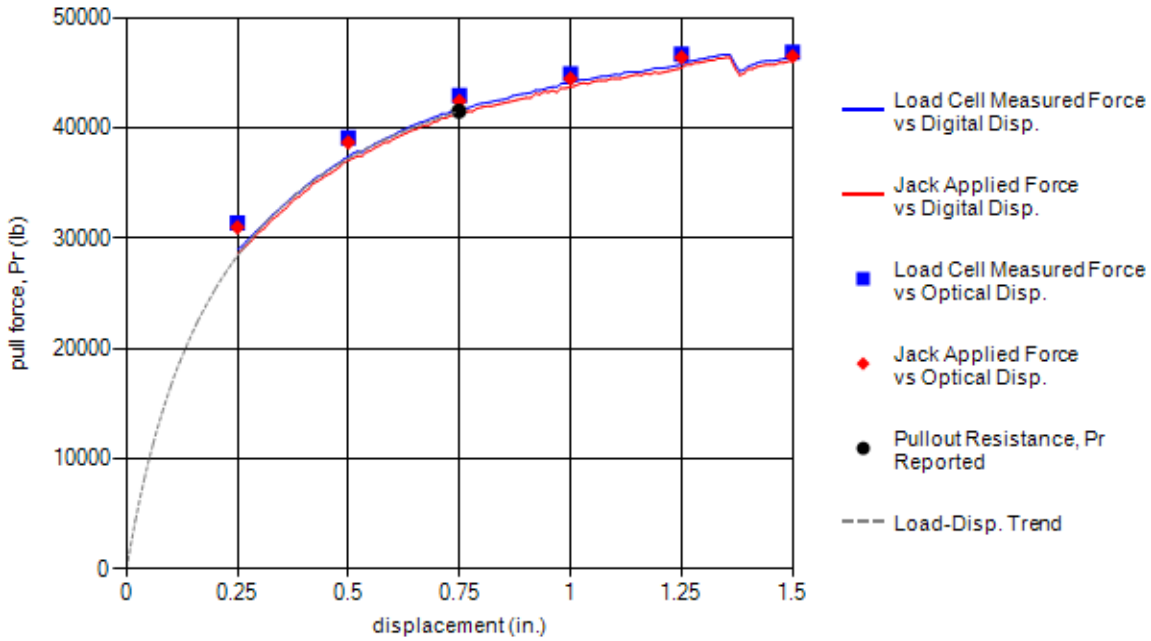
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	119.8	±2.4
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	5.7	±0.2%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	96.2	±1.9%

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****
Pullout	0.75	2569	41513	20.3	**0.60**

Load-Displacement Curve

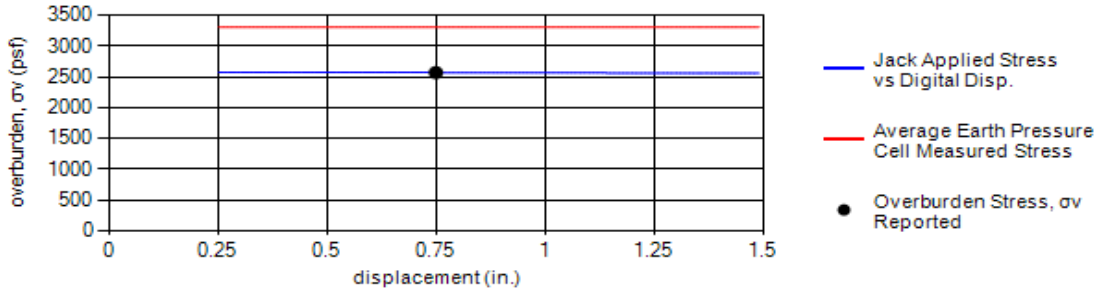


Comments

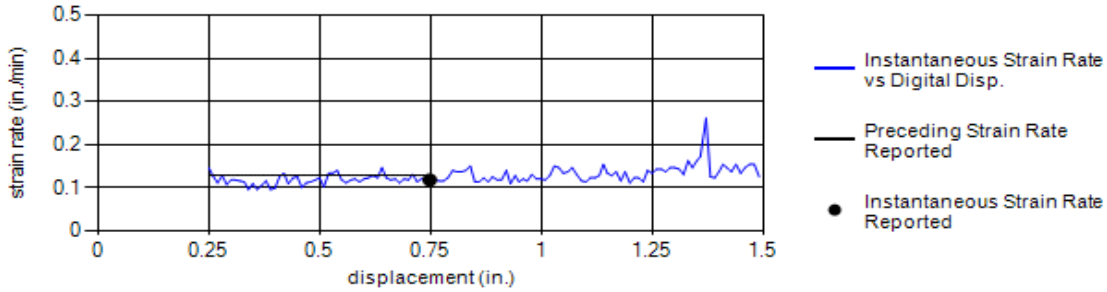
Personnel

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

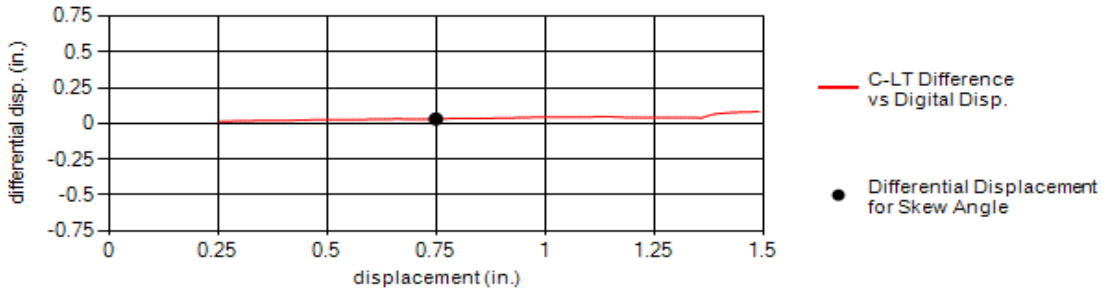
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3521	No Data	3213	2804	3695	3308	1.98	2569



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.12	0.13	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	0.03	No Data	0.05	CCW



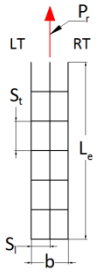
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	10/25/2010 10:22:00 AM
Test Identification:	TS16.04-G-9x18-W20xW15-L9-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):	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

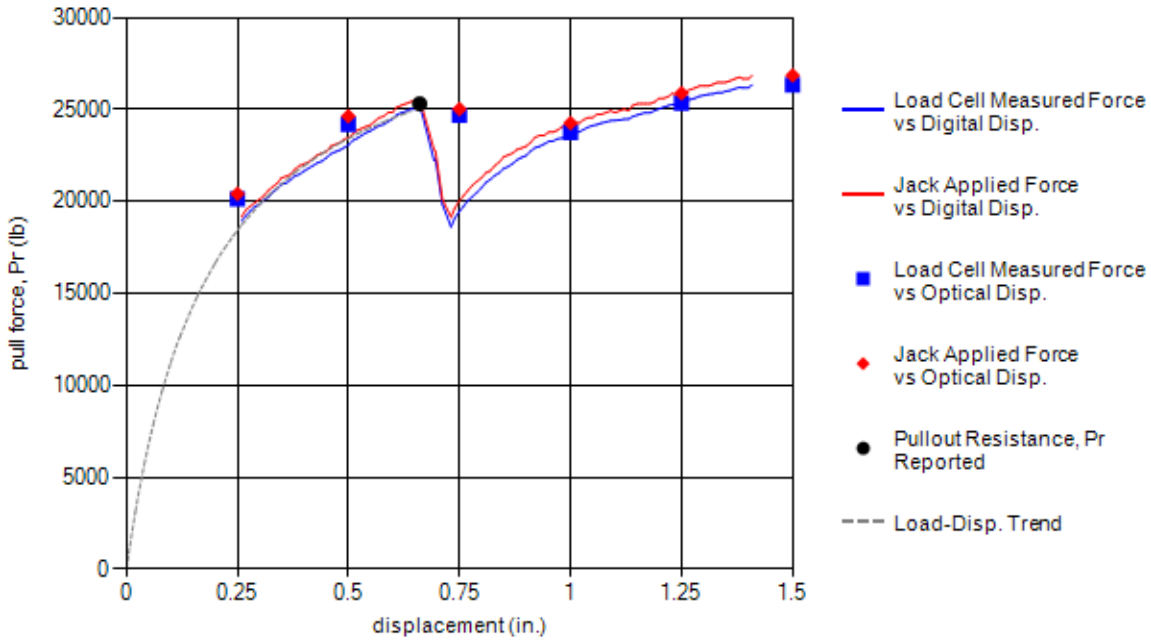
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	119.8	±2.4
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	5.7	±0.2%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	96.2	±1.9%

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	5079	25303	40.1	**0.18**

Load-Displacement Curve

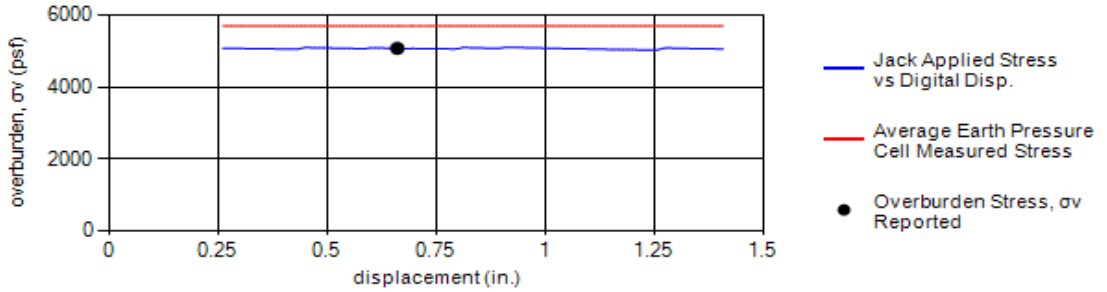


Comments

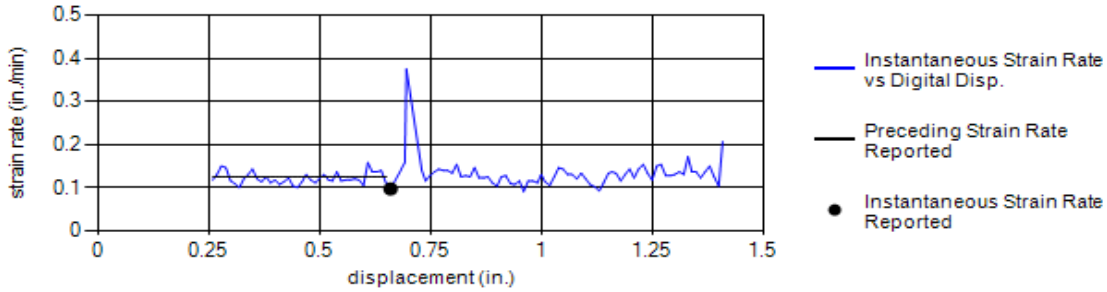
Personnel

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

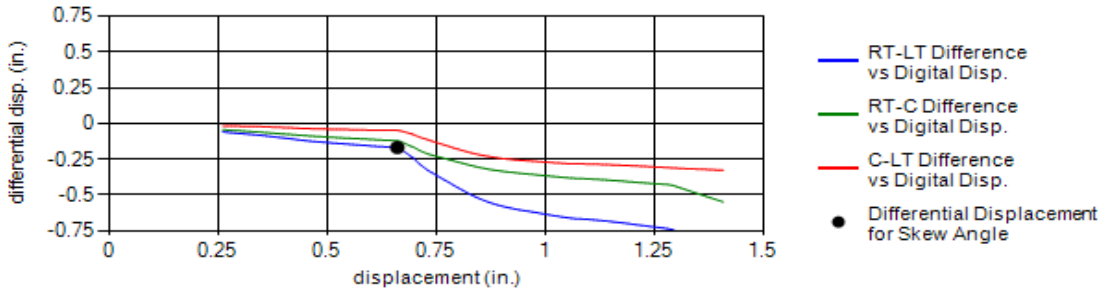
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
6708	No Data	5416	4625	6062	5703	1.03	5079



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.10	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	-0.12	-0.05	No Data	-0.54	CW



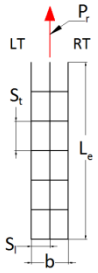
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	10/25/2010 3:57:00 PM
Test Identification:	TS16.05-G-9x18-W20xW15-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.):*	0.44	*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 B

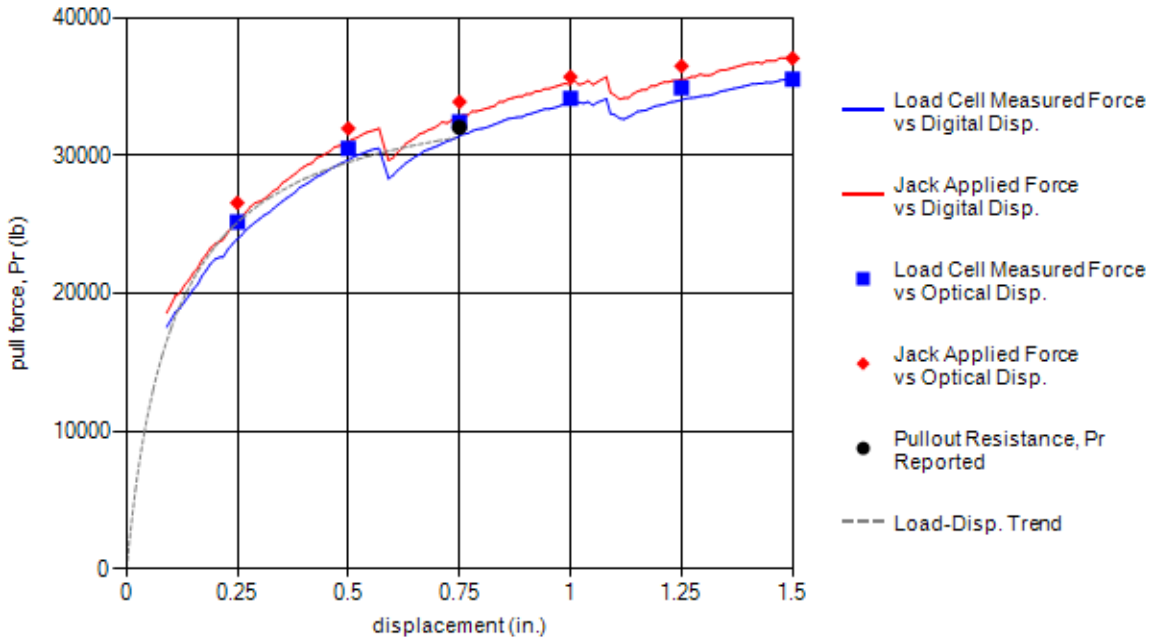
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	119.8	±2.4
Moisture Content, w (%):	5.7	±0.2%
Relative Compaction, C_R (%):	96.2	±1.9%

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	0.75	669	32030	5.3	**1.77**

Load-Displacement Curve

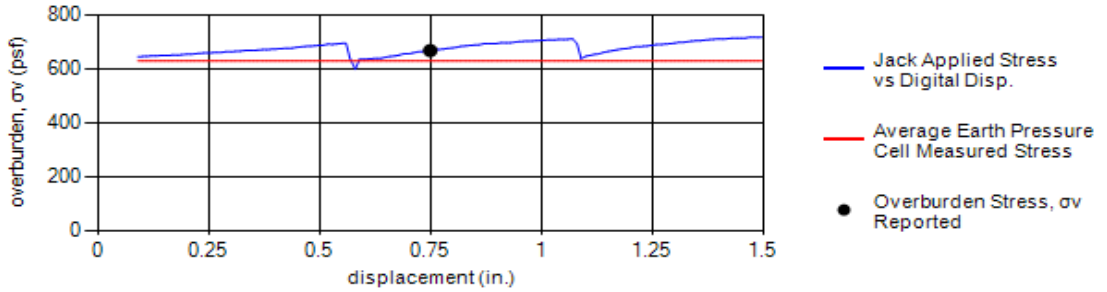


Comments

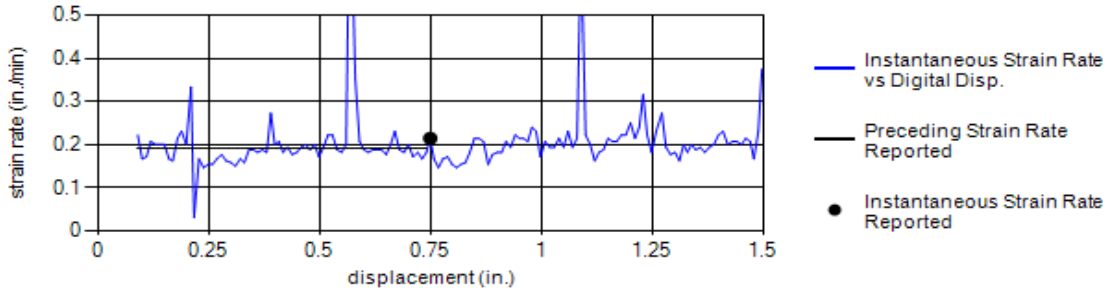
Personnel

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

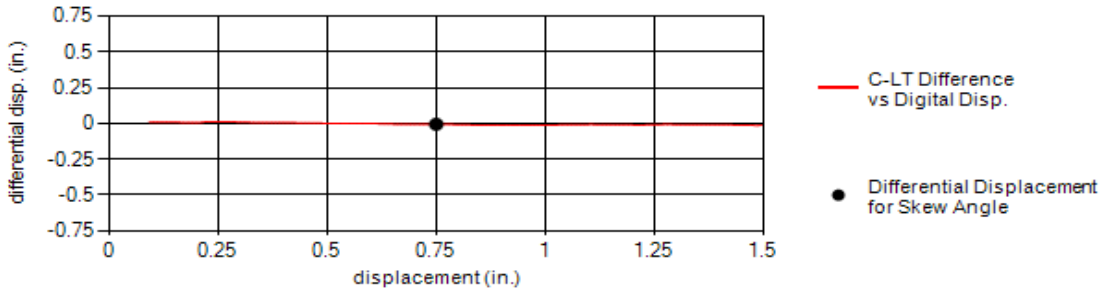
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1229	No Data	341	355	598	630	9.50	669



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.21	0.19	0.18



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	No Data	-0.01	No Data	-0.01	CW



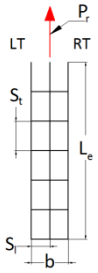
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	10/26/2010 8:21:00 AM
Test Identification:	TS16.06-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

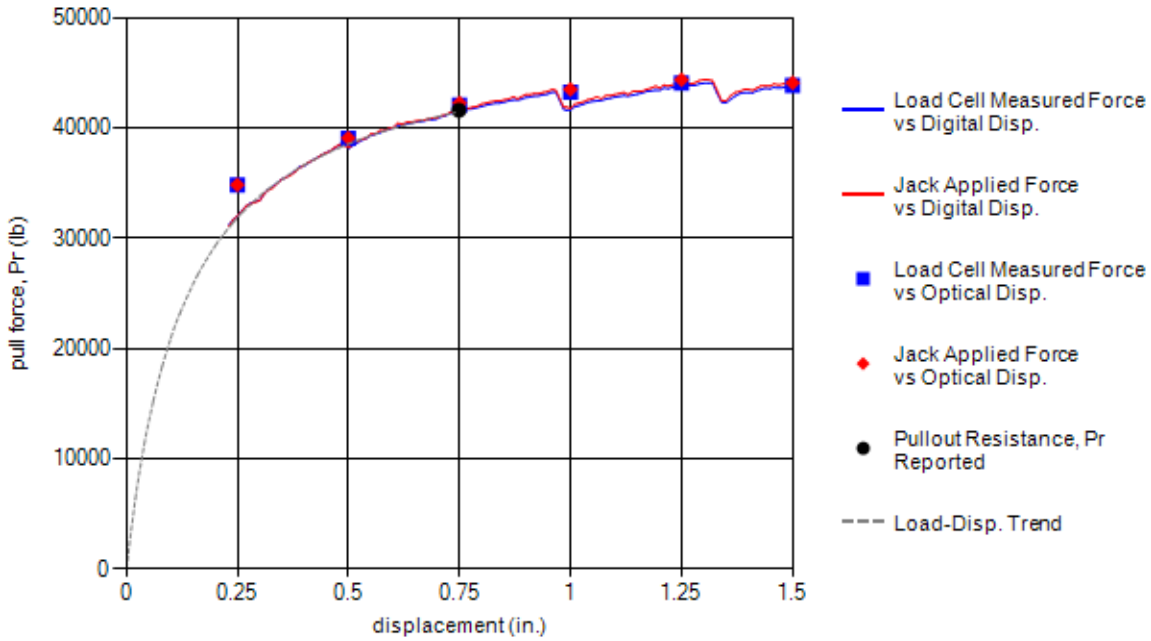
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	119.8	±2.4
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	5.7	±0.2%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	96.2	±1.9%

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	1536	41589	12.1	**1.00**

Load-Displacement Curve

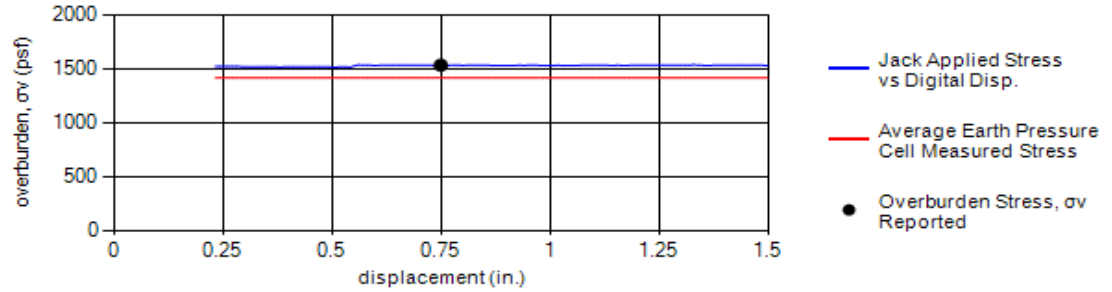


Comments

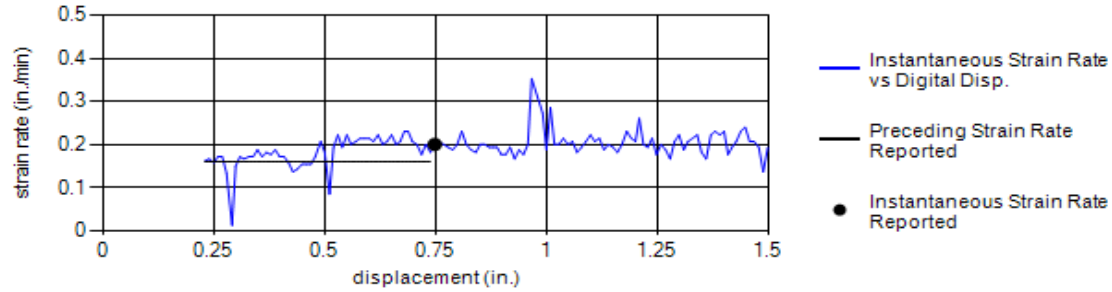
Personnel

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

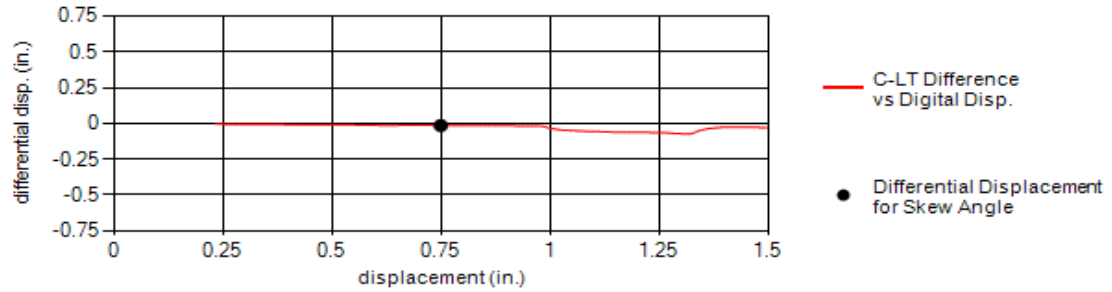
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1705	No Data	1170	1264	1531	1418	4.22	1536



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.20	0.16	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	-0.01	No Data	-0.02	CW



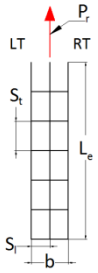
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	10/26/2010 8:59:00 AM
Test Identification:	TS16.07-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

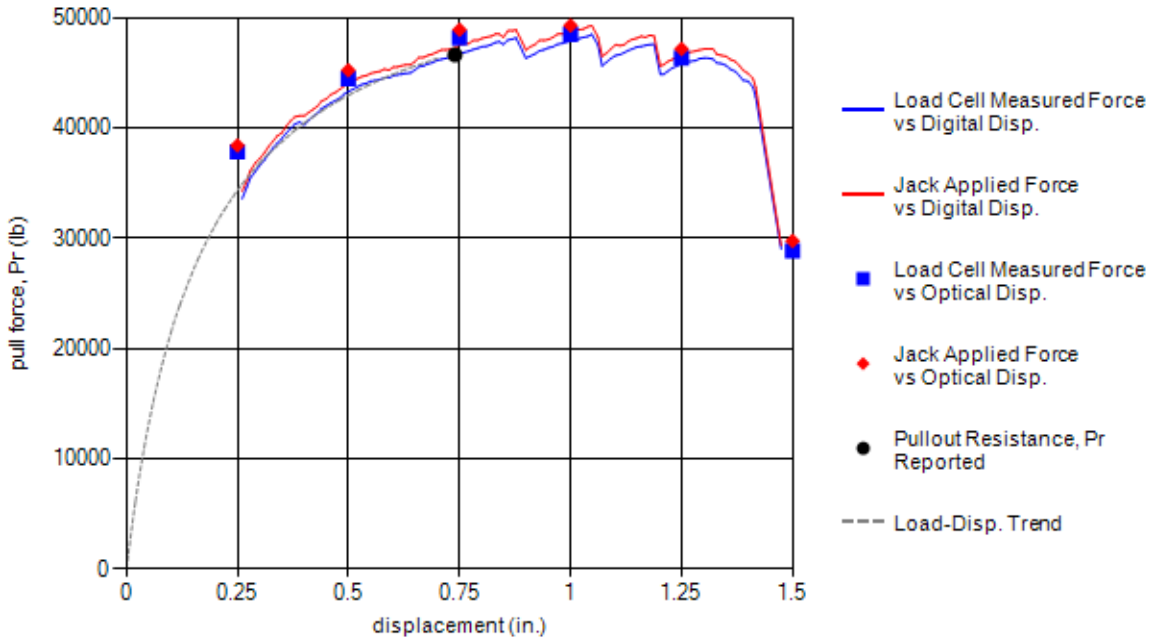
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	119.8	±2.4
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	5.7	±0.2%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	96.2	±1.9%

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	2554	46607	20.2	**0.68**

Load-Displacement Curve

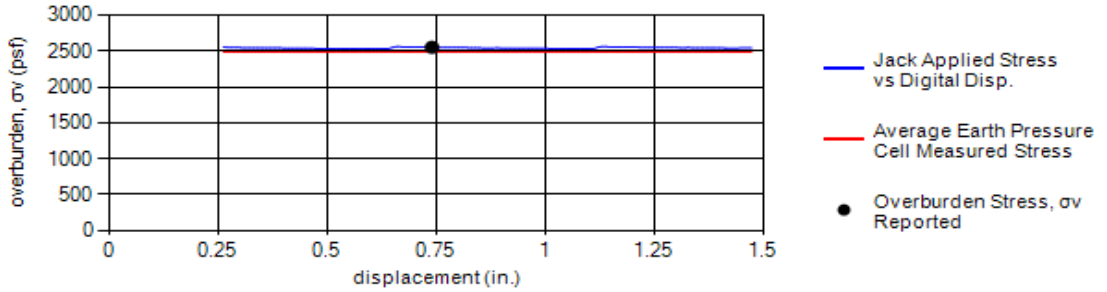


Comments

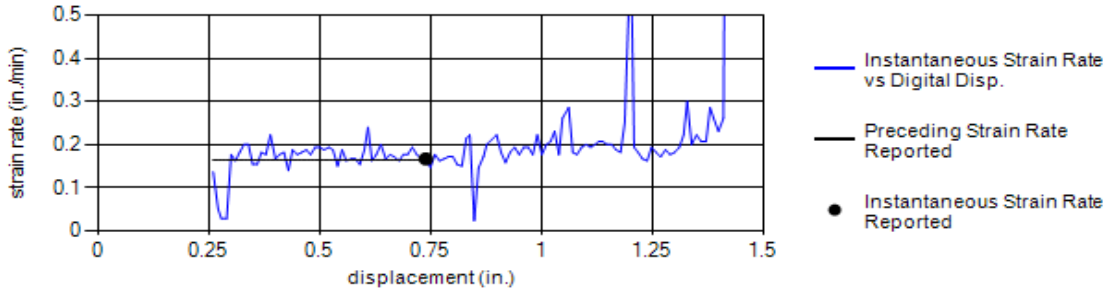
Personnel

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

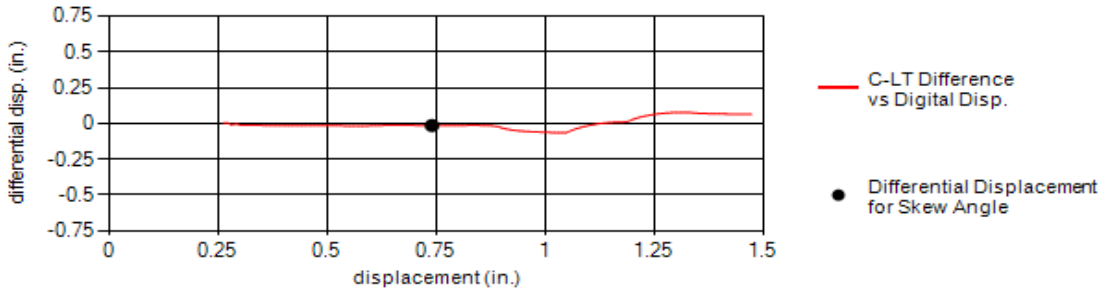
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2851	No Data	2263	2268	2577	2490	2.41	2554



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.17	0.16	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	-0.01	No Data	-0.02	CW



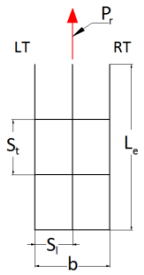
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	10/26/2010 10:13:00 AM
Test Identification:	TS16.08-G-9x18-W20xW15-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.):*	0.44	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	18	*Spacing, S_l (in.):*	9

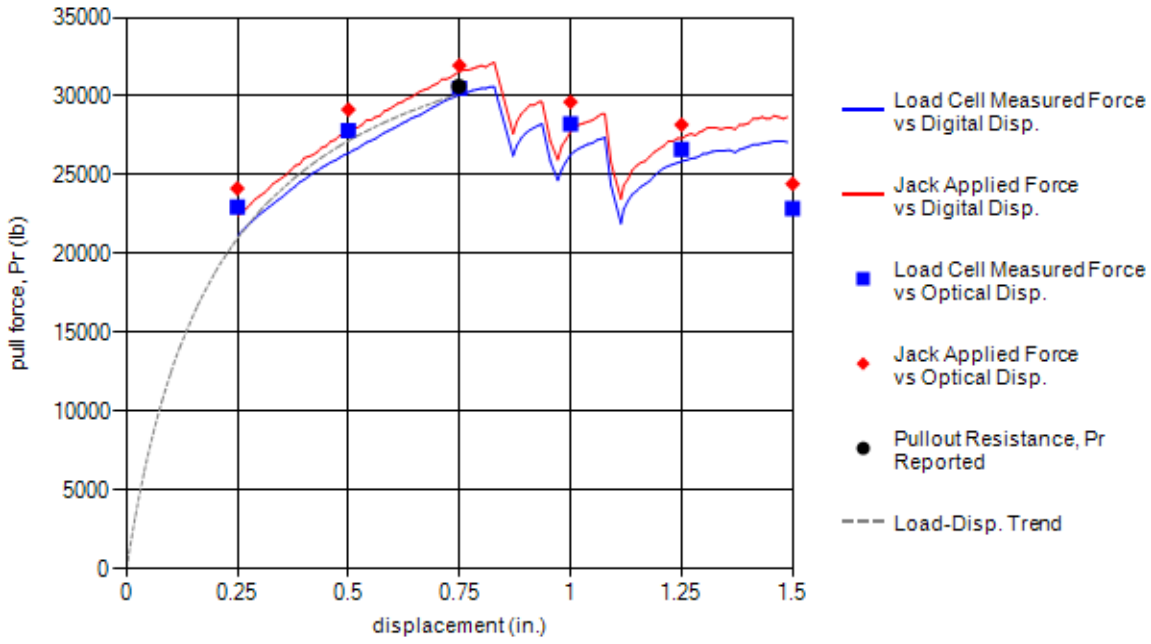
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	119.8 ±2.4
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	5.7 ±0.2%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	96.2 ±1.9%

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	5064	30628	40.0	**0.45**

Load-Displacement Curve

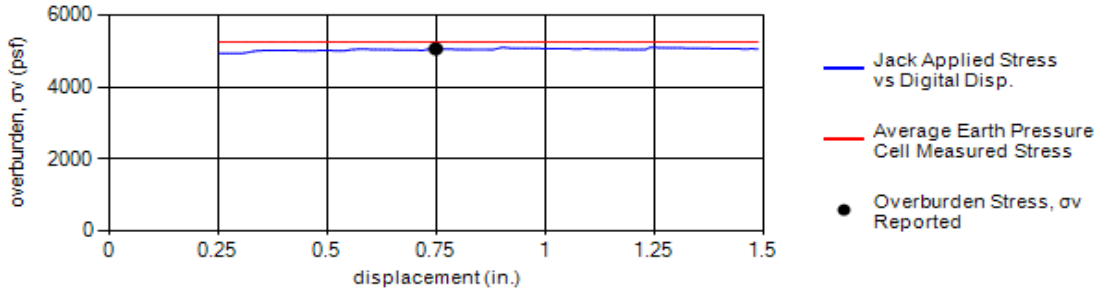


Comments

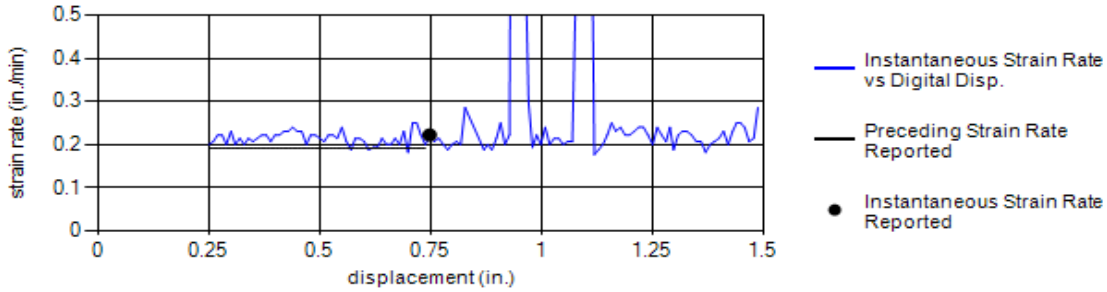
Personnel

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

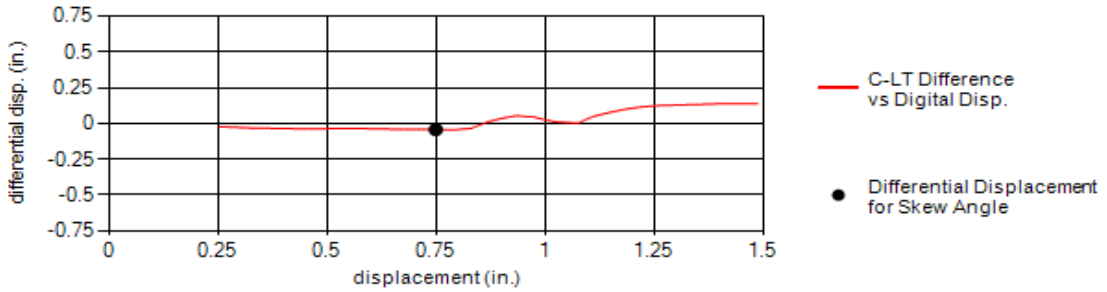
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
5641	No Data	5074	4696	5594	5251	1.14	5064



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.22	0.19	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	-0.04	No Data	-0.07	CW



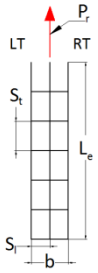
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	10/25/2010 1:09:00 PM
Test Identification:	TS16.09-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

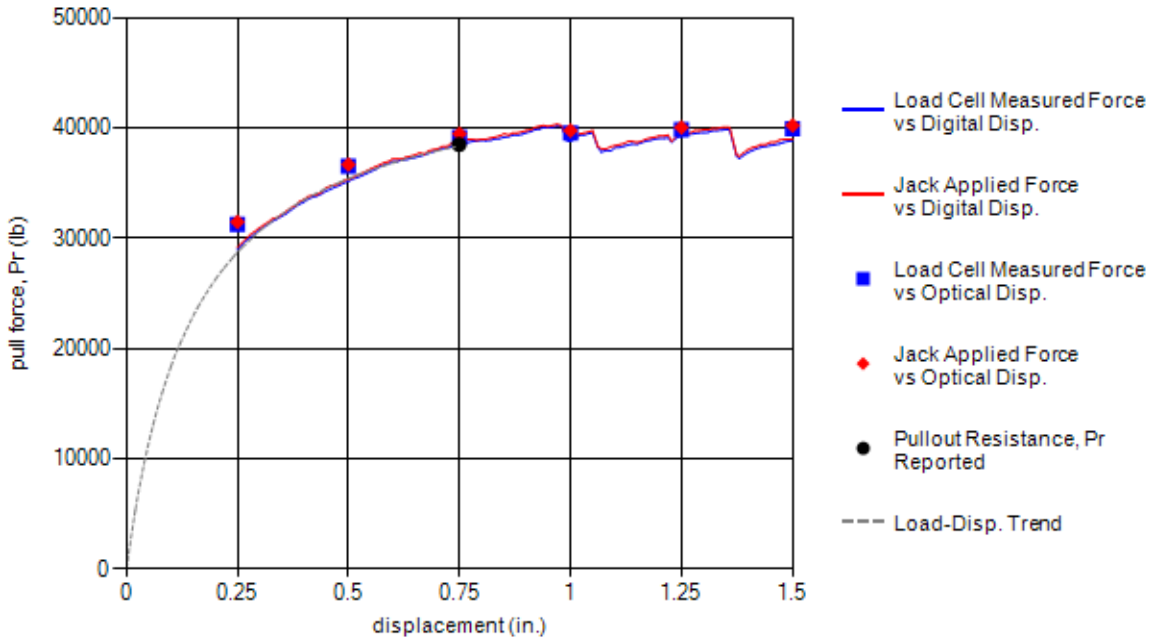
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	119.8	±2.4
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	5.7	±0.2%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	96.2	±1.9%

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	695	38480	5.5	**2.05**

Load-Displacement Curve

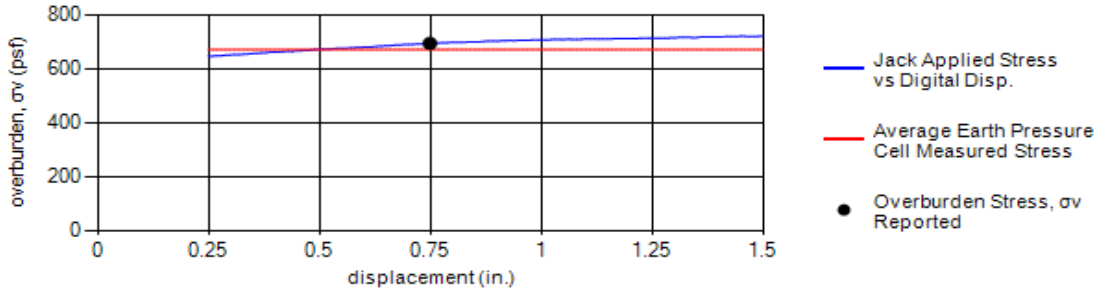


Comments

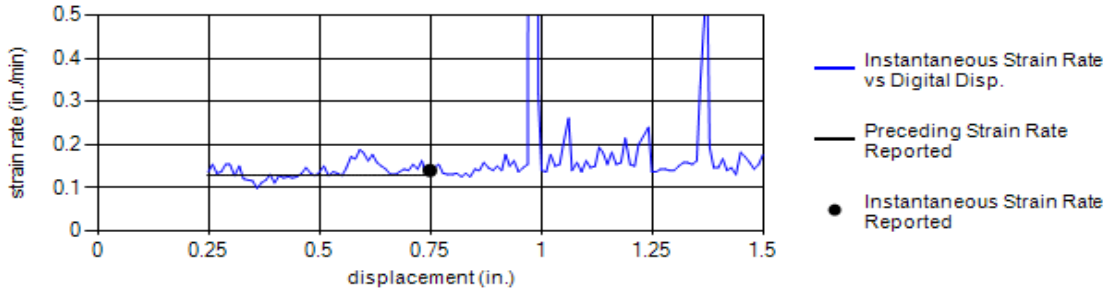
Personnel

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

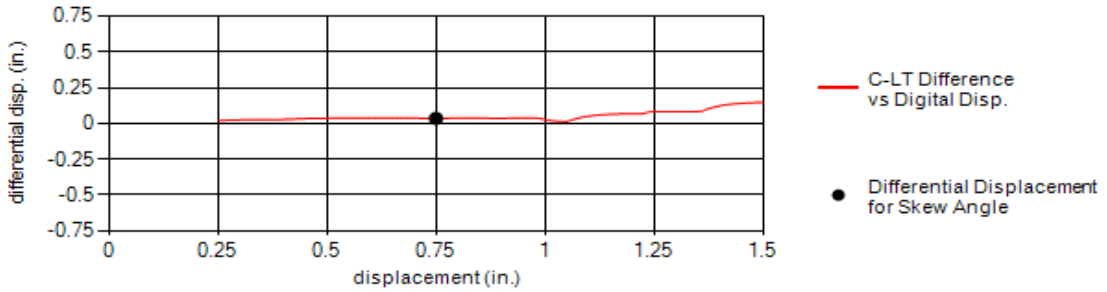
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1523	No Data	420	191	556	673	8.91	695



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.14	0.13	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	0.04	No Data	0.06	CCW



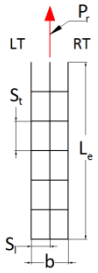
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	10/25/2010 1:57:00 PM
Test Identification:	TS16.10-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

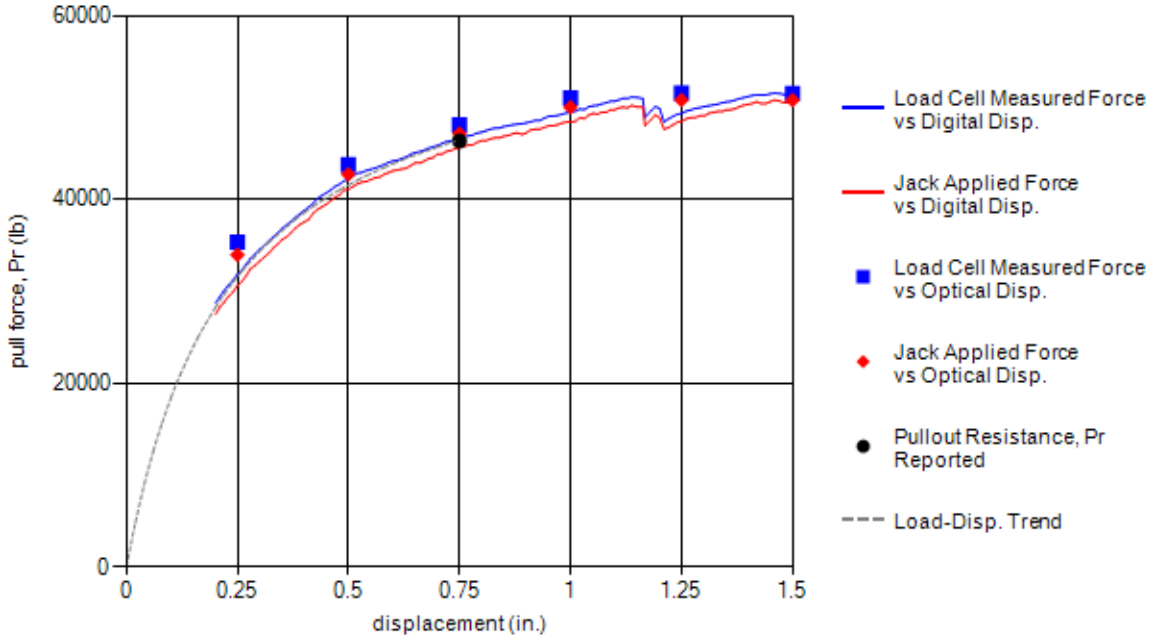
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	119.8	±2.4
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	5.7	±0.2%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	96.2	±1.9%

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	1522	46352	12.0	**1.13**

Load-Displacement Curve

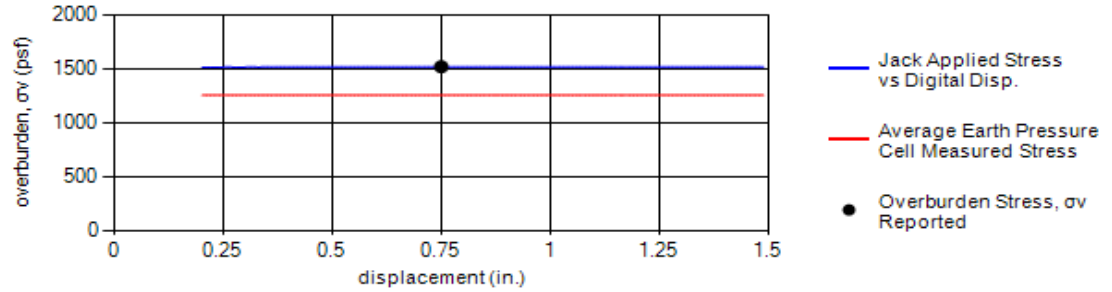


Comments

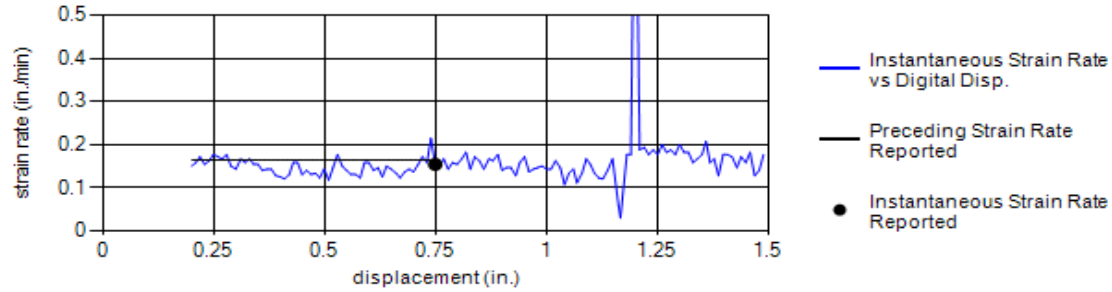
Personnel

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

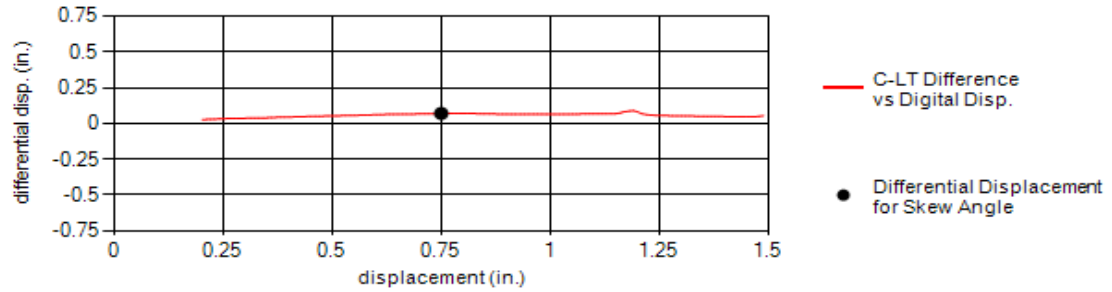
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1686	No Data	983	957	1401	1257	4.77	1522



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.15	0.16	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	0.07	No Data	0.11	CCW



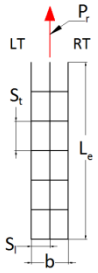
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	10/25/2010 2:34:00 PM
Test Identification:	TS16.11-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

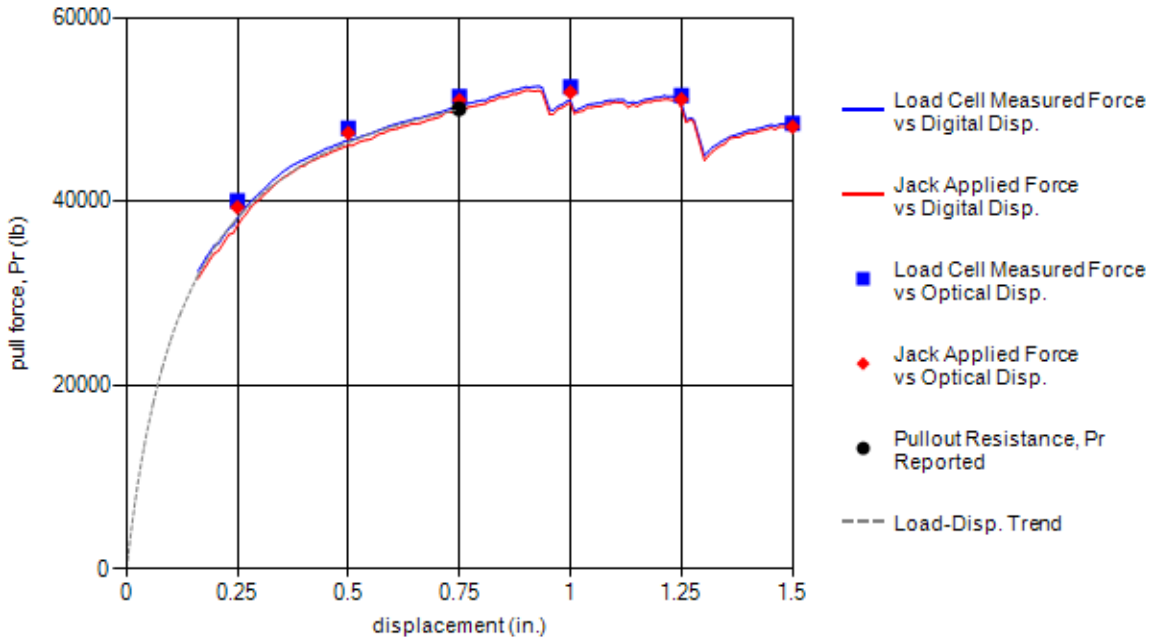
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	119.8	±2.4
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	5.7	±0.2%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	96.2	±1.9%

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	2541	50062	20.1	**0.73**

Load-Displacement Curve

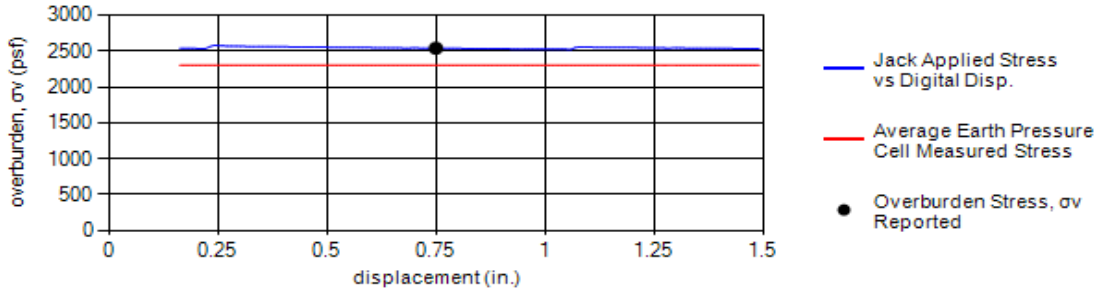


Comments

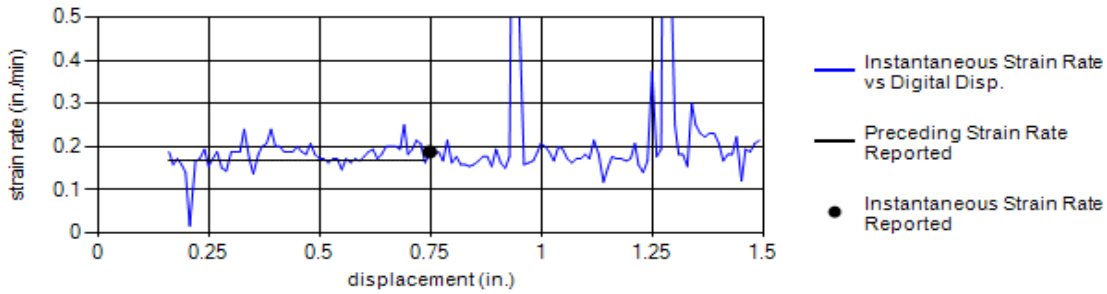
Personnel

Tested:	MB JL DH
Prepared:	SB TW
Checked:	WL PJ

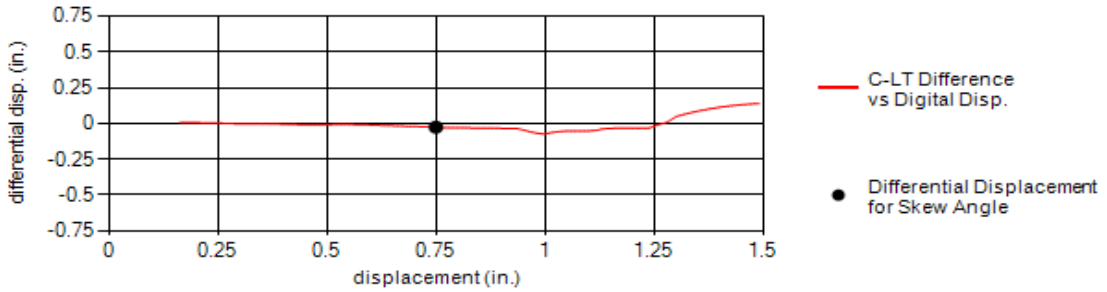
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2961	No Data	1849	1941	2459	2303	2.60	2541



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.19	0.17	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	-0.03	No Data	-0.04	CW



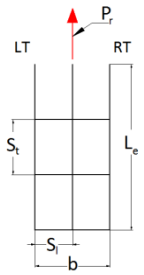
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	10/25/2010 3:06:00 PM
Test Identification:	TS16.12-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

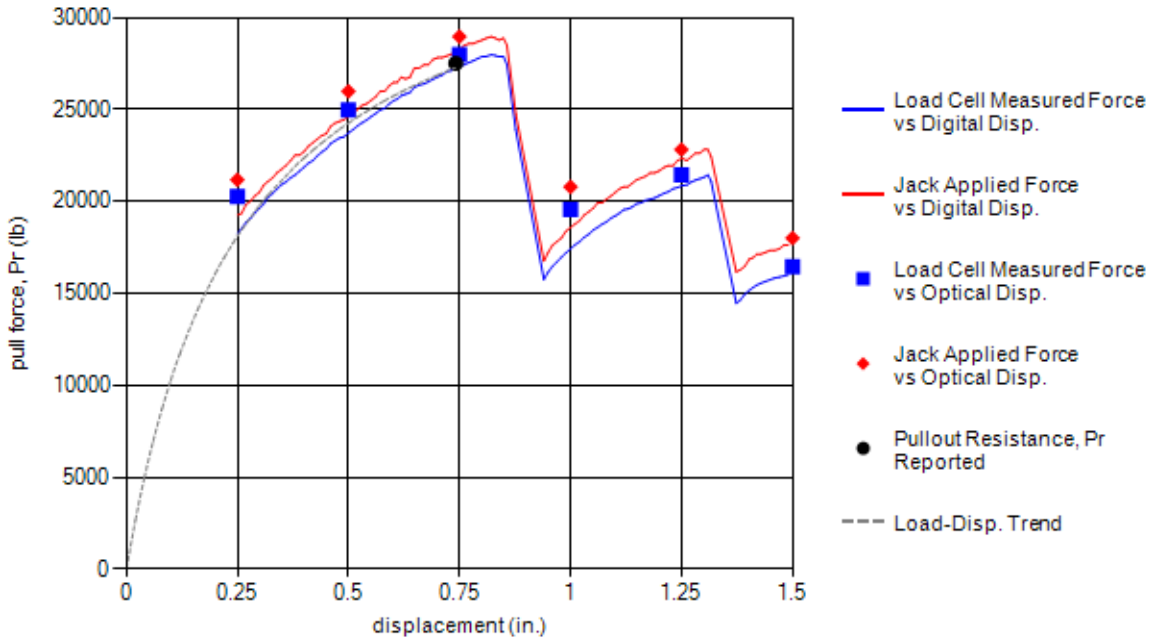
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	119.8 ±2.4
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	5.7 ±0.2%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	96.2 ±1.9%

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	5041	27501	39.8	**0.40**

Load-Displacement Curve

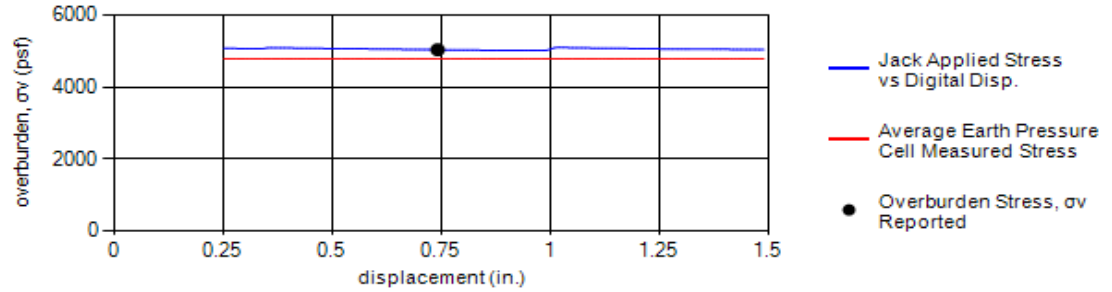


Comments

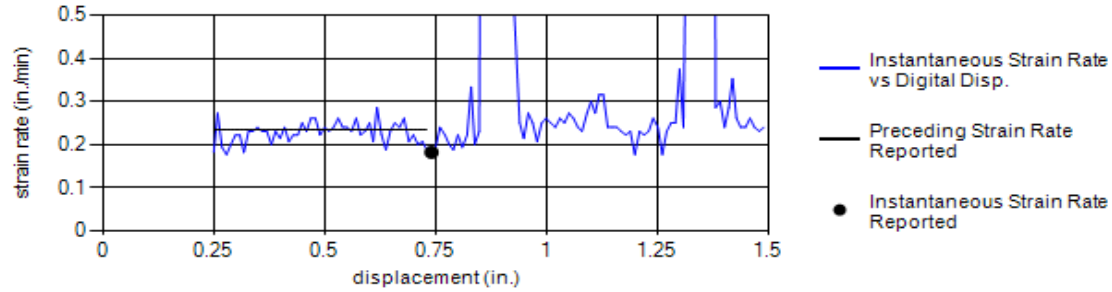
Personnel

Tested:	MB JL DH
Prepared:	SB TW
Checked:	WL PJ

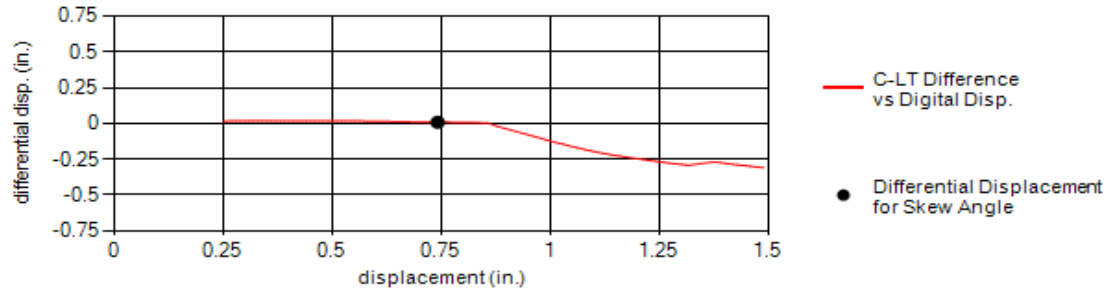
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
5442	No Data	4465	4125	5127	4790	1.25	5041



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.18	0.24	0.23



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	No Data	0.01	No Data	0.01	CCW



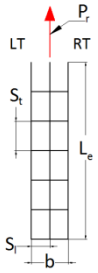
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	11/8/2010 4:14:00 PM
Test Identification:	TS17.01-G-9x24-W20xW15-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.):*	0.44	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	24	*Spacing, S_l (in.):*	9

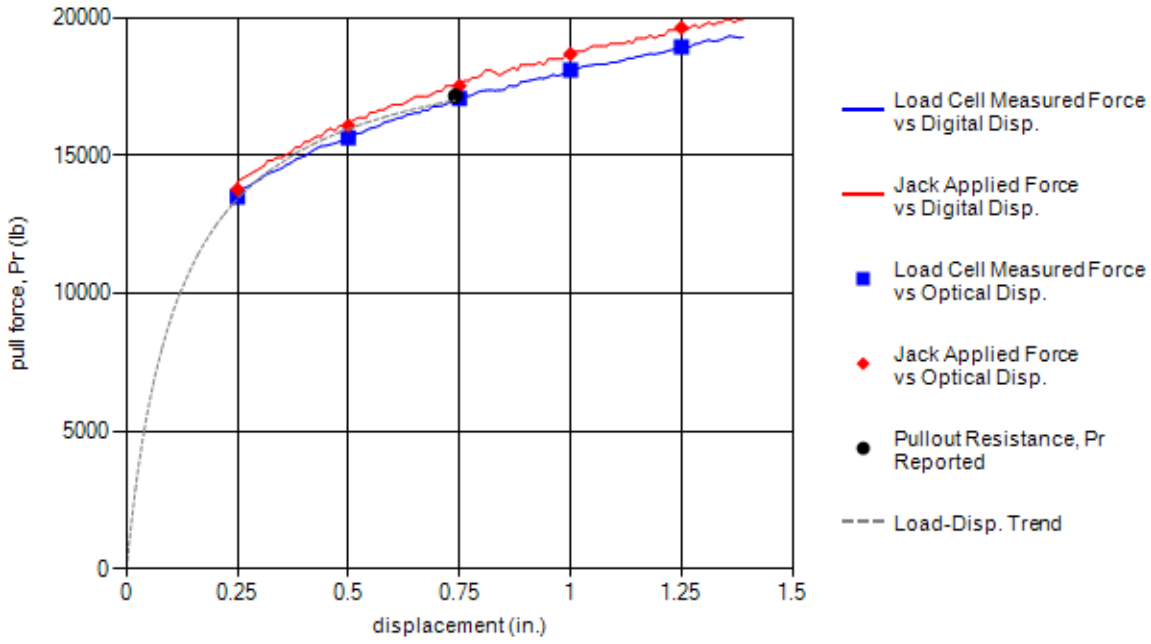
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	118.4	±2.0
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	5.9	±0.4%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	95.1	±1.6%

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	627	17150	5.0	**0.76**

Load-Displacement Curve

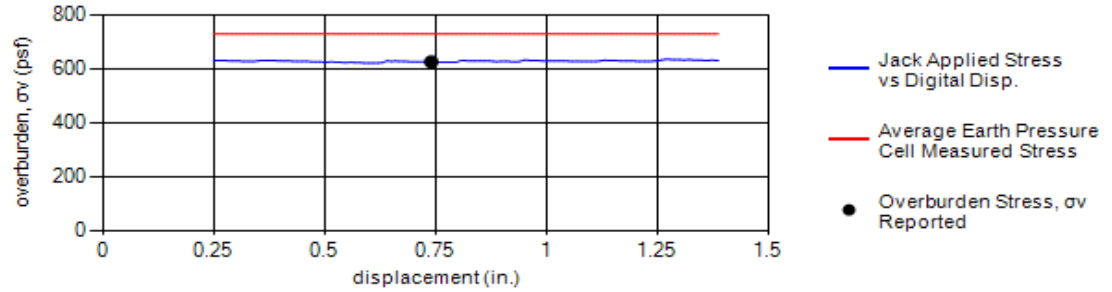


Comments

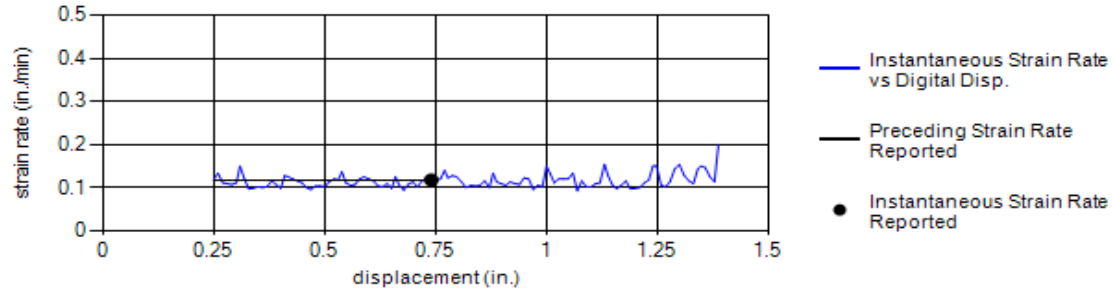
Personnel

Tested:	TW MB JL
Prepared:	SB TW
Checked:	WL PJ

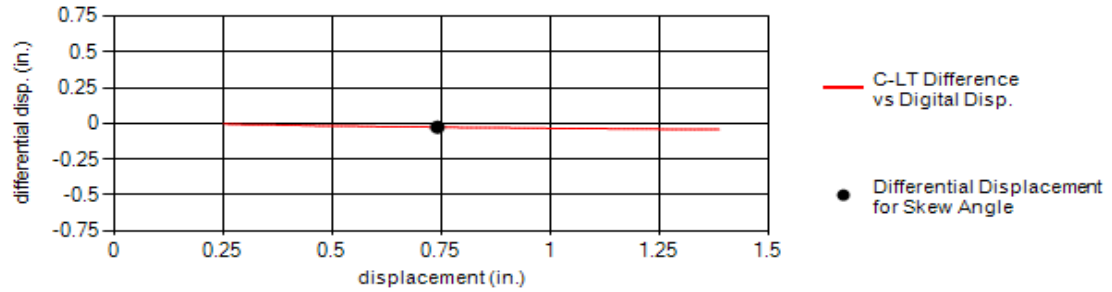
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
908	No Data	753	593	666	730	1.17	627



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.12	0.12	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	-0.03	No Data	-0.04	CW



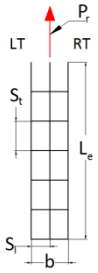
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	11/8/2010 4:47:00 PM
Test Identification:	TS17.02-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

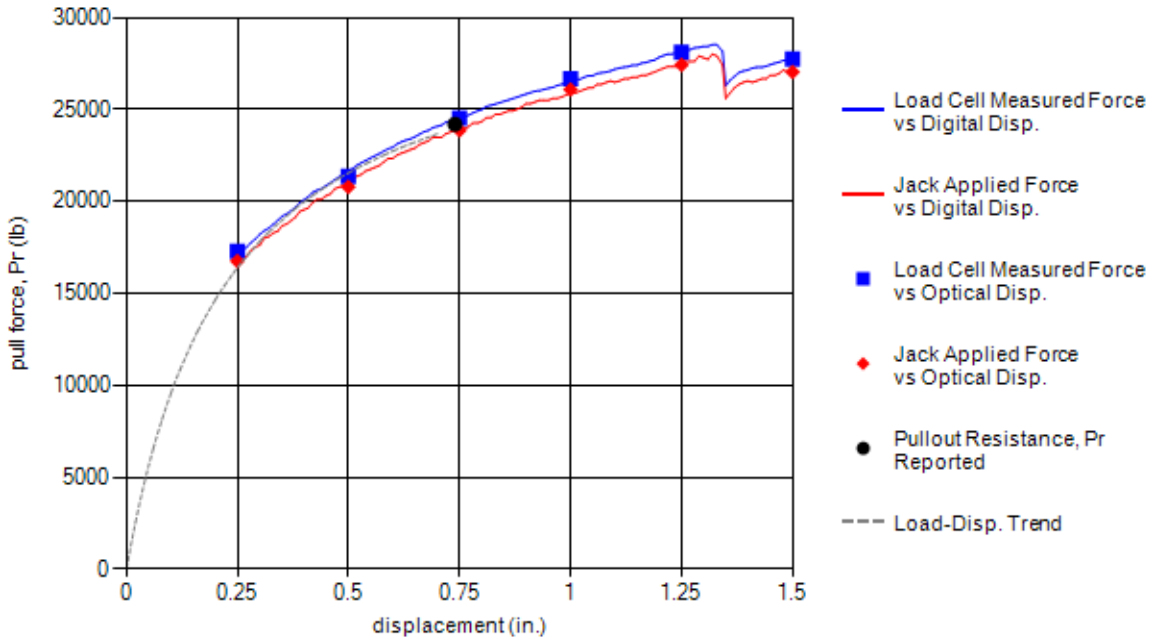
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	118.4	±2.0
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	5.9	±0.4%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	95.1	±1.6%

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	1502	24192	12.0	**0.45**

Load-Displacement Curve

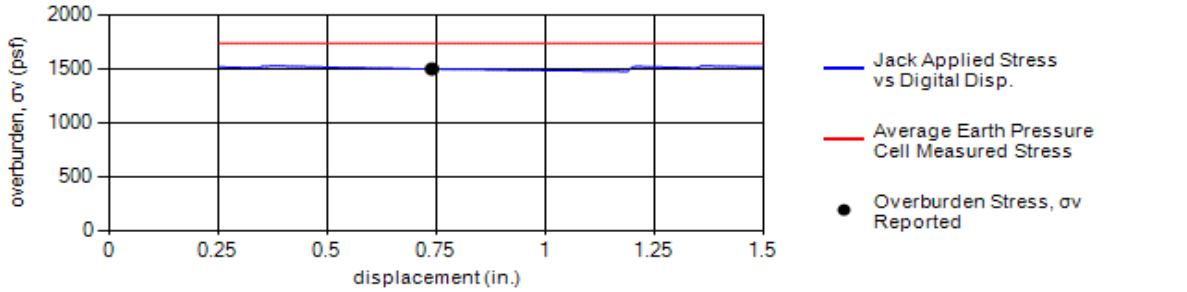


Comments

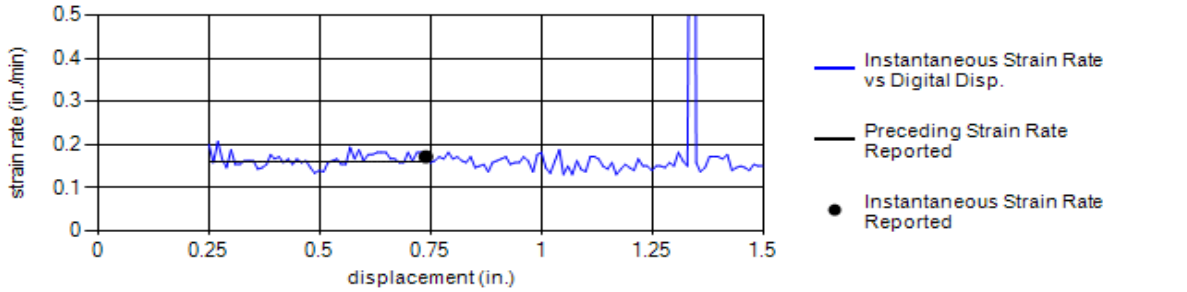
Personnel

Tested:	TW JL MB
Prepared:	SB TW
Checked:	WL PJ

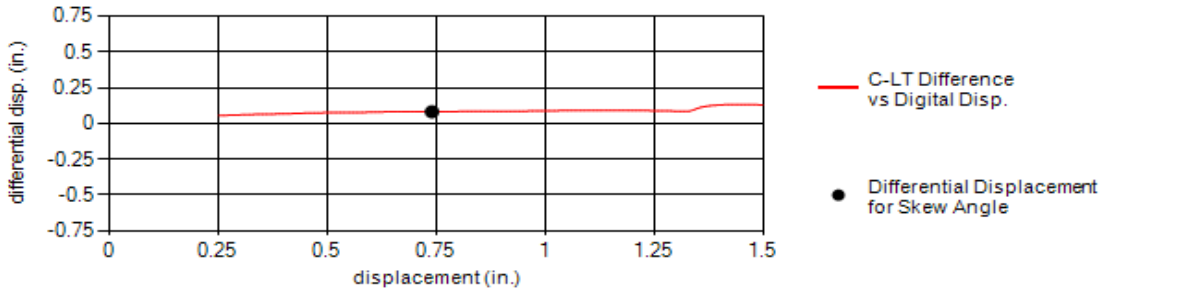
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2014	No Data	1656	1639	1650	1740	1.22	1501



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.17	0.16	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	0.08	No Data	0.13	CCW



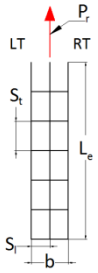
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	11/10/2010 1:36:00 PM
Test Identification:	TS17.03-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

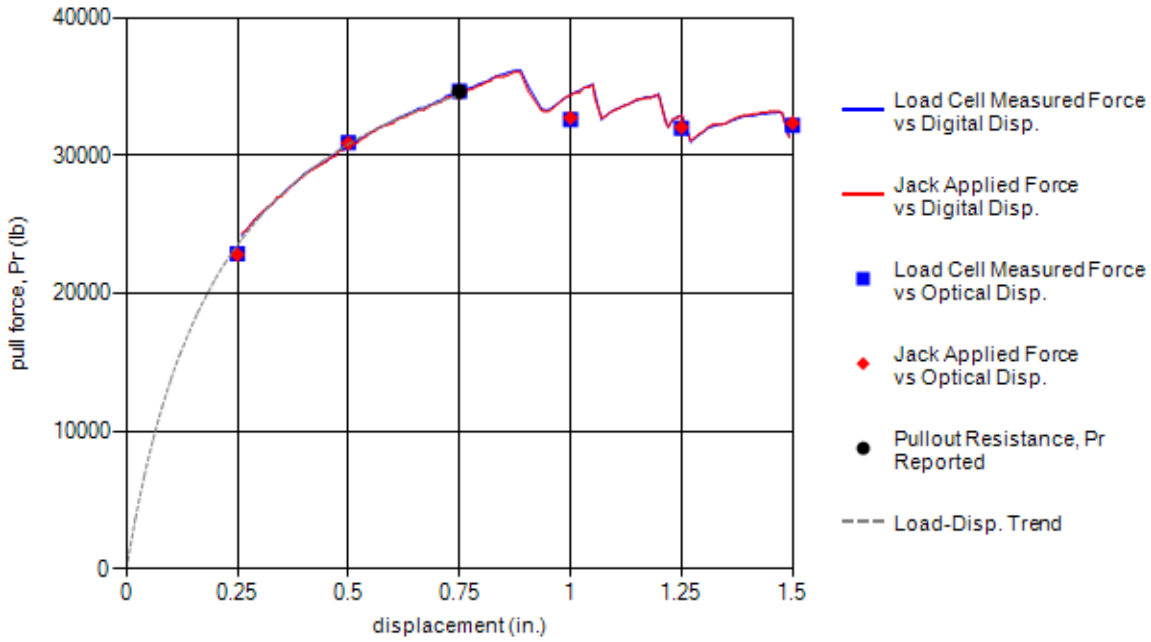
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	118.4	±2.0
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	5.9	±0.4%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	95.1	±1.6%

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	2546	34624	20.3	**0.38**

Load-Displacement Curve

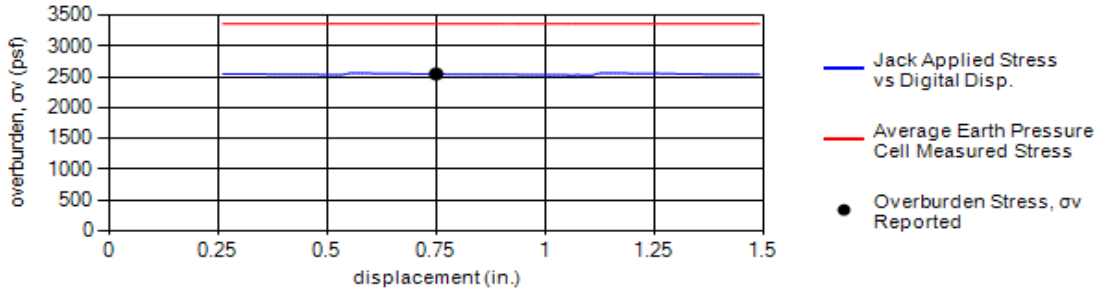


Comments

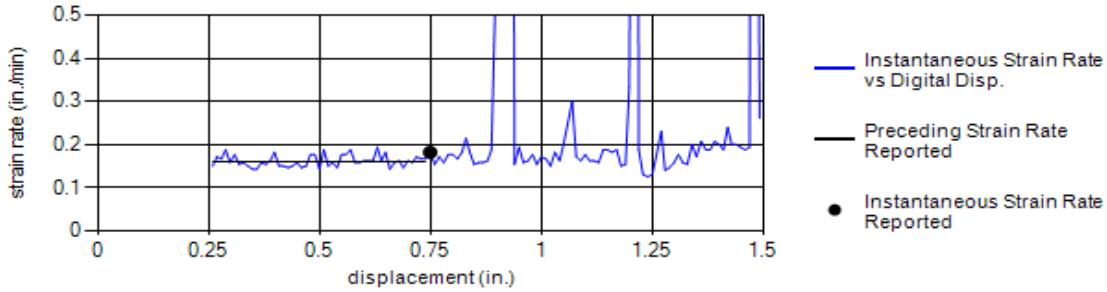
Personnel

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

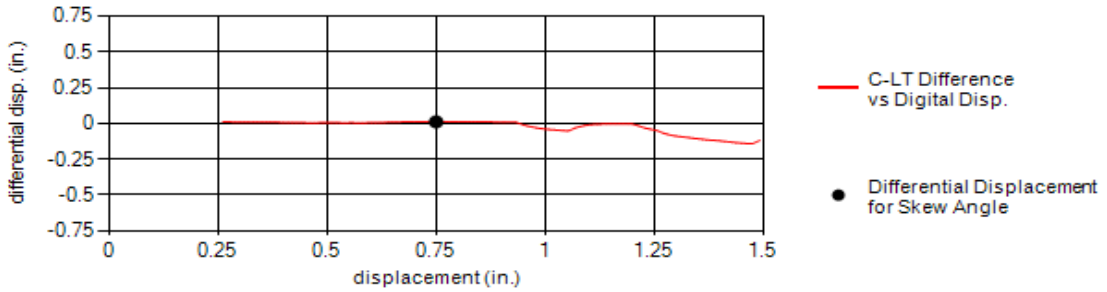
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3587	No Data	2934	3644	3274	3360	1.11	2545



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.18	0.16	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	0.01	No Data	0.02	CCW



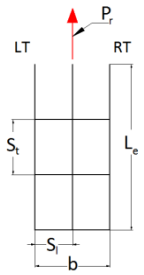
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	11/10/2010 2:10:00 PM
Test Identification:	TS17.04-G-9x24-W20xW15-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.):*	0.44	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	24	*Spacing, S_l (in.):*	9

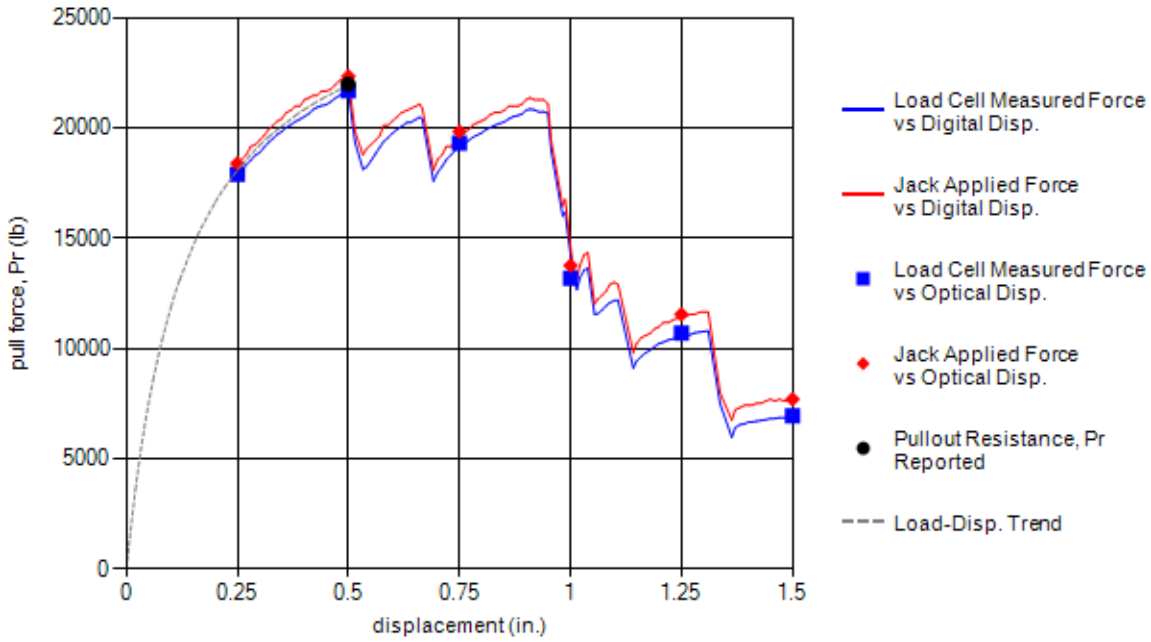
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	118.4	±2.0
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	5.9	±0.4%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	95.1	±1.6%

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	0.50	5075	21974	40.5	**0.24**

Load-Displacement Curve

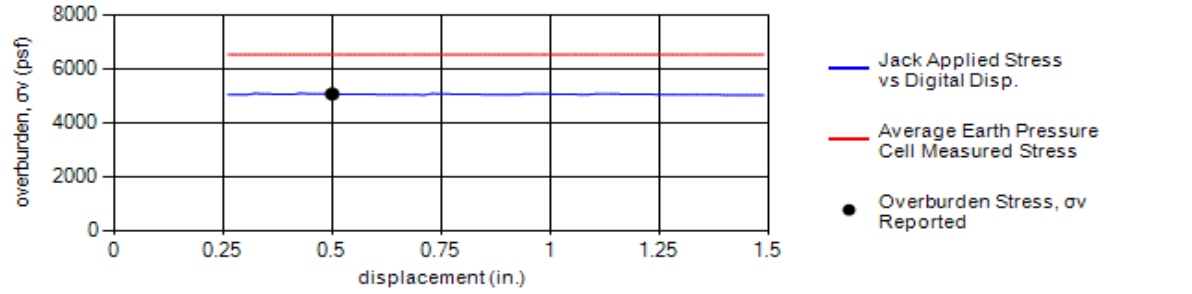


Comments

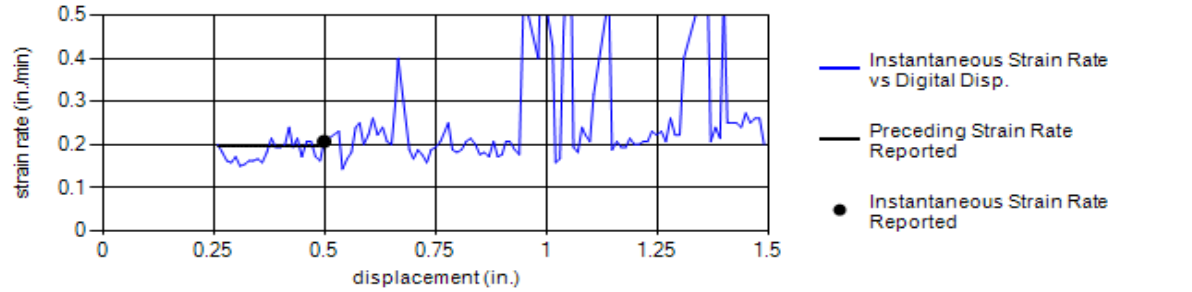
Personnel

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

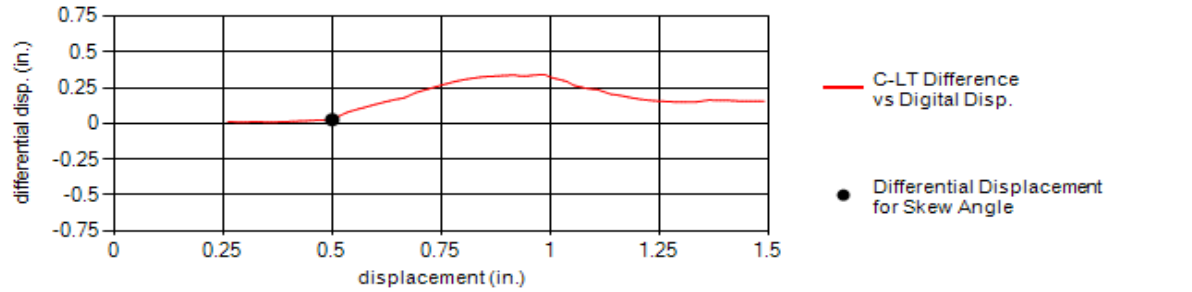
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
7258	No Data	5558	6696	6652	6541	1.00	5075



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.21	0.19	0.22



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	No Data	0.03	No Data	0.04	CCW



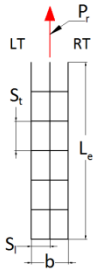
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	11/12/2010 10:19:00 AM
Test Identification:	TS17.05-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

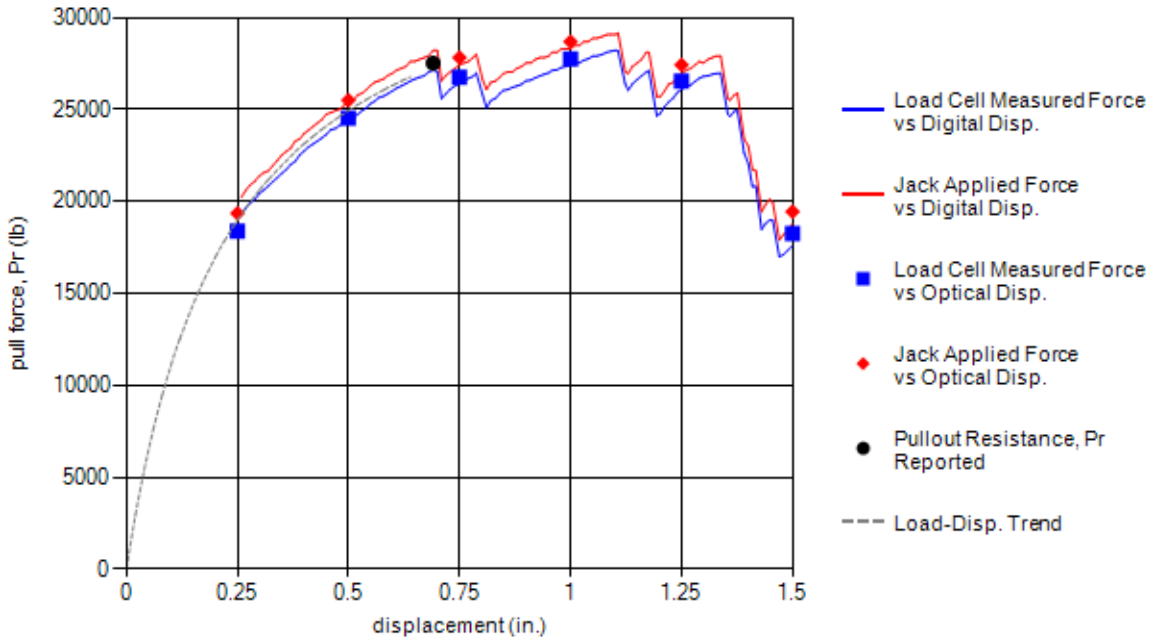
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	118.4	±2.0
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	5.9	±0.4%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	95.1	±1.6%

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	0.69	638	27510	5.1	**1.20**

Load-Displacement Curve

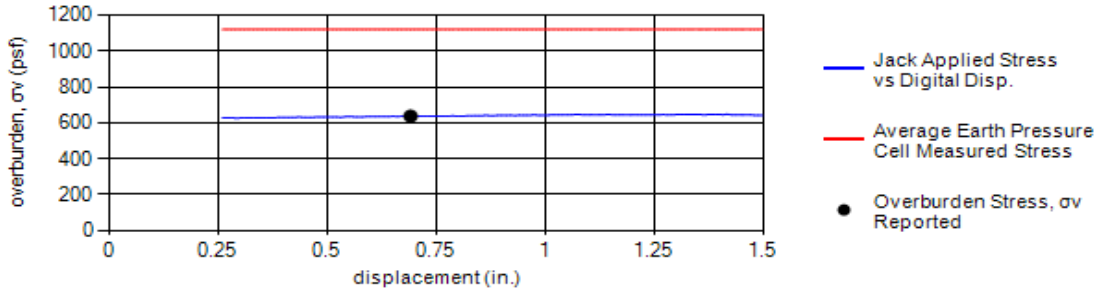


Comments

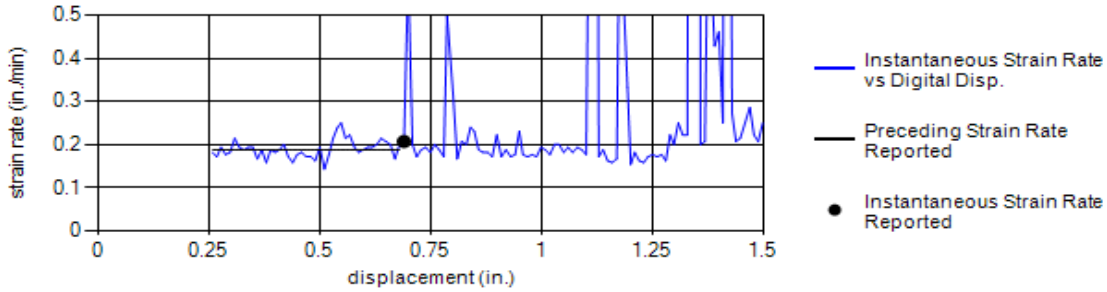
Personnel

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

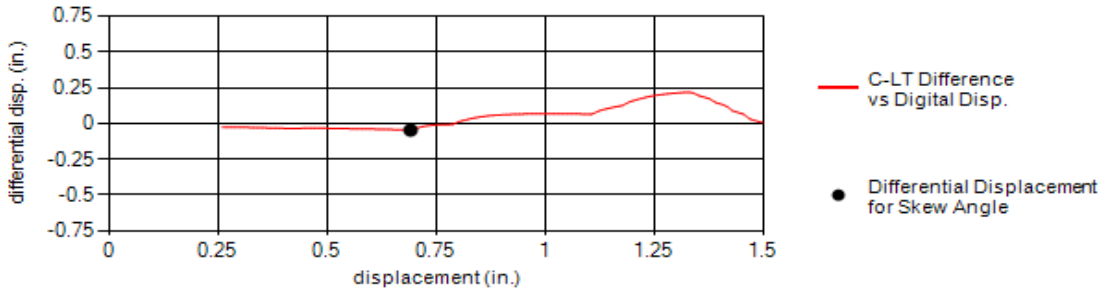
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1587	No Data	670	1304	923	1121	8.15	638



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.21	0.19	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	-0.05	No Data	-0.07	CW



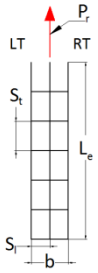
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	11/12/2010 10:51:00 AM
Test Identification:	TS17.06-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

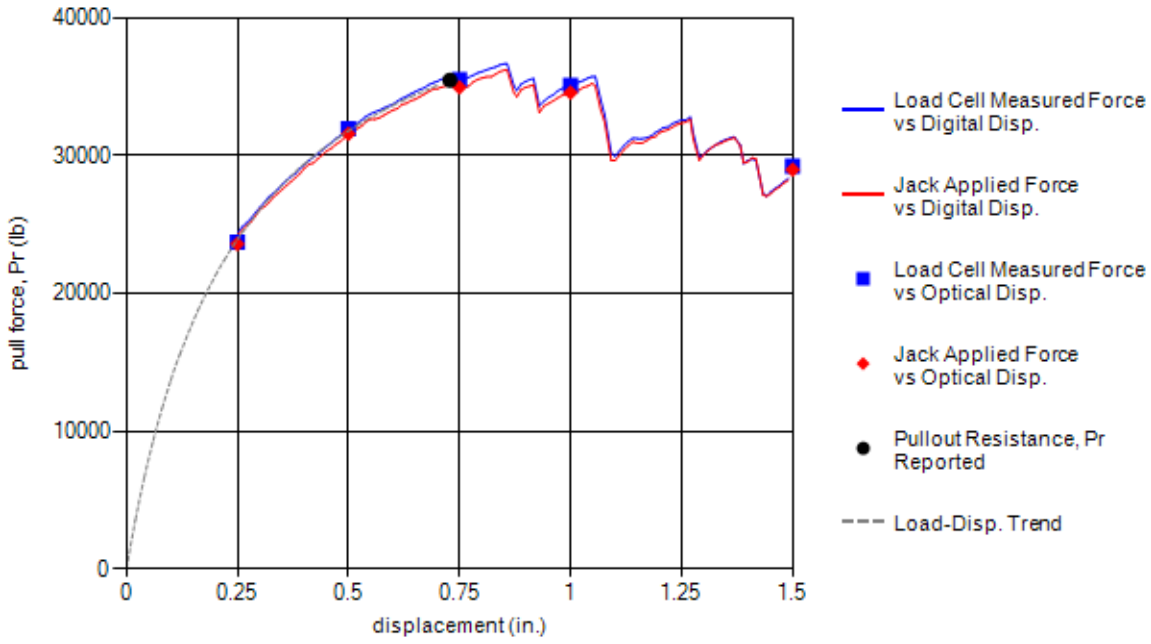
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	118.4	±2.0
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	5.9	±0.4%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	95.1	±1.6%

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	1524	35449	12.2	**0.65**

Load-Displacement Curve

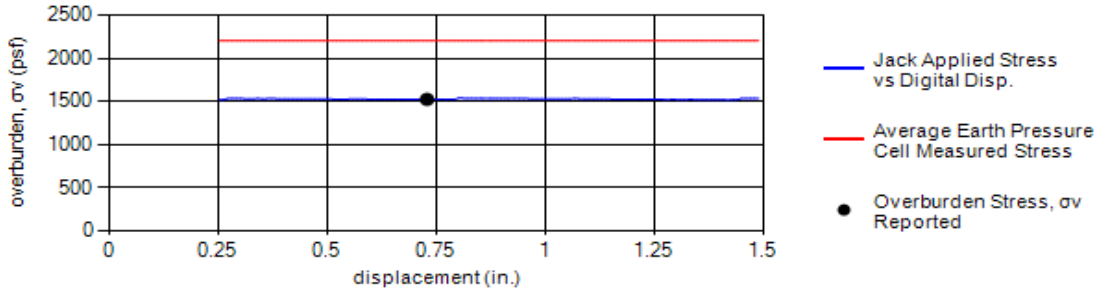


Comments

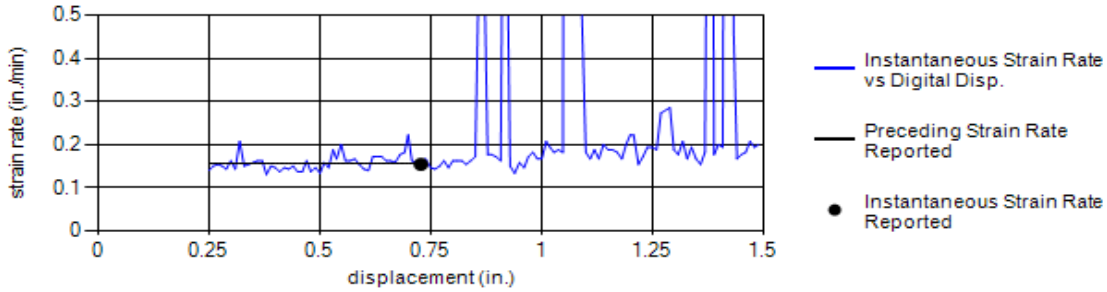
Personnel

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

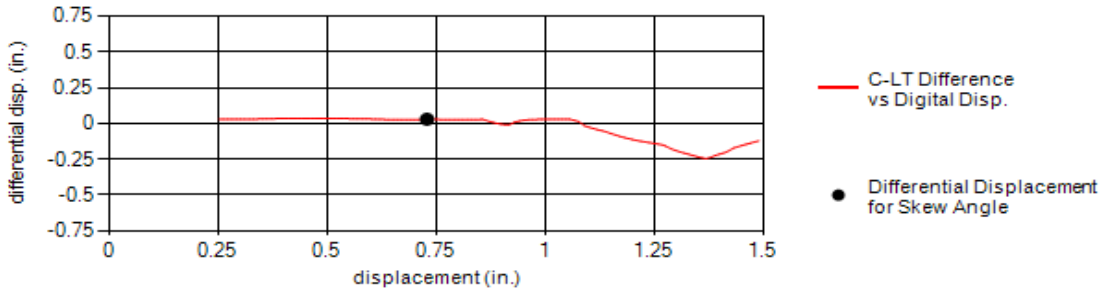
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2551	No Data	1770	2309	2184	2204	3.41	1523



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.15	0.16	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	0.03	No Data	0.05	CCW



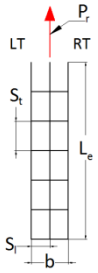
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	11/12/2010 11:21:00 AM
Test Identification:	TS17.07-G-9x24-W20xW15-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.):*	0.44	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	24	*Spacing, S_l (in.):*	9

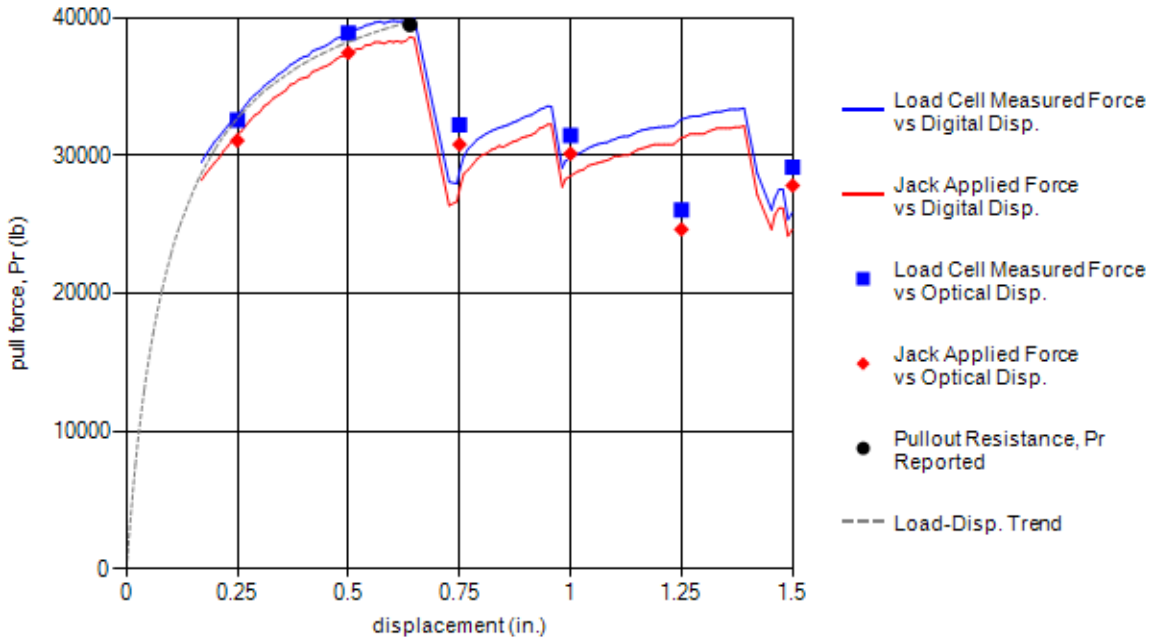
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	118.4	±2.0
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	5.9	±0.4%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	95.1	±1.6%

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	2502	39474	20.0	**0.44**

Load-Displacement Curve

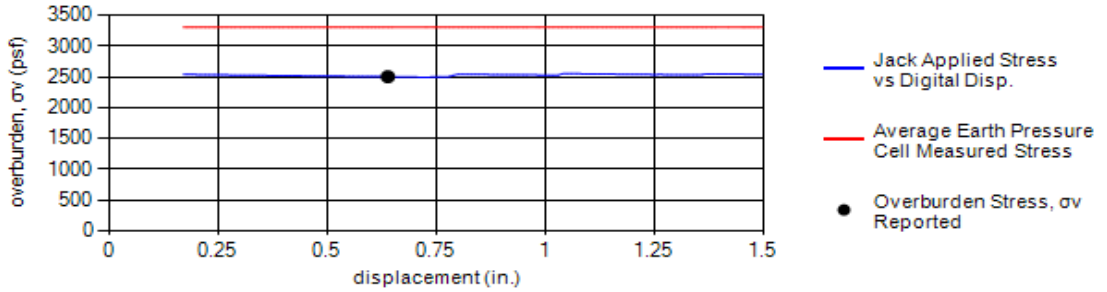


Comments

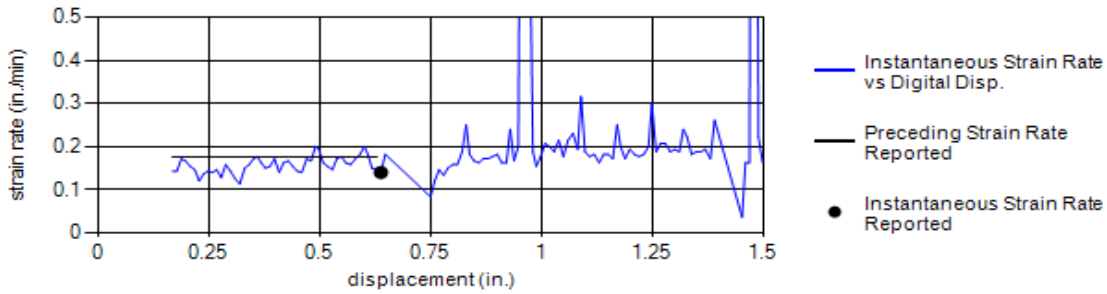
Personnel

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

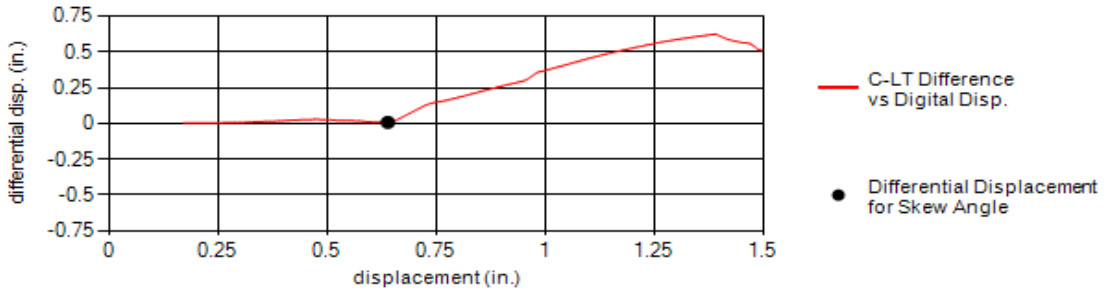
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3817	No Data	2860	3235	3298	3303	2.08	2502



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



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	No Data	0.01	No Data	0.01	CCW



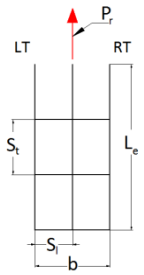
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	11/12/2010 11:50:00 AM
Test Identification:	TS17.08-G-9x24-W20xW15-L6-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):	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

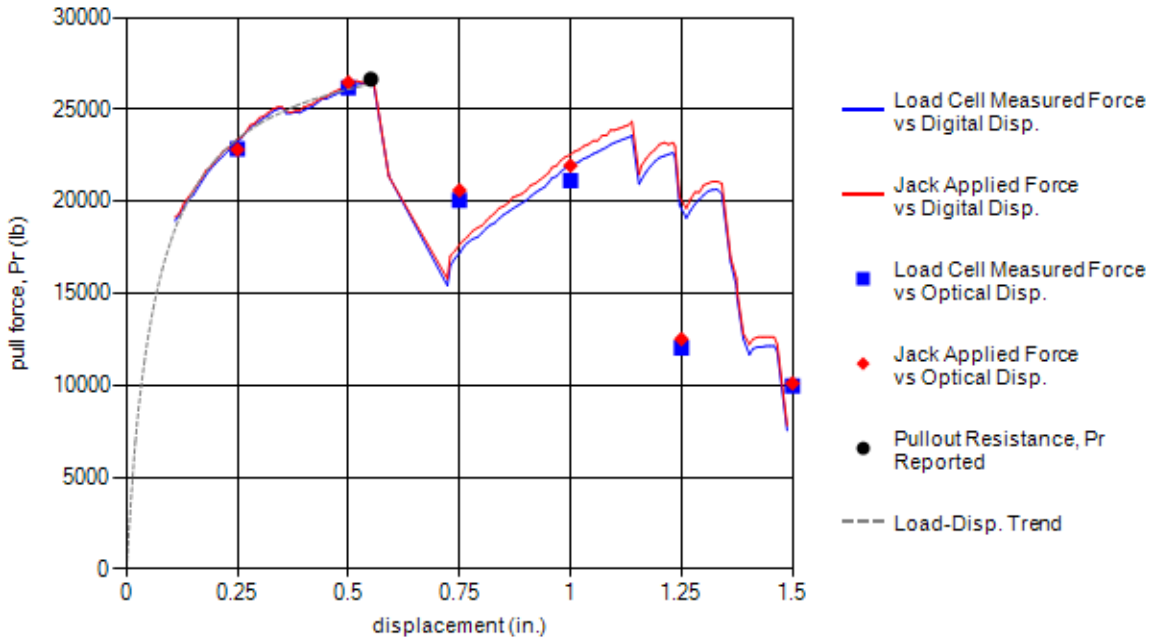
Specification:	TxDOT Item 423 - Type B

Moisture Density Relationship (TEX-114-E)		In-Place Density (TEX-115-E)		
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Dry Unit Weight, γ_d (pcf):*	118.4	±2.0
Optimum Moisture Content, OMC (%):	7.8%	*Moisture Content, w (%):*	5.9	±0.4%
		Relative Compaction, C_R (%):	95.1	±1.6%

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	0.55	5064	26638	40.4	**0.29**

Load-Displacement Curve

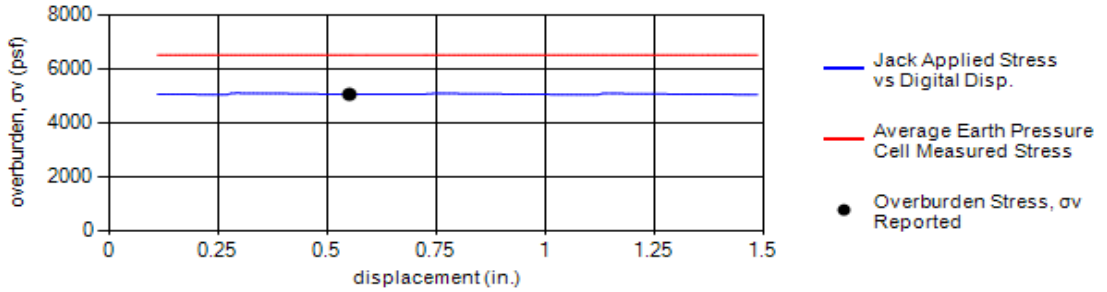


Comments

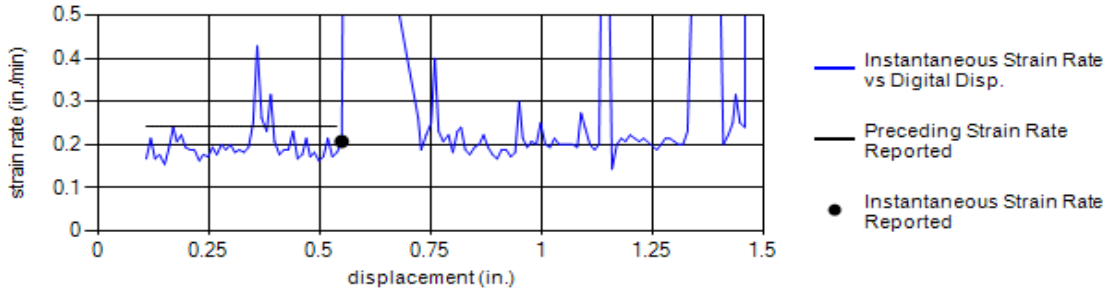
Personnel

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

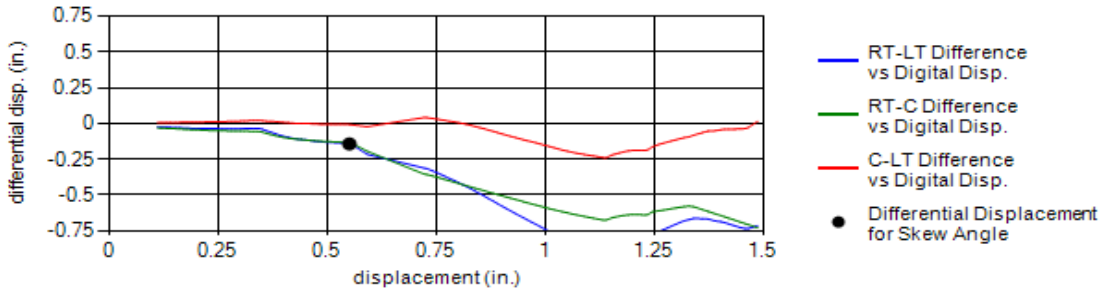
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
7177	No Data	5960	6303	6667	6527	1.04	5064



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.21	0.24	0.23



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
-0.14	-0.14	-0.01	No Data	-0.45	CW



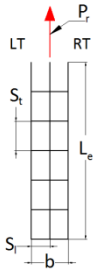
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	11/10/2010 4:17:00 PM
Test Identification:	TS17.09-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

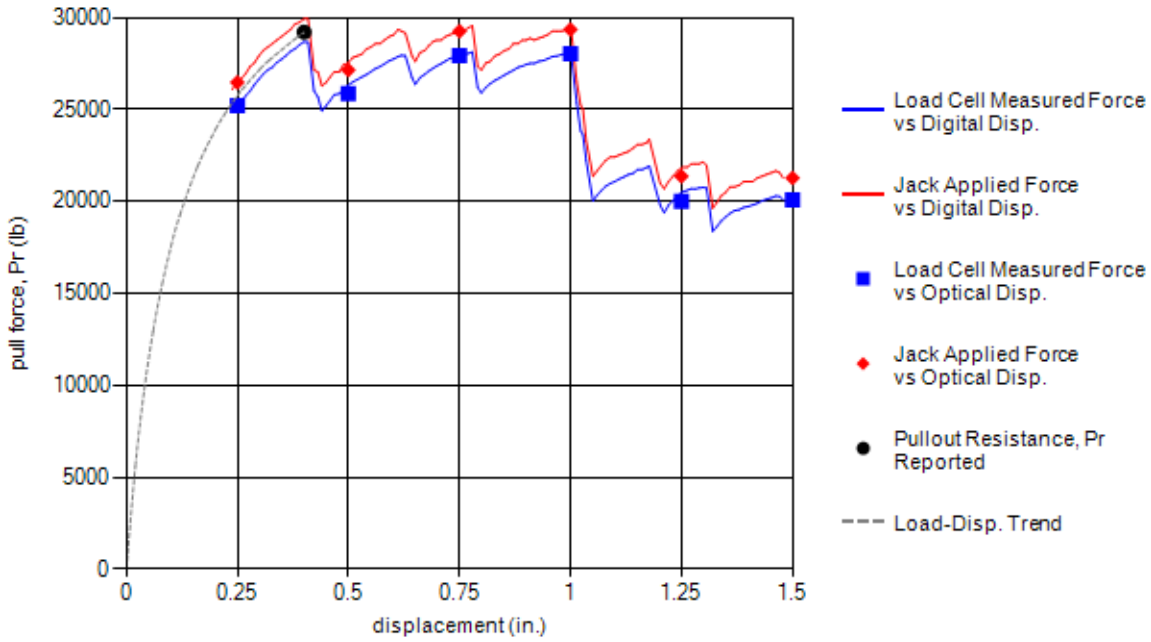
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	118.4	±2.0
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	5.9	±0.4%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	95.1	±1.6%

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	0.40	640	29197	5.1	**1.27**

Load-Displacement Curve

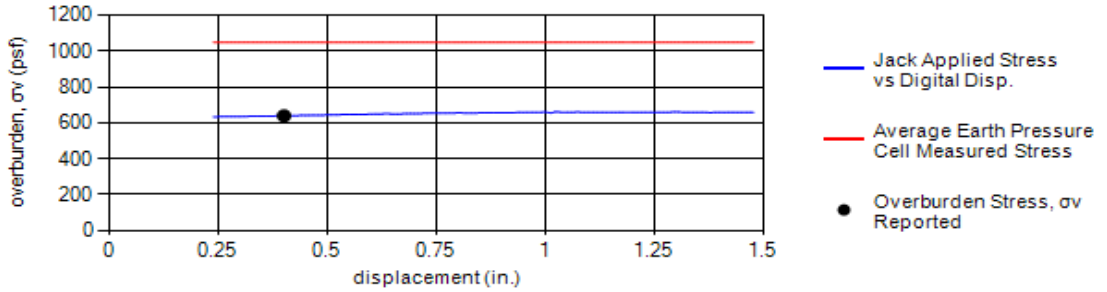


Comments

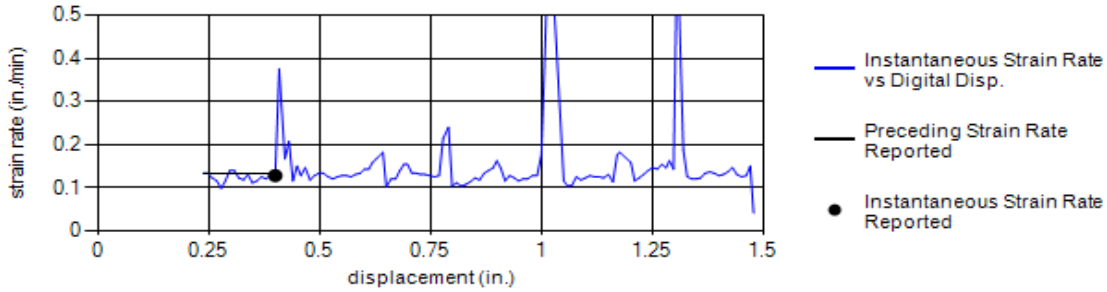
Personnel

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

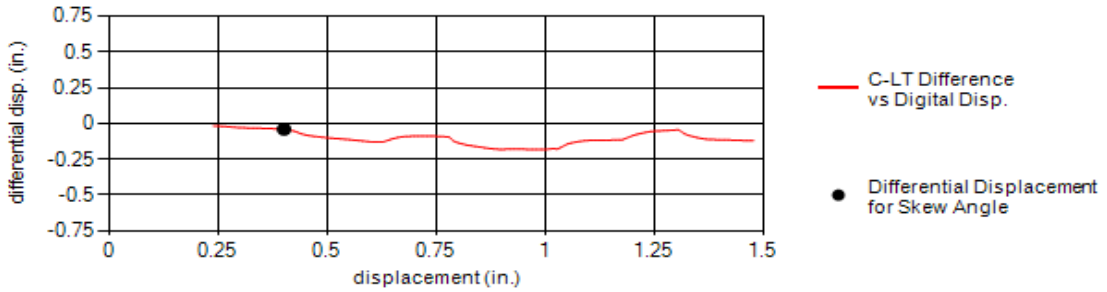
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1604	No Data	556	1179	862	1050	8.32	640



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.13	0.13	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	-0.04	No Data	-0.06	CW



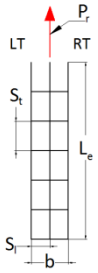
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	11/10/2010 3:44:00 PM
Test Identification:	TS17.10-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

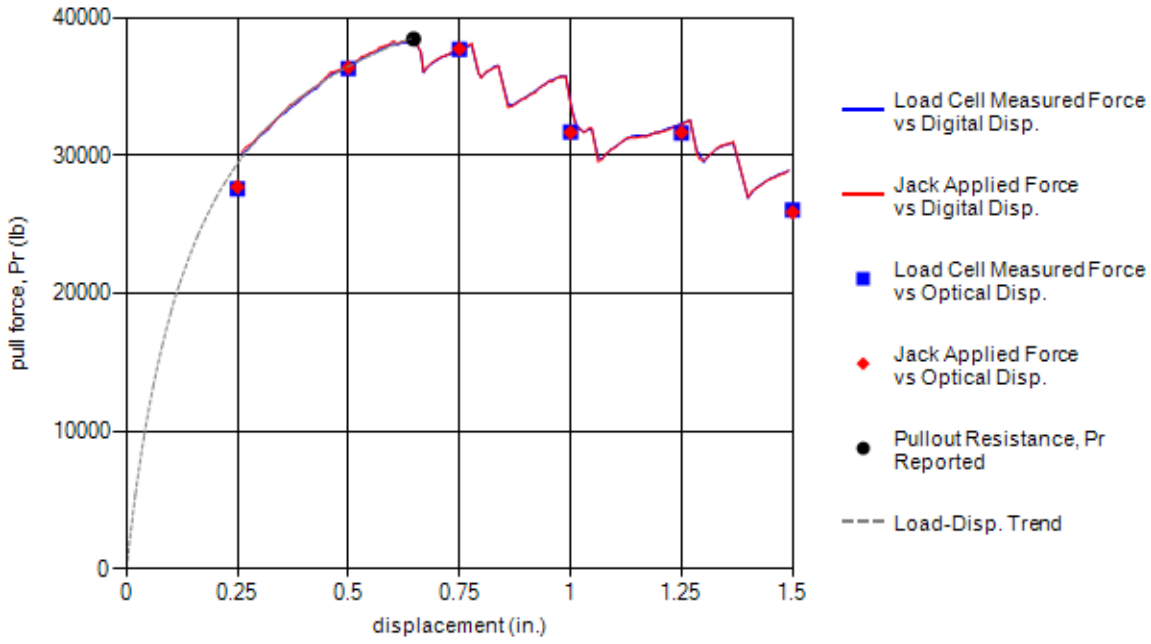
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	118.4	±2.0
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	5.9	±0.4%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	95.1	±1.6%

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	0.65	1520	38436	12.1	**0.70**

Load-Displacement Curve

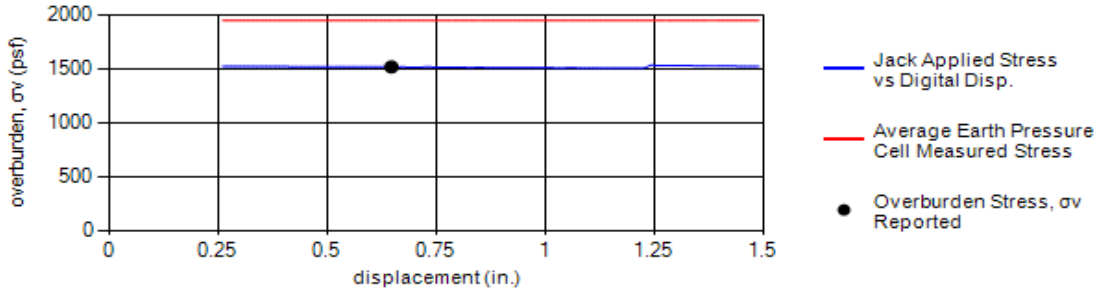


Comments

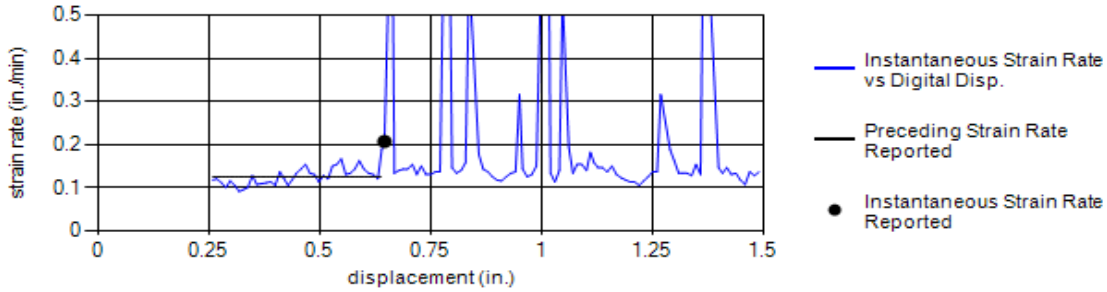
Personnel

Tested:	TW MB JL
Prepared:	SB TW
Checked:	WL PJ

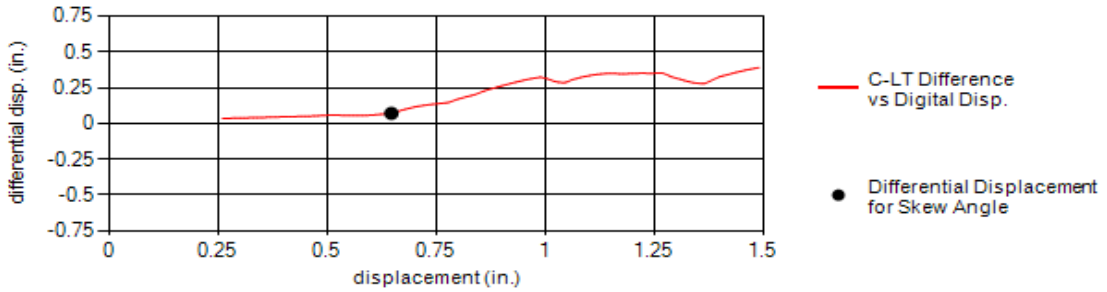
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1960	No Data	1494	2231	2114	1950	3.51	1520



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.21	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	0.07	No Data	0.11	CCW



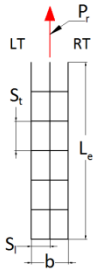
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	11/10/2010 3:14:00 PM
Test Identification:	TS17.11-G-9x24-W20xW15-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.):*	0.44	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	24	*Spacing, S_l (in.):*	9

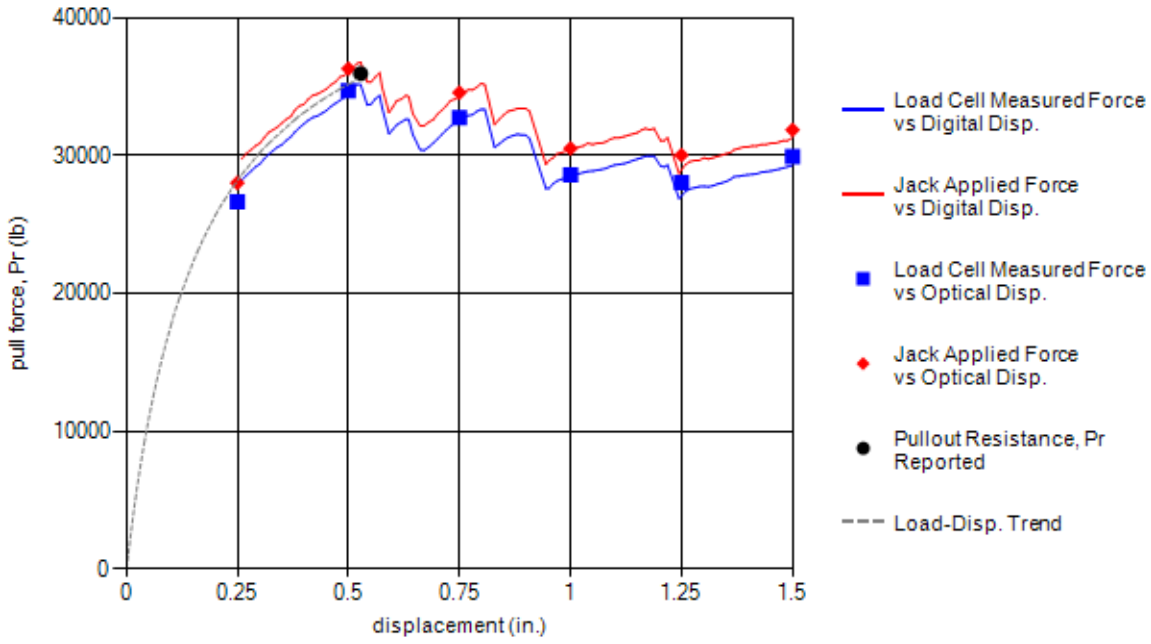
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	118.4	±2.0
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	5.9	±0.4%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	95.1	±1.6%

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	0.53	2582	35930	20.6	**0.39**

Load-Displacement Curve

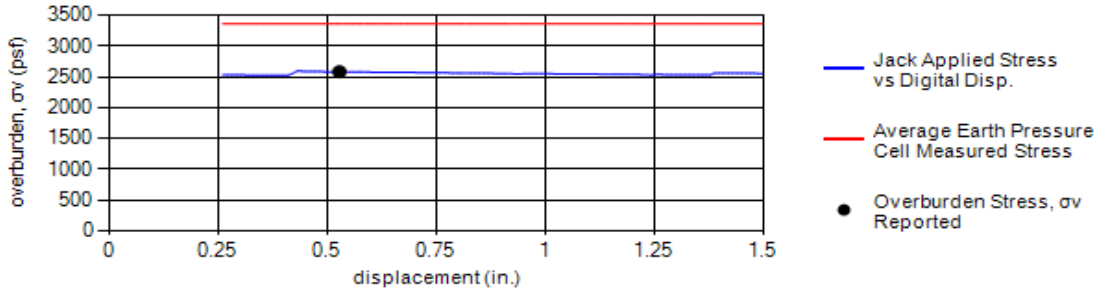


Comments

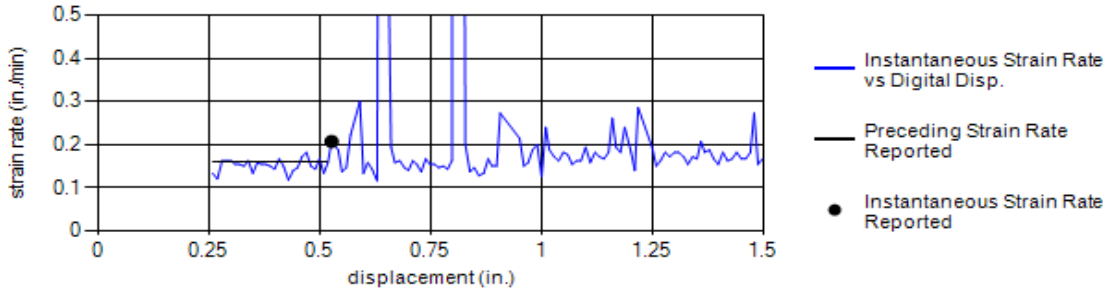
Personnel

Tested:	TW JL MB
Prepared:	SB TW
Checked:	WL PJ

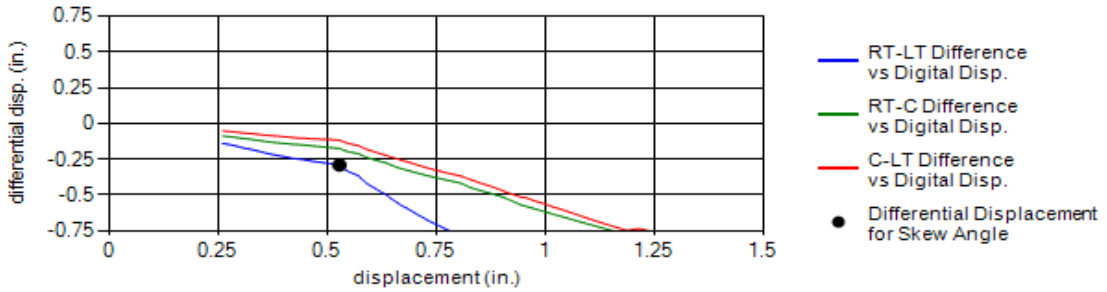
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3579	No Data	2623	3856	3390	3362	2.06	2582



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.21	0.16	0.17



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
-0.29	-0.17	-0.12	No Data	-0.93	CW



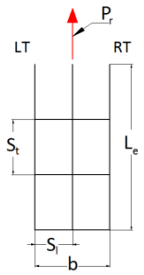
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	11/10/2010 2:50:00 PM
Test Identification:	TS17.12-G-9x24-W20xW15-L6-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):	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 B

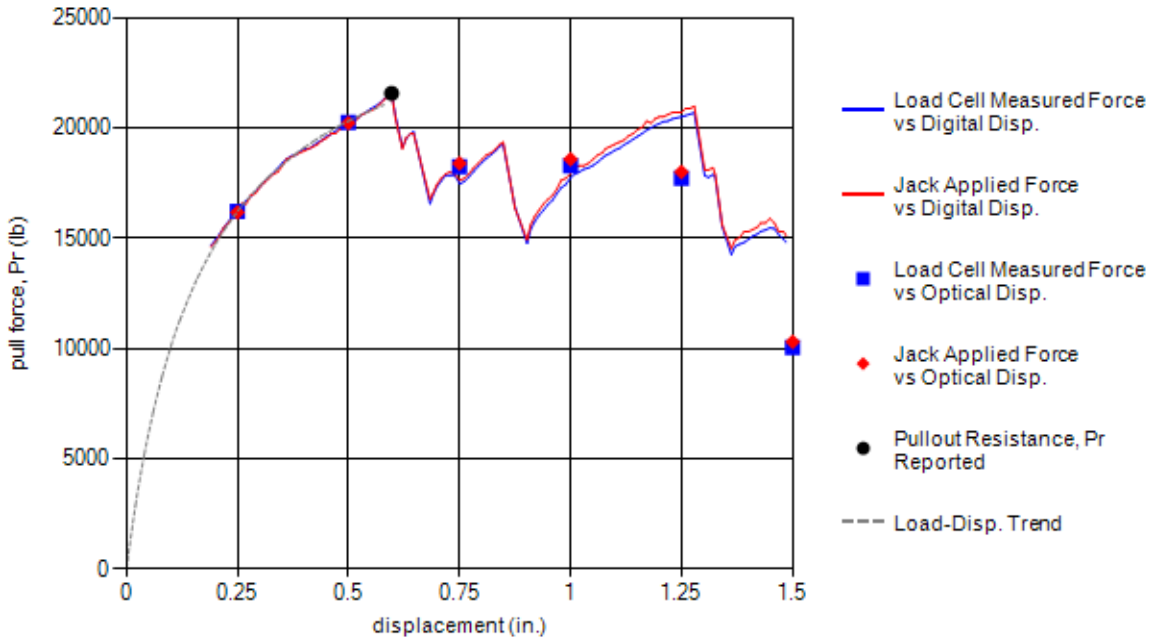
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	118.4	±2.0
Moisture Content, w (%):	5.9	±0.4%
Relative Compaction, C_R (%):	95.1	±1.6%

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	0.60	5083	21558	40.6	**0.24**

Load-Displacement Curve

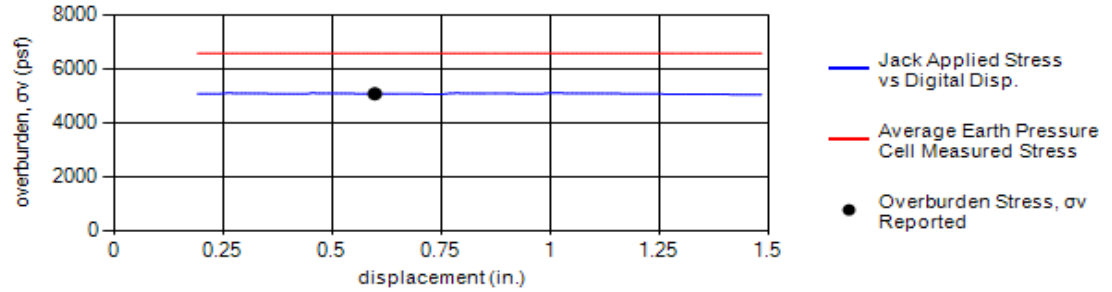


Comments

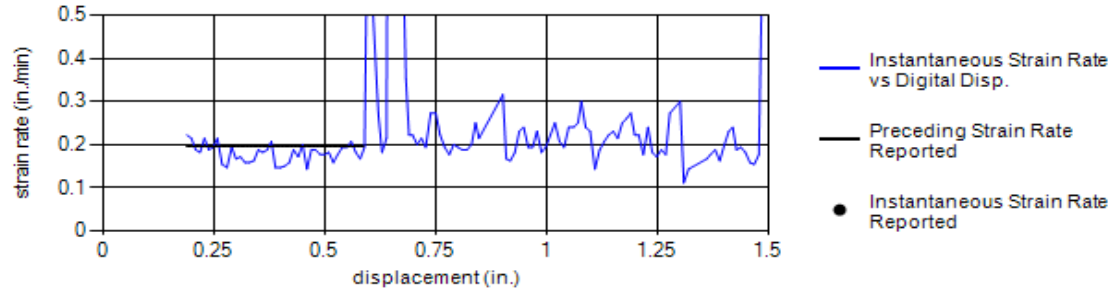
Personnel

Tested:	TW JL MB
Prepared:	SB TW
Checked:	WL PJ

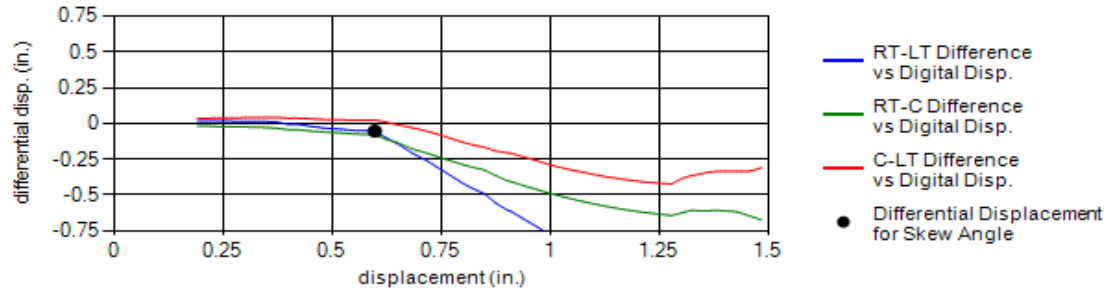
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
7302	No Data	5656	6735	6659	6588	1.05	5083



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.75	0.20	0.20



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
-0.05	-0.08	0.02	No Data	-0.17	CW



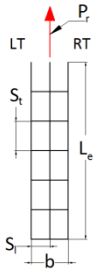
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	11/24/2010 11:56:00 AM
Test Identification:	TS18.01-G-9x12-W20xW7.5-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.):*	0.31	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

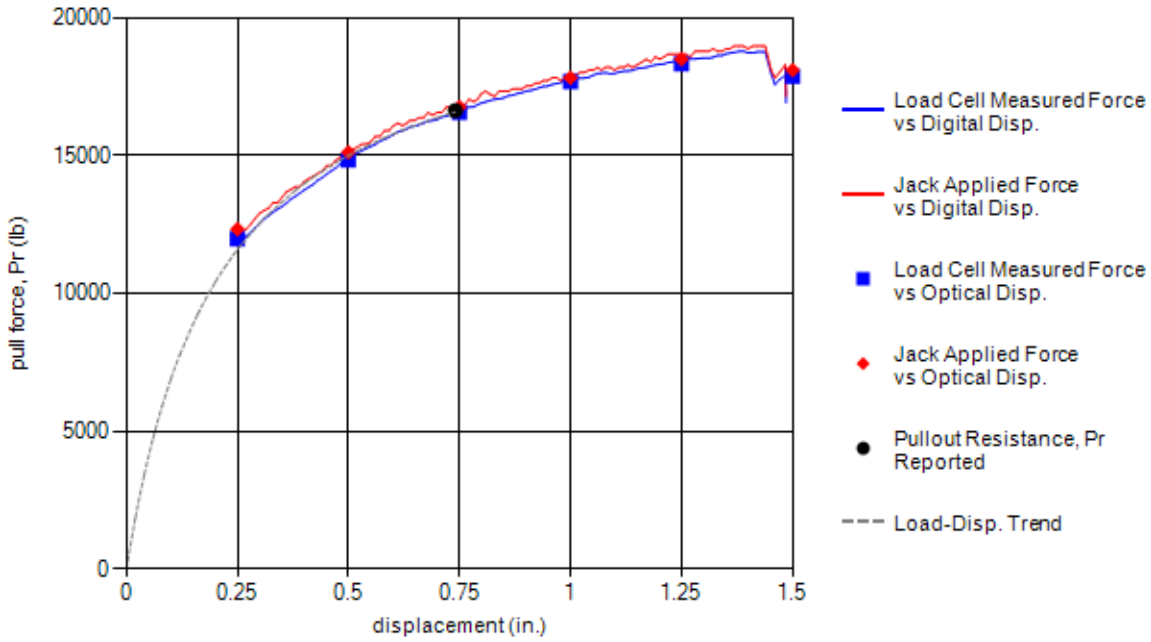
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	117.5	±1.0
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	6.7	±0.3%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	94.4	±0.8%

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	651	16620	5.2	**1.42**

Load-Displacement Curve

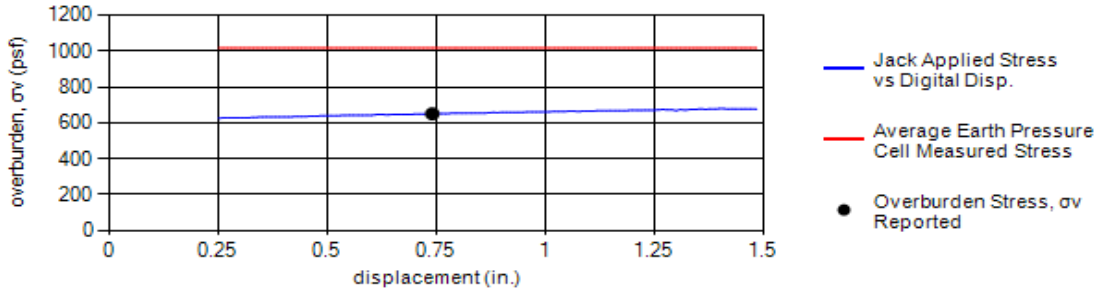


Comments

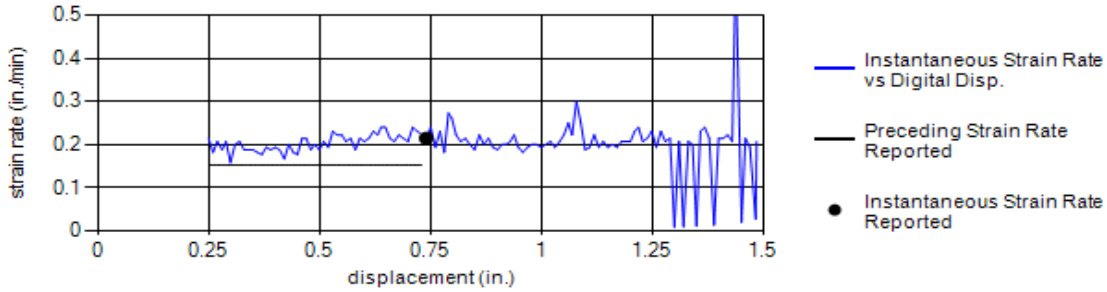
Personnel

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

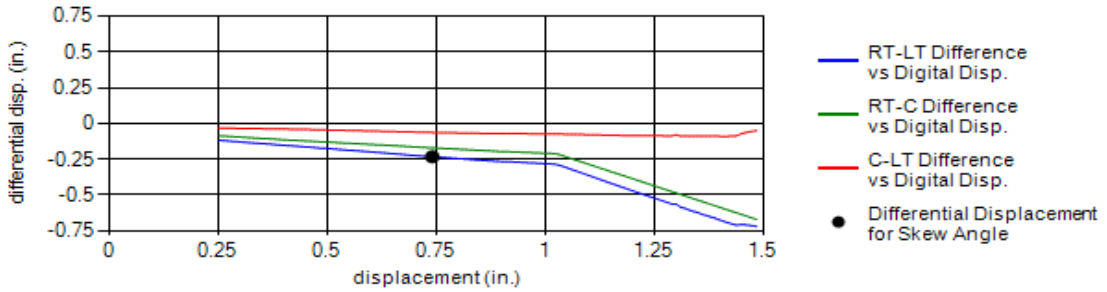
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1400	No Data	717	937	No Data	1018	8.99	651



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.21	0.15	0.17



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
-0.23	-0.17	-0.06	No Data	-0.74	CW



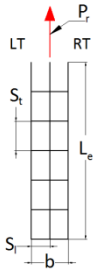
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	11/24/2010 12:20:00 PM
Test Identification:	TS18.02-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

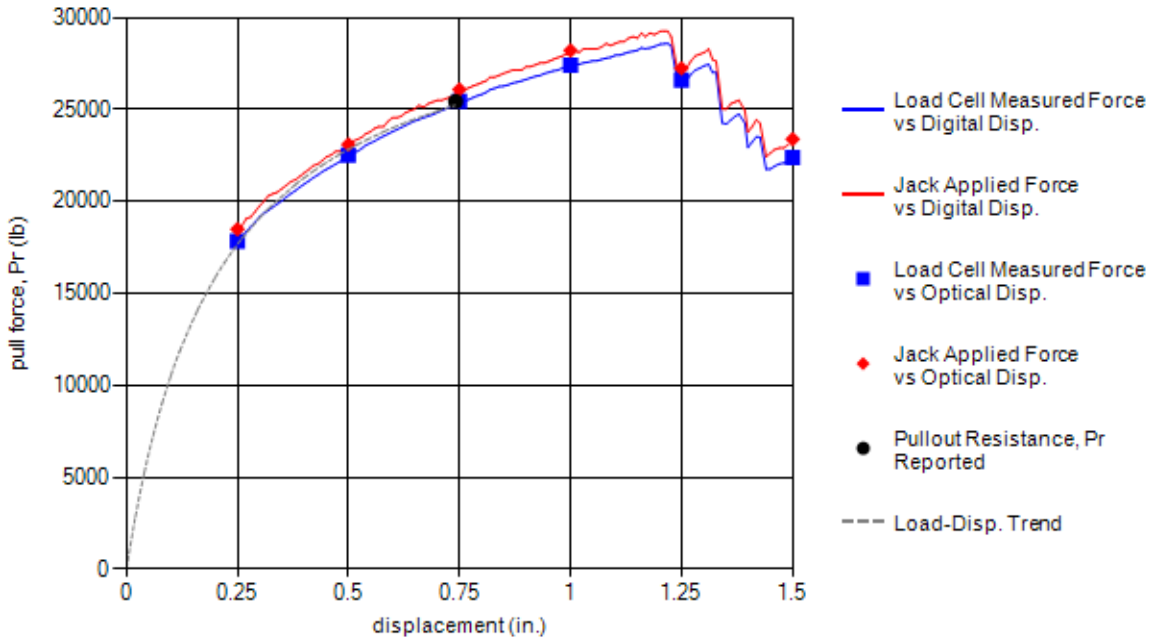
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	117.5	±1.0
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	6.7	±0.3%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	94.4	±0.8%

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	1539	25426	12.3	**0.92**

Load-Displacement Curve

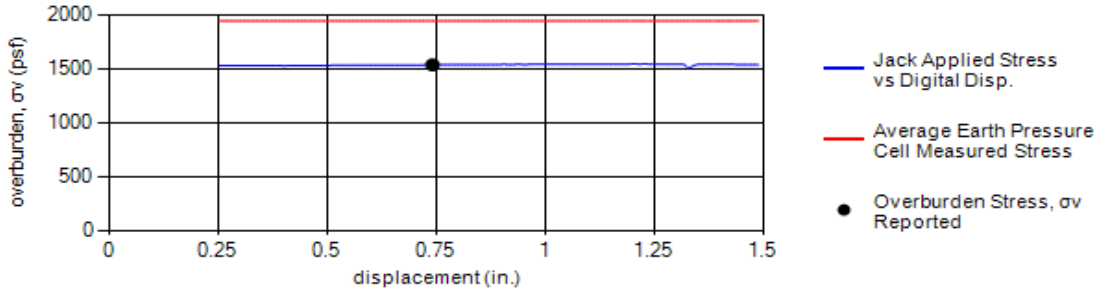


Comments

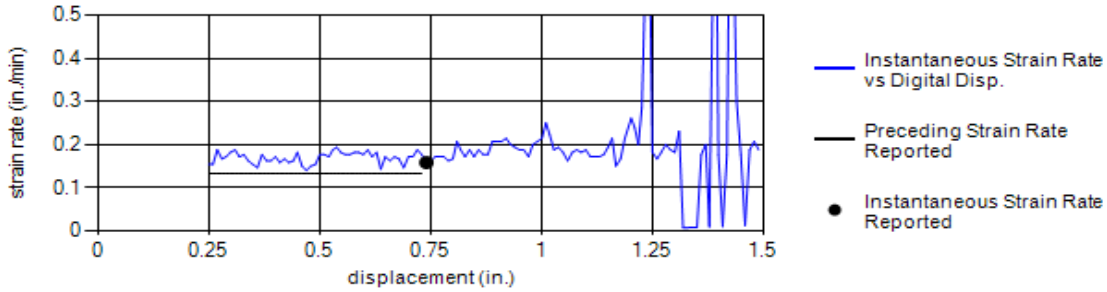
Personnel

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

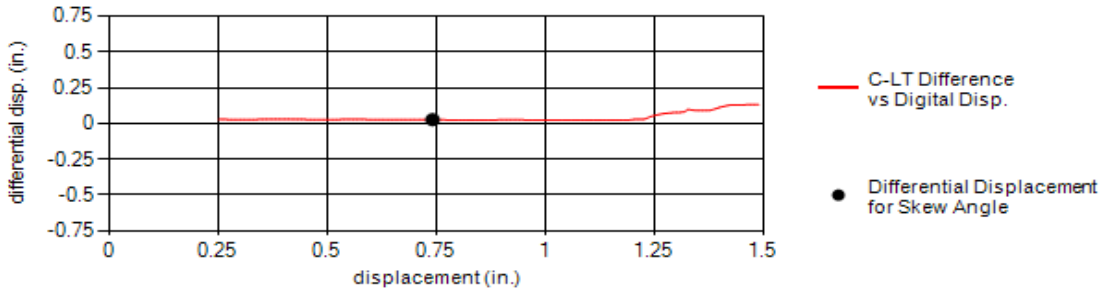
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2394	No Data	1477	1972	No Data	1948	4.57	1539



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.16	0.13	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	0.03	No Data	0.04	CCW



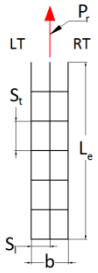
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	11/24/2010 12:45:00 PM
Test Identification:	TS18.03-G-9x6-W20xW11-L3-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):	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

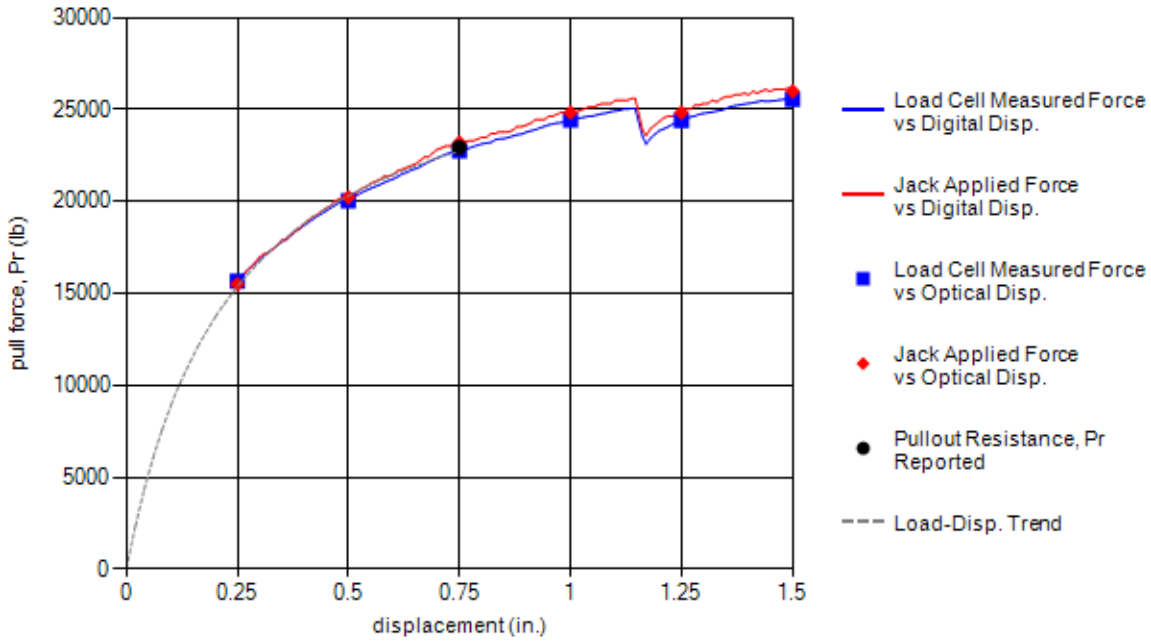
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	117.5 ±1.0
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	6.7 ±0.3%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	94.4 ±0.8%

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	2554	22927	20.4	**1.00**

Load-Displacement Curve

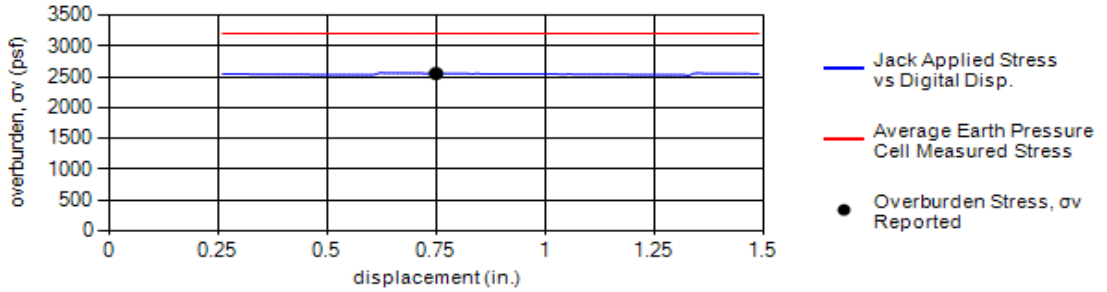


Comments

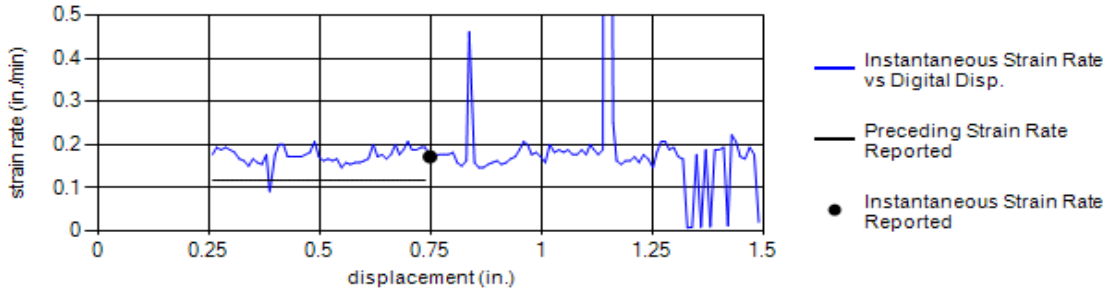
Personnel

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

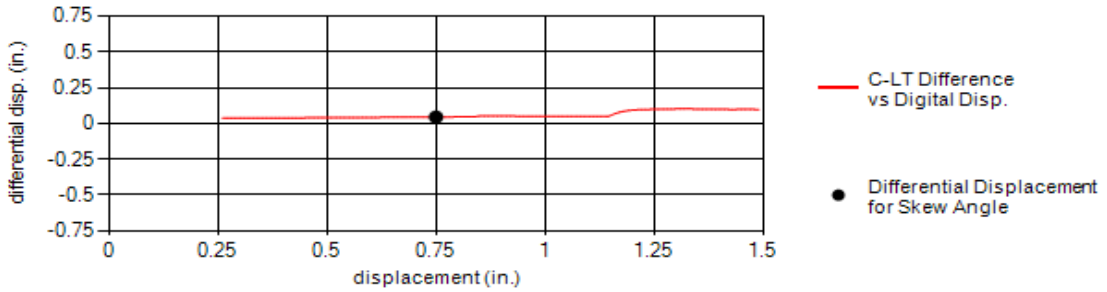
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3764	No Data	2591	3255	No Data	3203	2.75	2554



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.17	0.12	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	0.05	No Data	0.07	CCW



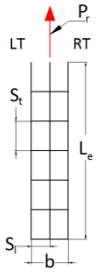
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	11/24/2010 12:43:00 PM
Test Identification:	TS18.04-G-9x6-W20xW11-L3-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):	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

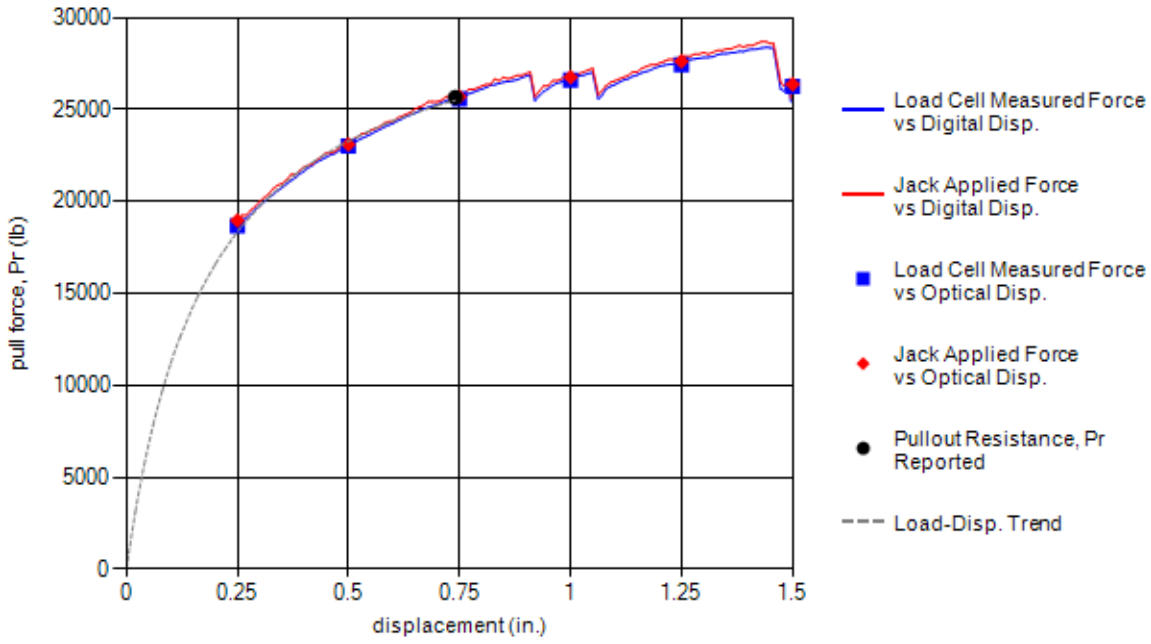
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	117.5	±1.0
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	6.7	±0.3%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	94.4	±0.8%

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	2536	25647	20.2	**1.12**

Load-Displacement Curve

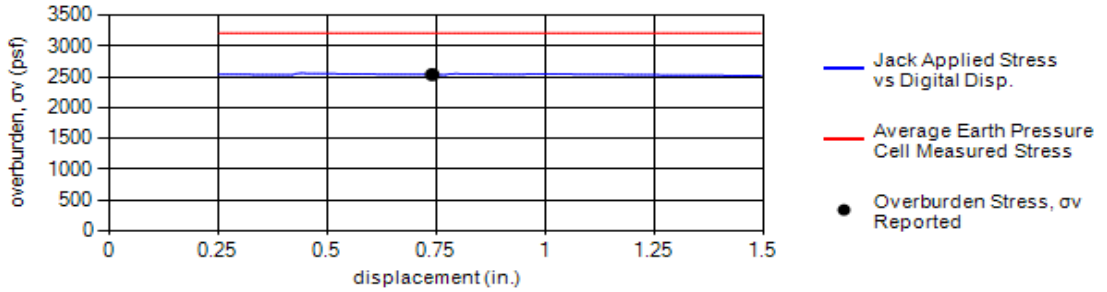


Comments

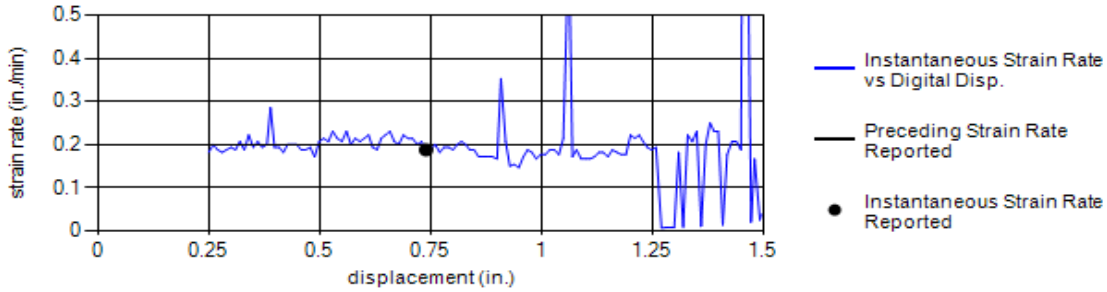
Personnel

Tested:	AS JL DH
Prepared:	SB TW
Checked:	WL PJ

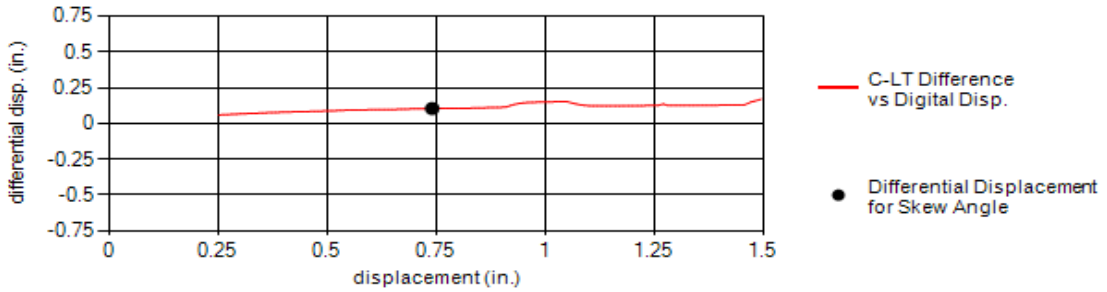
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3775	No Data	2604	3253	No Data	3211	2.74	2536



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.19	0.20	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	0.10	No Data	0.17	CCW



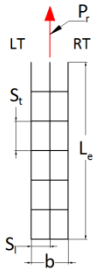
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	12/3/2010 2:04:00 PM
Test Identification:	TS18.05-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

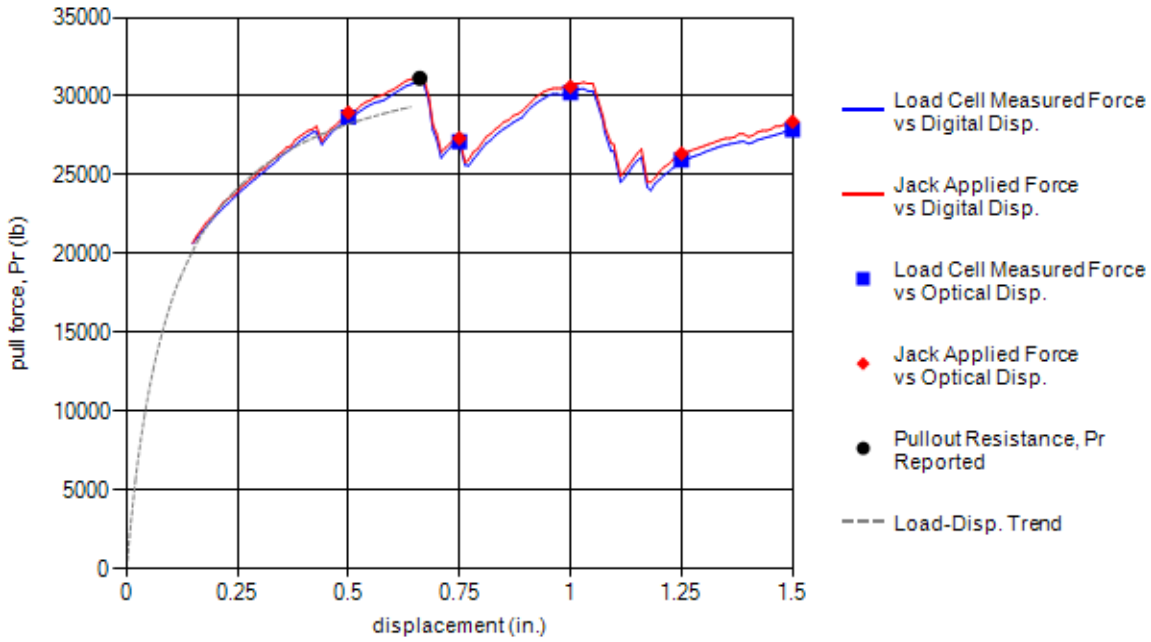
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	117.5	±1.0
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	6.7	±0.3%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	94.4	±0.8%

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	2535	31136	20.2	**0.68**

Load-Displacement Curve

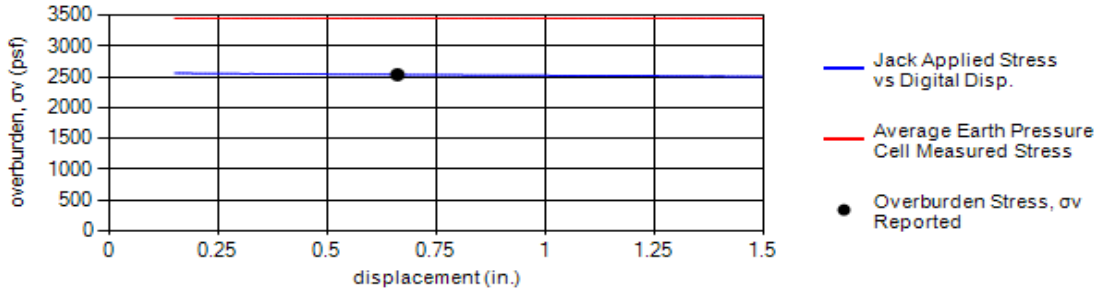


Comments

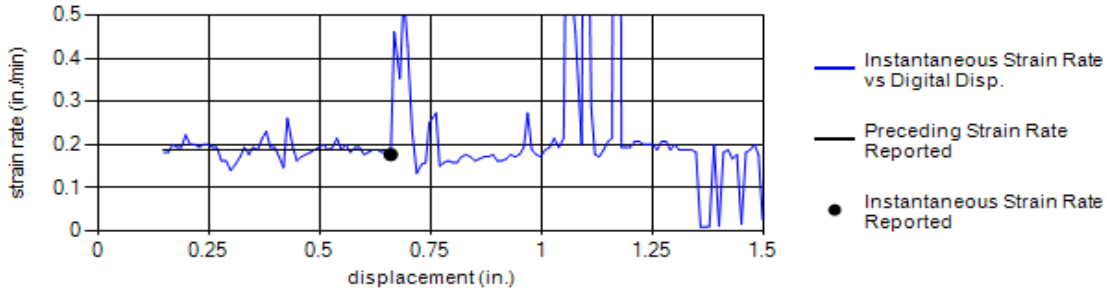
Personnel

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

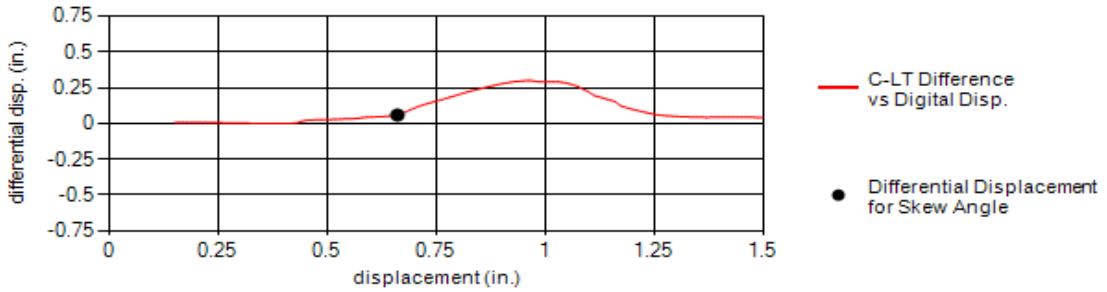
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
4084	No Data	2986	3271	No Data	3447	2.56	2534



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.18	0.19	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	0.06	No Data	0.09	CCW



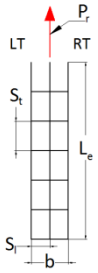
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	12/3/2010 1:16:00 PM
Test Identification:	TS18.06-G-9x12-W20xW15-L6-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):	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

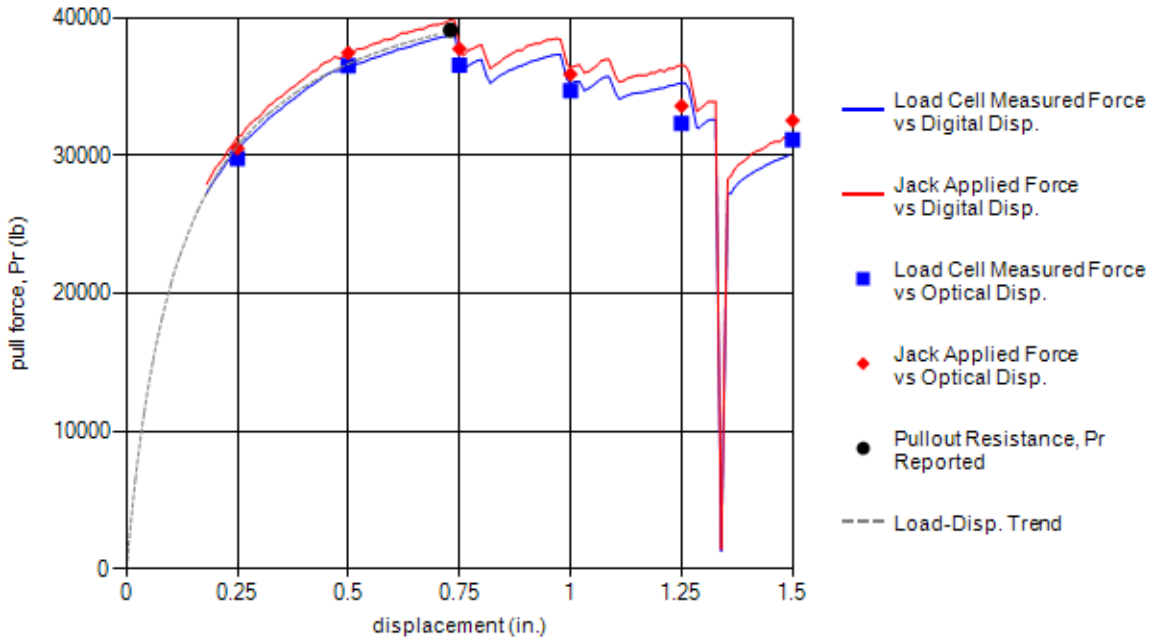
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	117.5 ±1.0
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	6.7 ±0.3%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	94.4 ±0.8%

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	2504	39085	20.0	**0.87**

Load-Displacement Curve

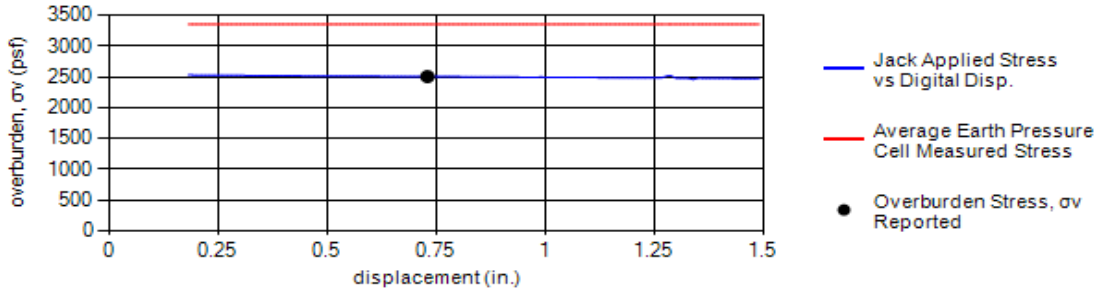


Comments

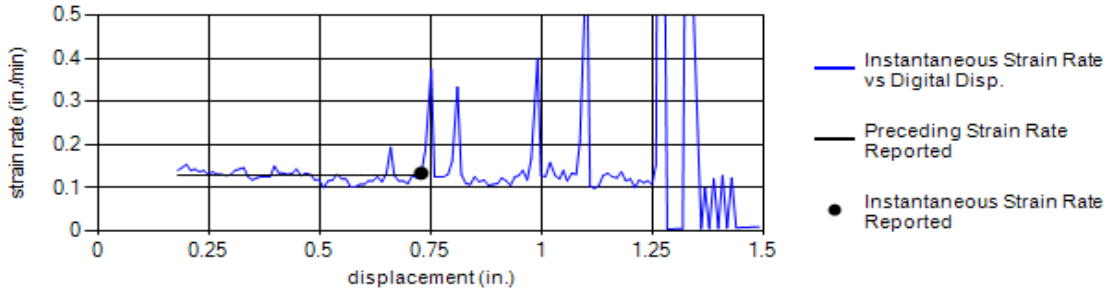
Personnel

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

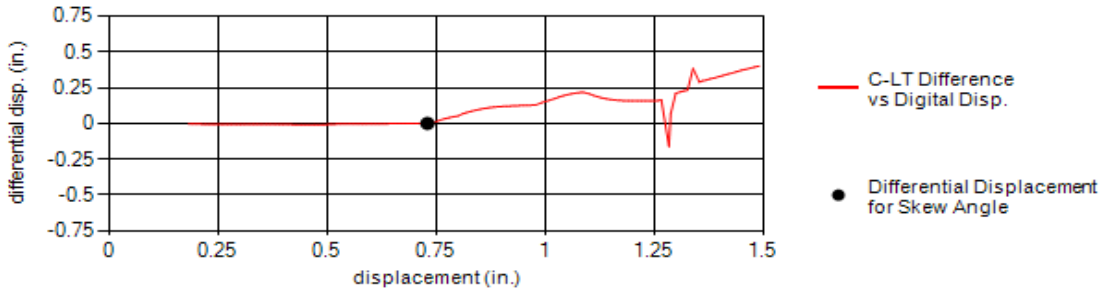
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
4084	No Data	2751	3226	No Data	3354	2.64	2504



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.13	0.13	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	0.00	No Data	0.00	CCW



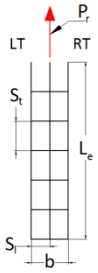
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	12/3/2010 12:53:00 PM
Test Identification:	TS18.07-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

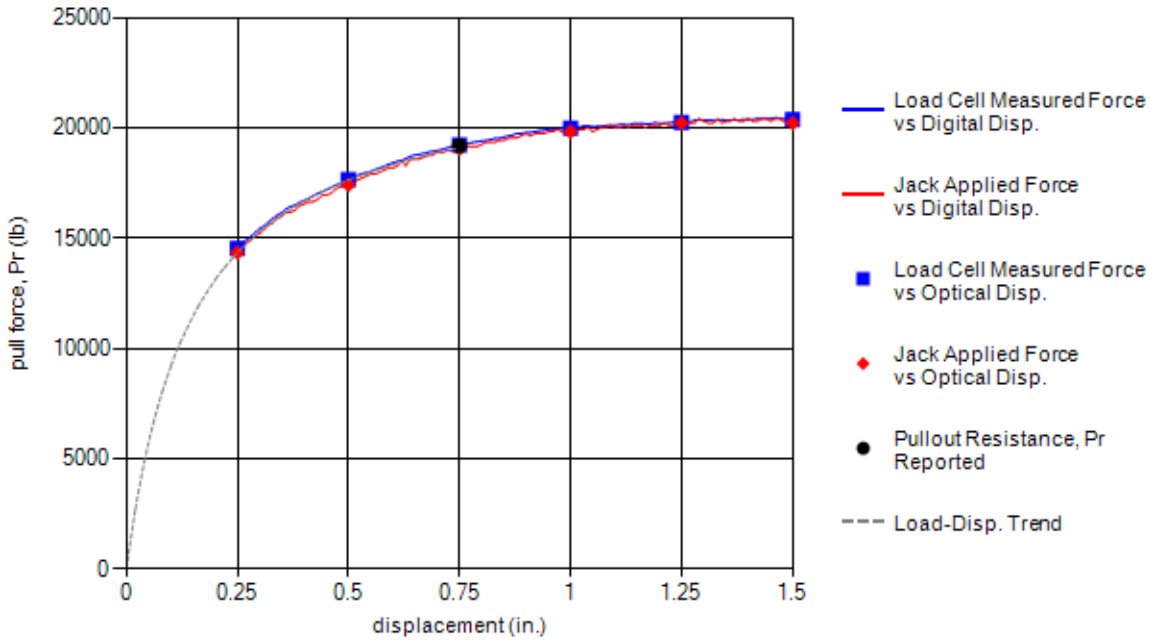
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	117.5	±1.0
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	6.7	±0.3%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	94.4	±0.8%

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****
Pullout	0.75	728	19188	5.8	**2.93**

Load-Displacement Curve

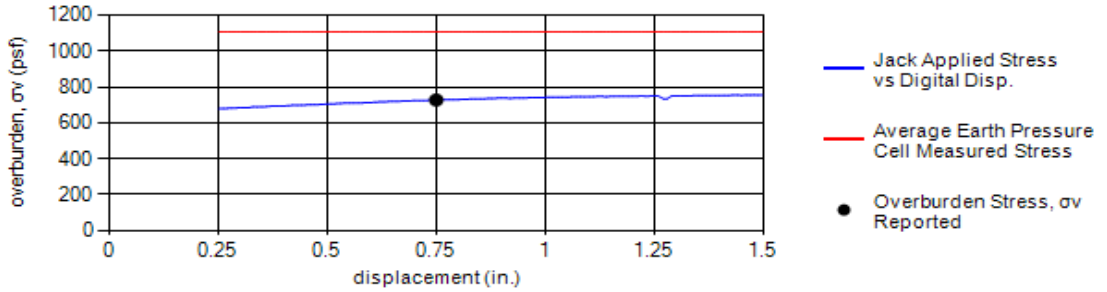


Comments

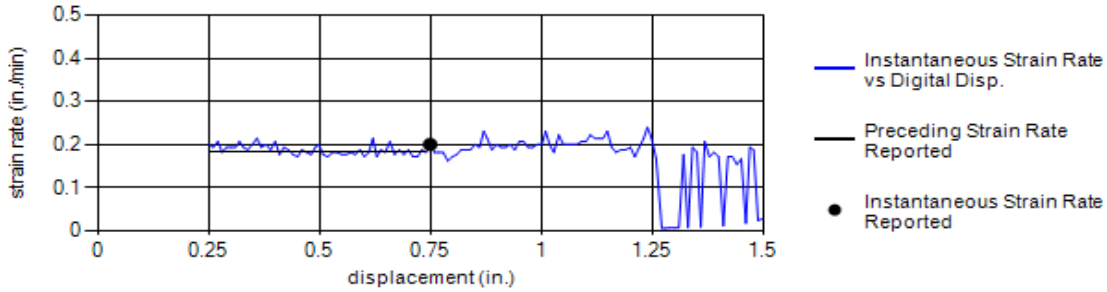
Personnel

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

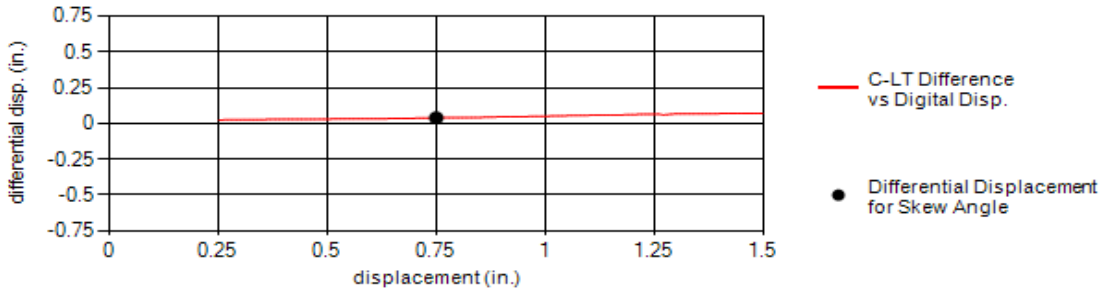
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1305	No Data	891	1125	No Data	1107	8.15	728



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*
No Data	No Data	0.04	No Data	0.06	CCW



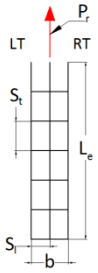
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	12/3/2010 12:29:00 PM
Test Identification:	TS18.08-G-9x6-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:*	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

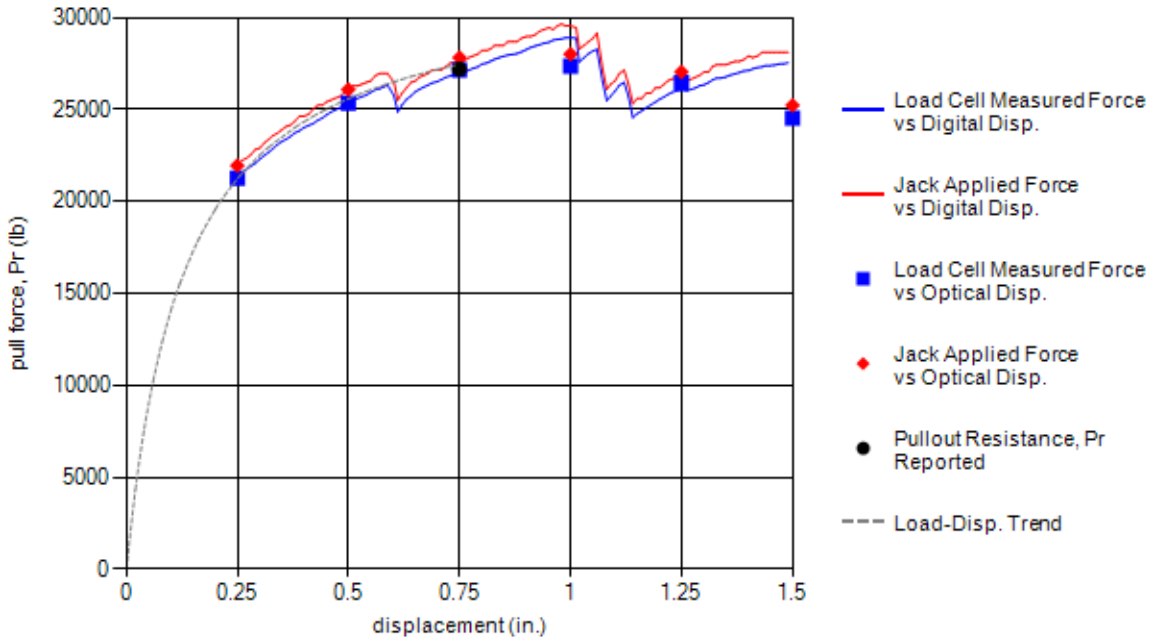
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	117.5	±1.0
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	6.7	±0.3%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	94.4	±0.8%

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	1511	27192	12.0	**2.00**

Load-Displacement Curve

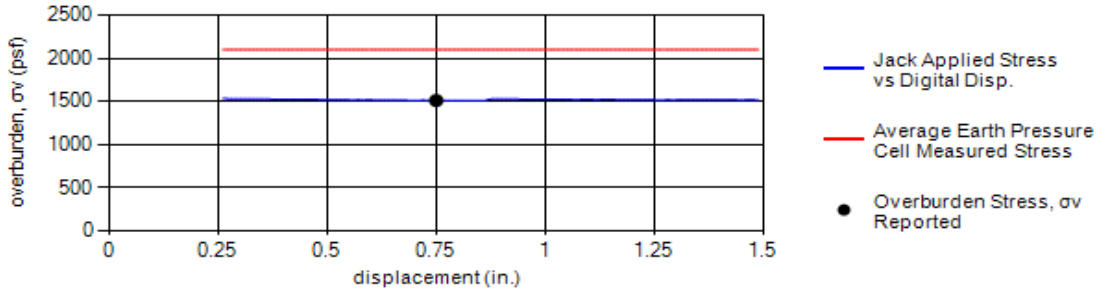


Comments

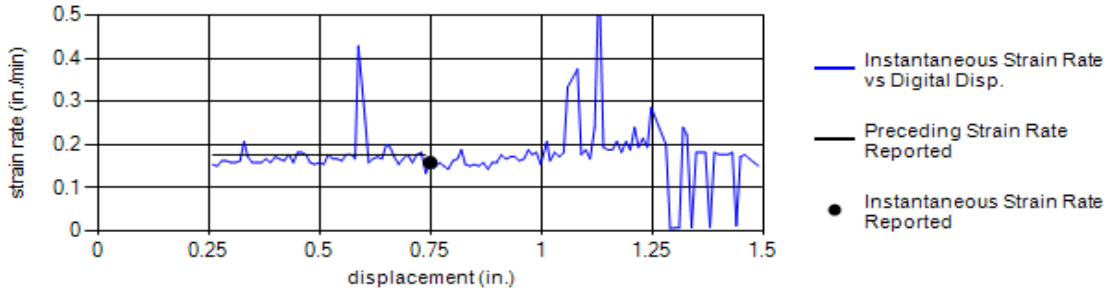
Personnel

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

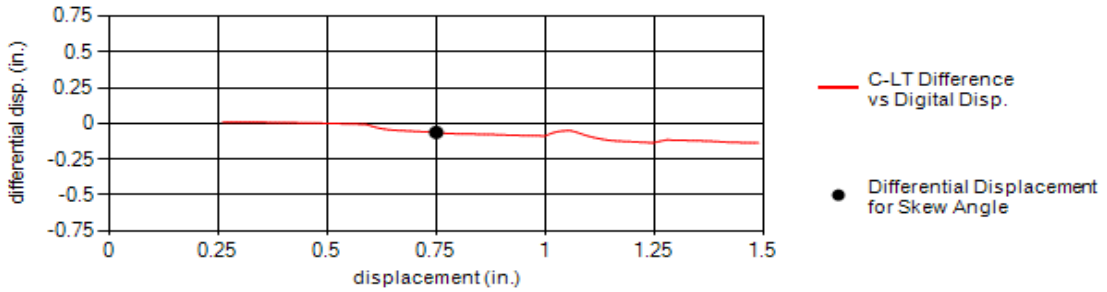
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2511	No Data	1781	2011	No Data	2101	4.23	1511



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.16	0.18	0.18



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	No Data	-0.06	No Data	-0.10	CW



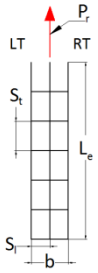
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	11/29/2010 3:18:00 PM
Test Identification:	TS18.09-G-9x12-W20xW7.5-L6-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):	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

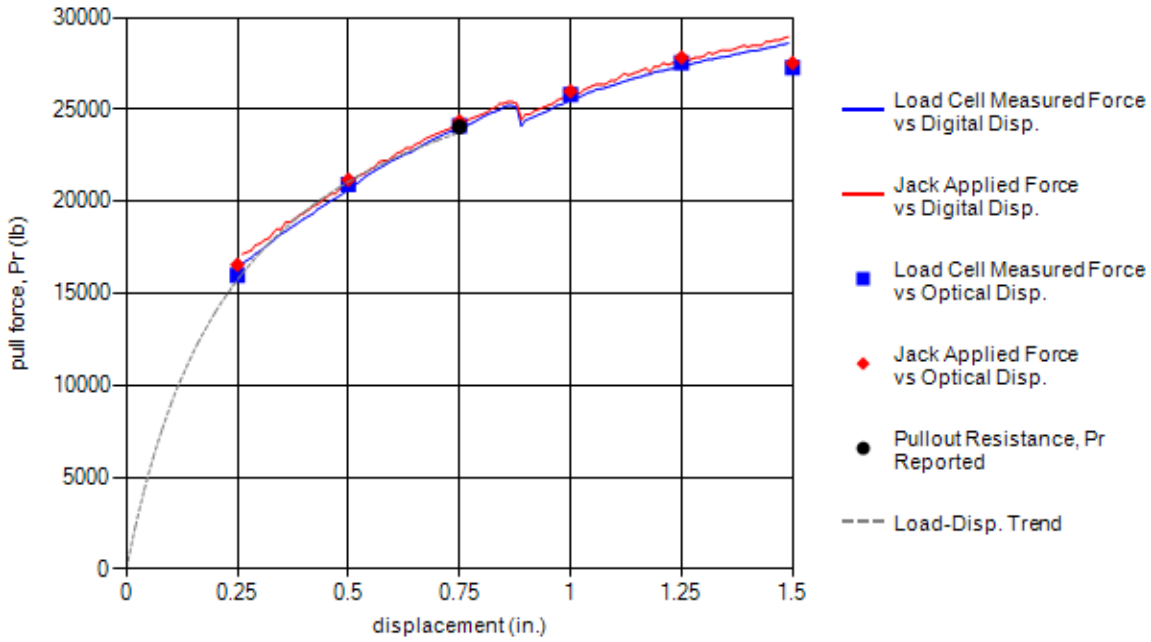
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	117.5 ±1.0
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	6.7 ±0.3%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	94.4 ±0.8%

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	690	24049	5.5	**1.94**

Load-Displacement Curve

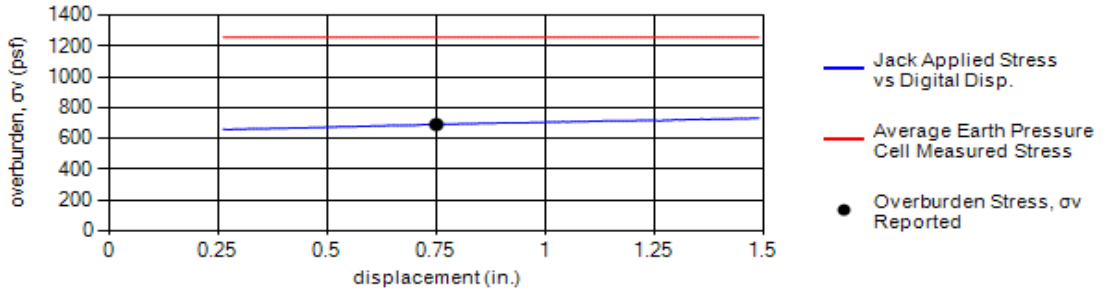


Comments

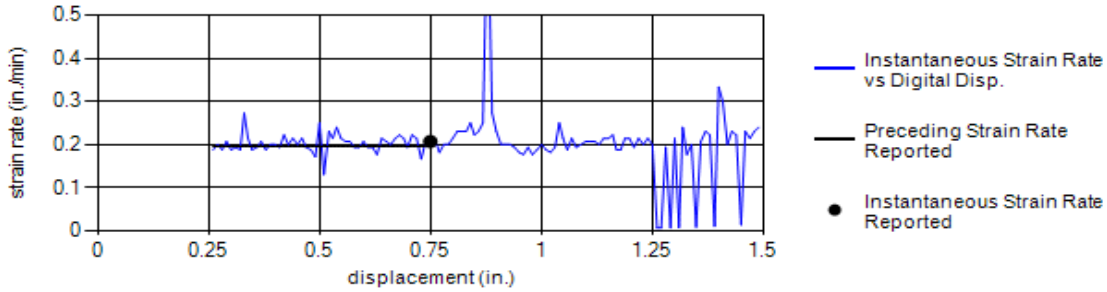
Personnel

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

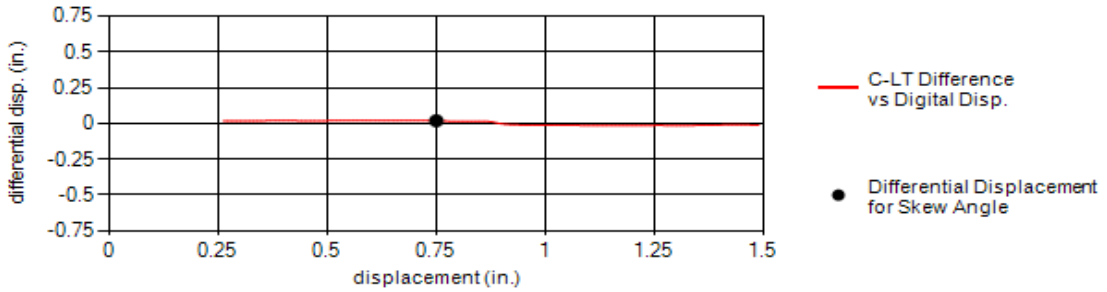
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2022	No Data	832	916	No Data	1257	7.74	690



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.21	0.20	0.20



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	No Data	0.02	No Data	0.03	CCW



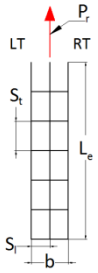
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	12/1/2010 3:38:00 PM
Test Identification:	TS18.10-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

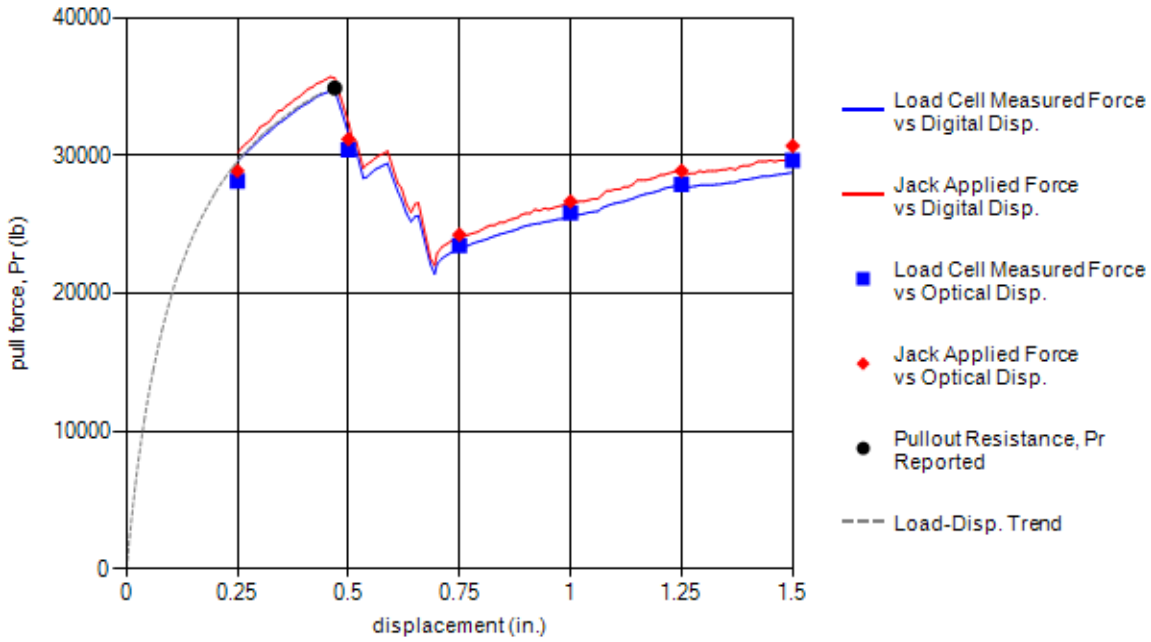
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	117.5	±1.0
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	6.7	±0.3%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	94.4	±0.8%

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	2543	34880	20.3	**0.76**

Load-Displacement Curve

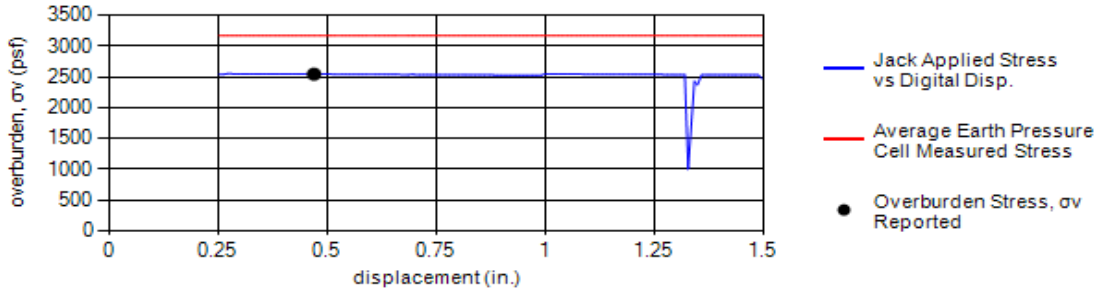


Comments

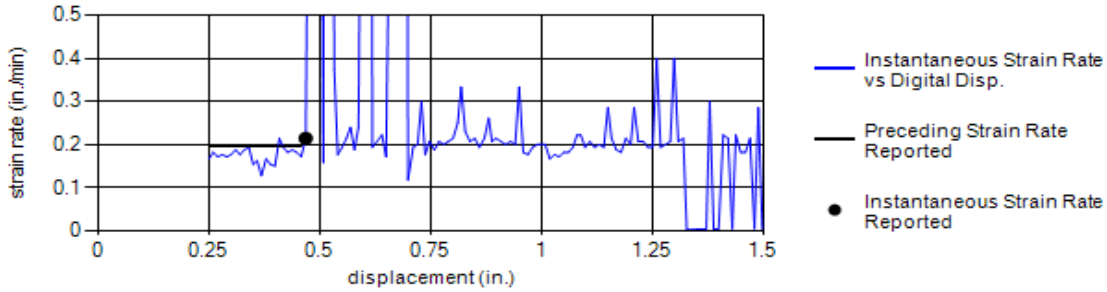
Personnel

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

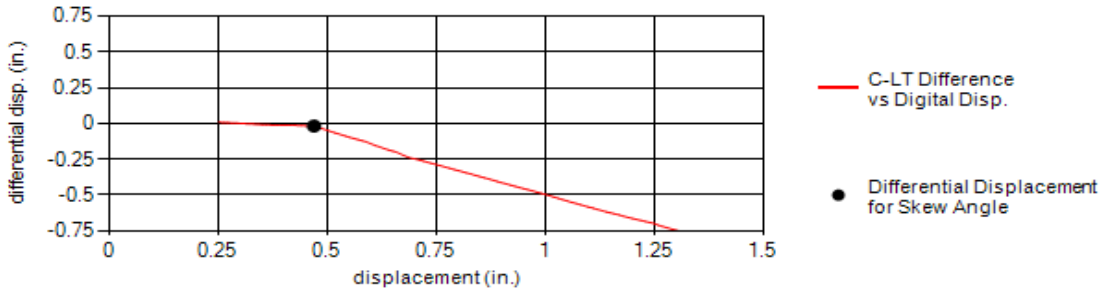
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3934	No Data	2724	3126	2894	3170	2.10	2543



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.21	0.20	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	-0.02	No Data	-0.03	CW



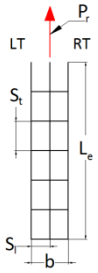
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	12/1/2010 4:20:00 PM
Test Identification:	TS18.11-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

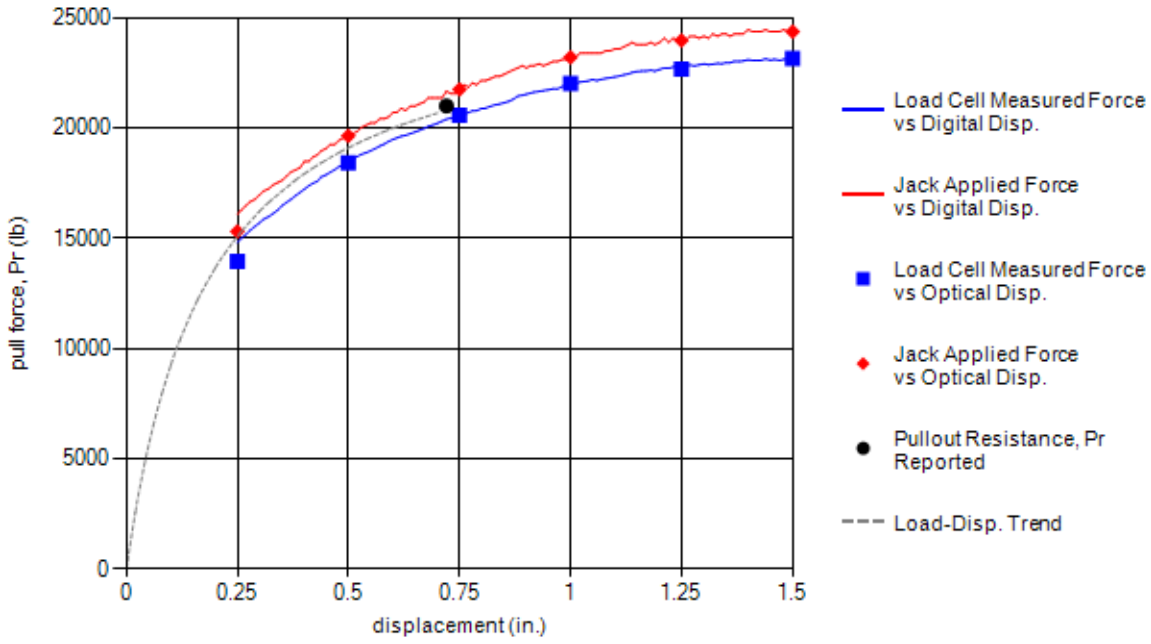
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	117.5 ±1.0
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	6.7 ±0.3%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	94.4 ±0.8%

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	660	20991	5.3	**3.53**

Load-Displacement Curve

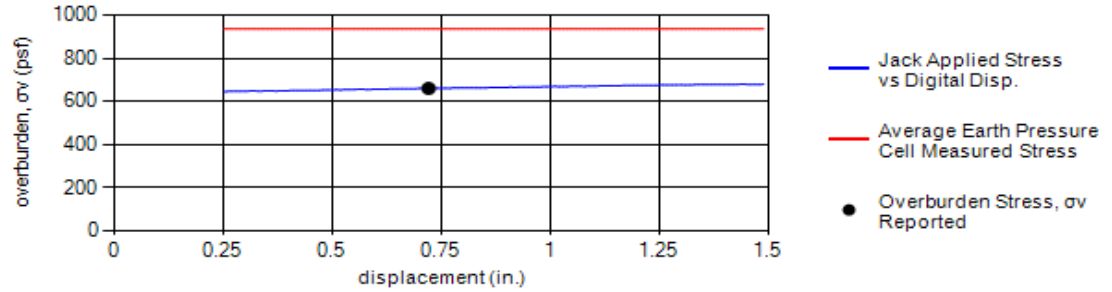


Comments

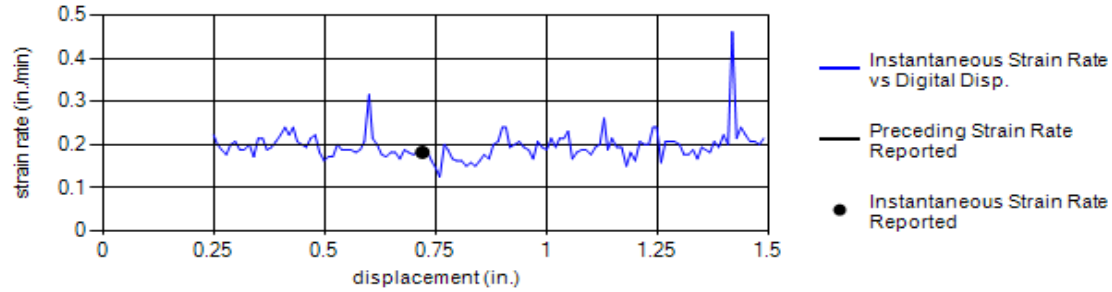
Personnel

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

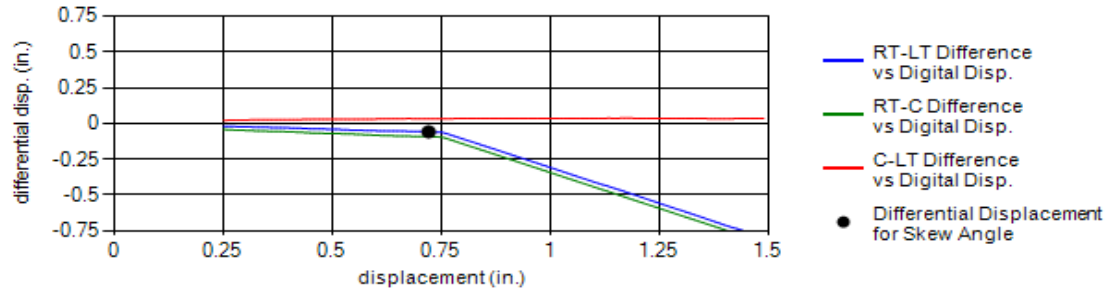
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1075	No Data	806	935	927	936	8.09	660



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



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
-0.06	-0.09	0.03	No Data	-0.18	CW



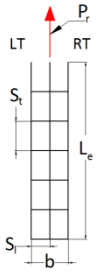
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	12/1/2010 4:49:00 PM
Test Identification:	TS18.12-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

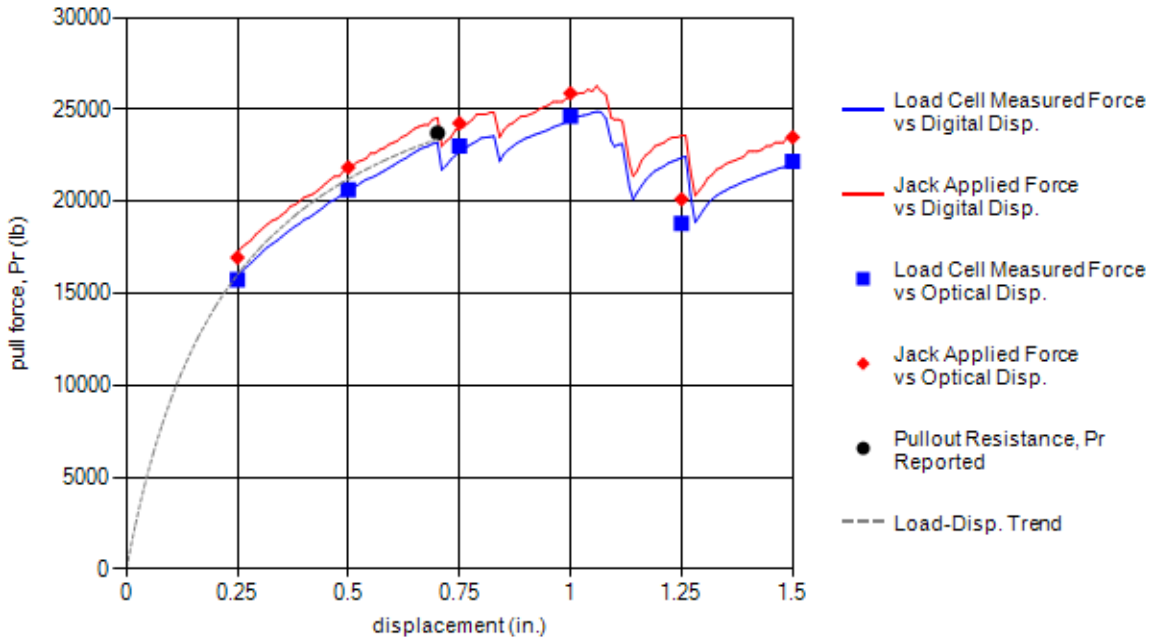
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	117.5 ±1.0
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	6.7 ±0.3%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	94.4 ±0.8%

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	0.70	1528	23714	12.2	**1.72**

Load-Displacement Curve

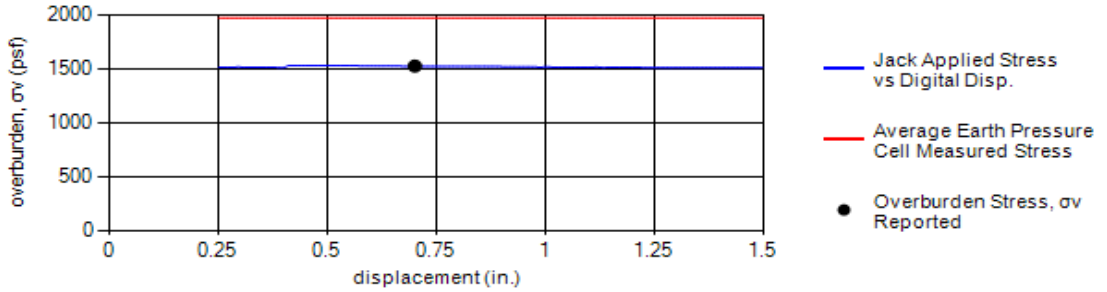


Comments

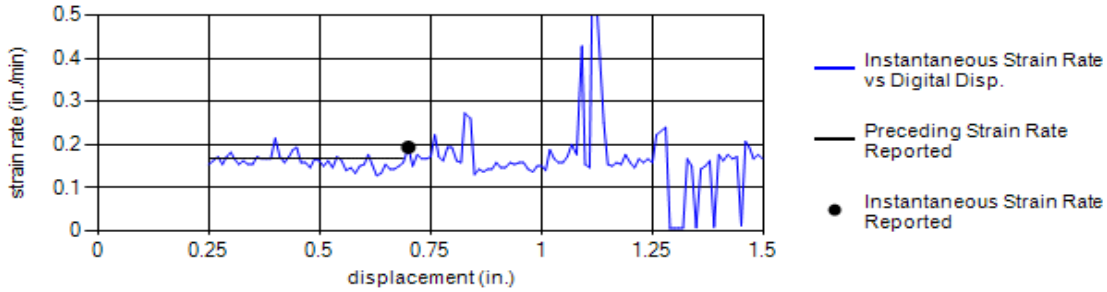
Personnel

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

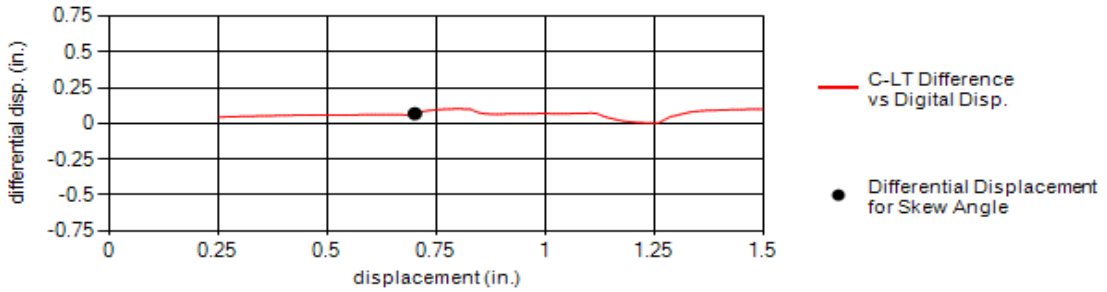
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2445	No Data	1726	1916	1816	1976	3.49	1528



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.19	0.17	0.16



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	No Data	0.07	No Data	0.11	CCW



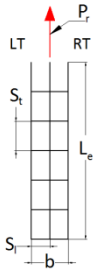
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	12/23/2010 9:53:00 AM
Test Identification:	TS19.01-G-2x12-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.):	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

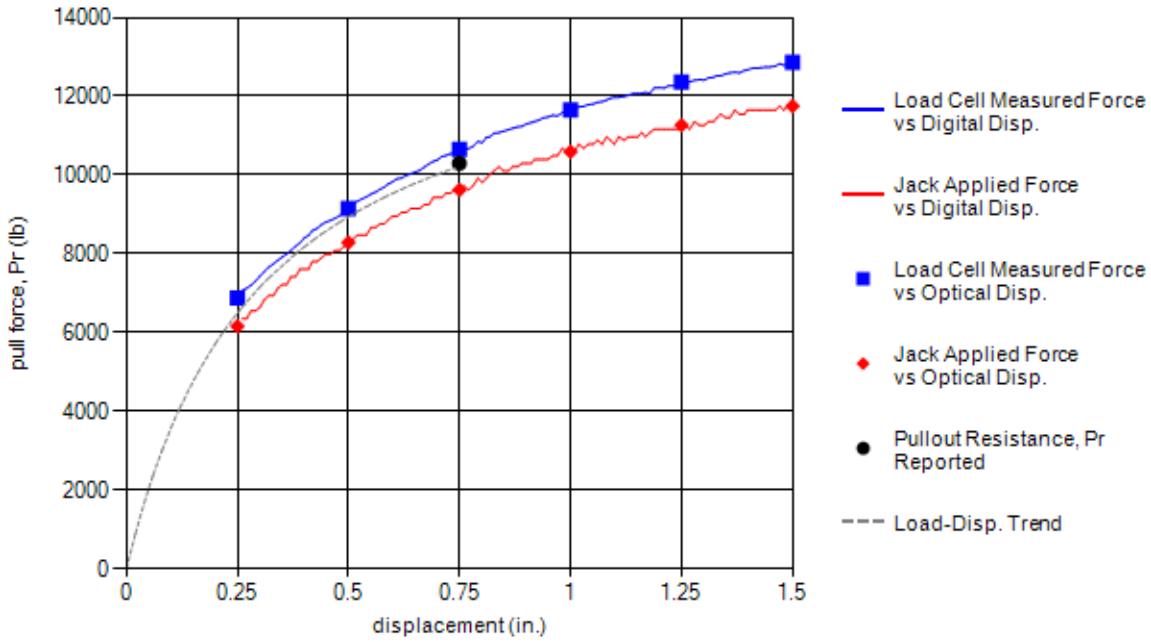
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	117.5 ±1.0
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	6.7 ±0.3%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	94.4 ±0.8%

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	10297	5.0	**4.08**

Load-Displacement Curve

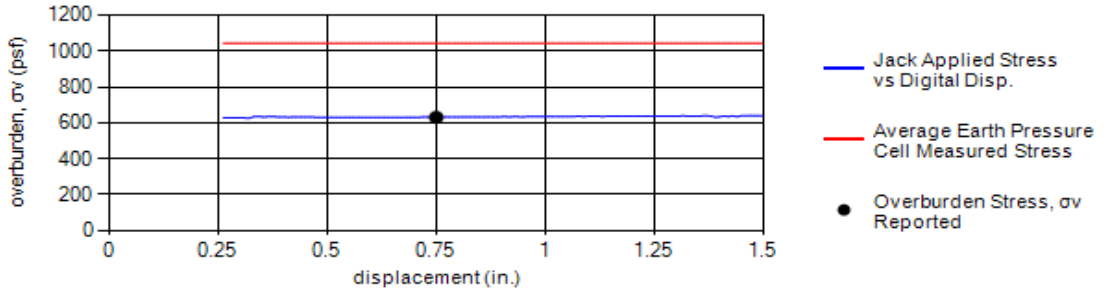


Comments

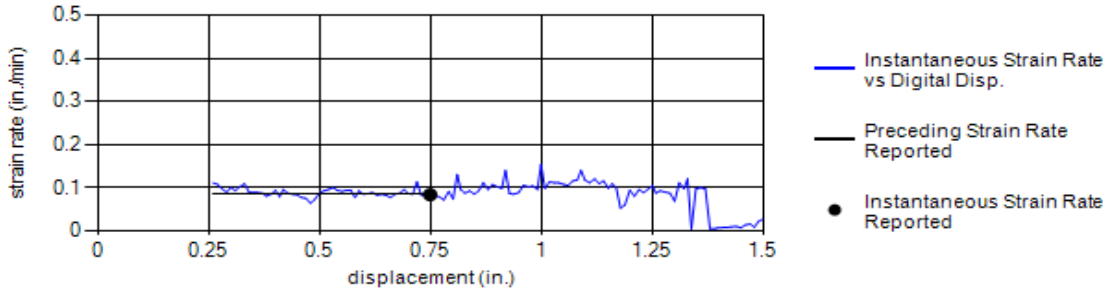
Personnel

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

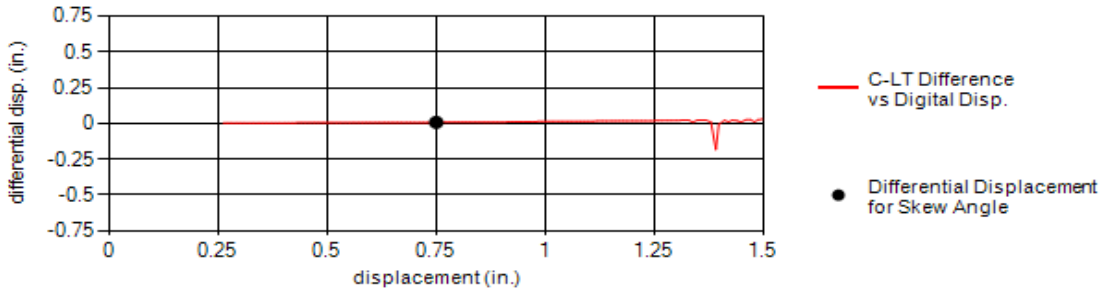
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1448	No Data	945	961	828	1045	7.95	631



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*
No Data	No Data	0.01	No Data	0.06	CCW



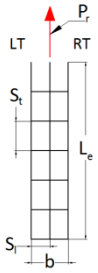
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	12/23/2010 10:35:00 AM
Test Identification:	TS19.02-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

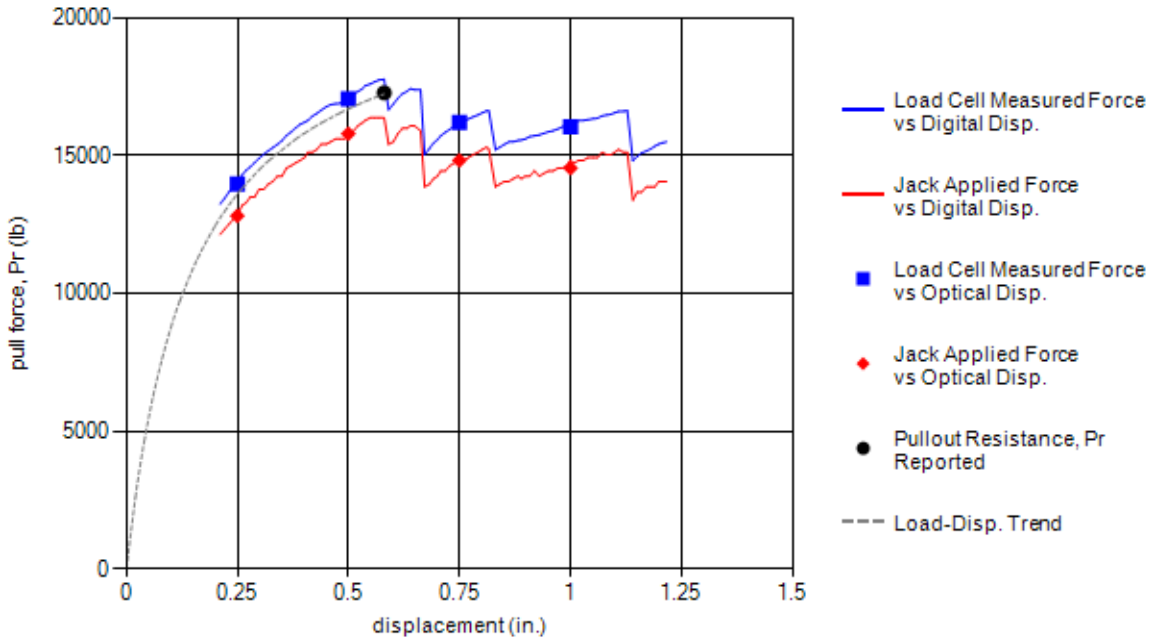
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	117.5 ±1.0
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	6.7 ±0.3%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	94.4 ±0.8%

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	637	17266	5.1	**1.13**

Load-Displacement Curve

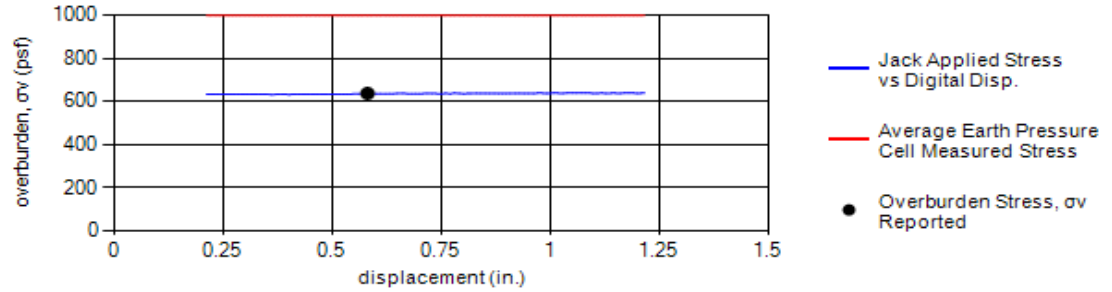


Comments

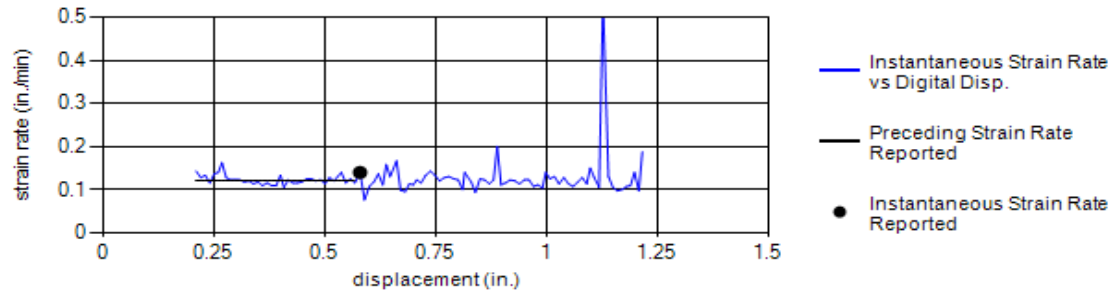
Personnel

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

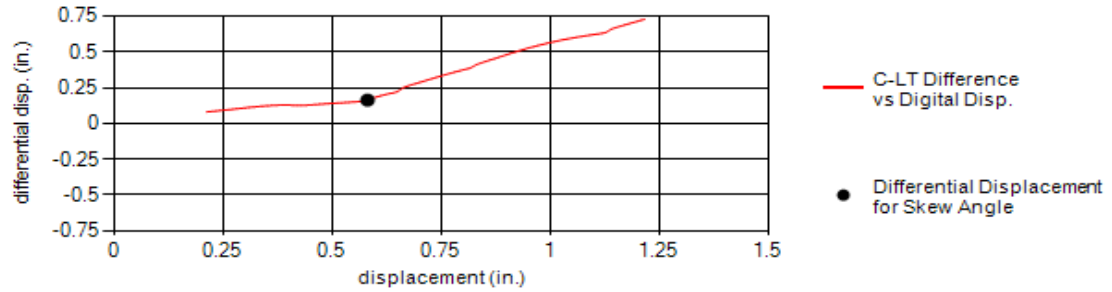
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1310	No Data	890	962	832	999	7.87	637



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.14	0.12	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	0.16	No Data	0.20	CCW



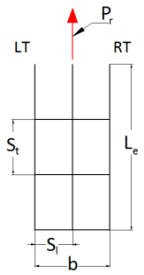
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	12/23/2010 11:16:00 AM
Test Identification:	TS19.03-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

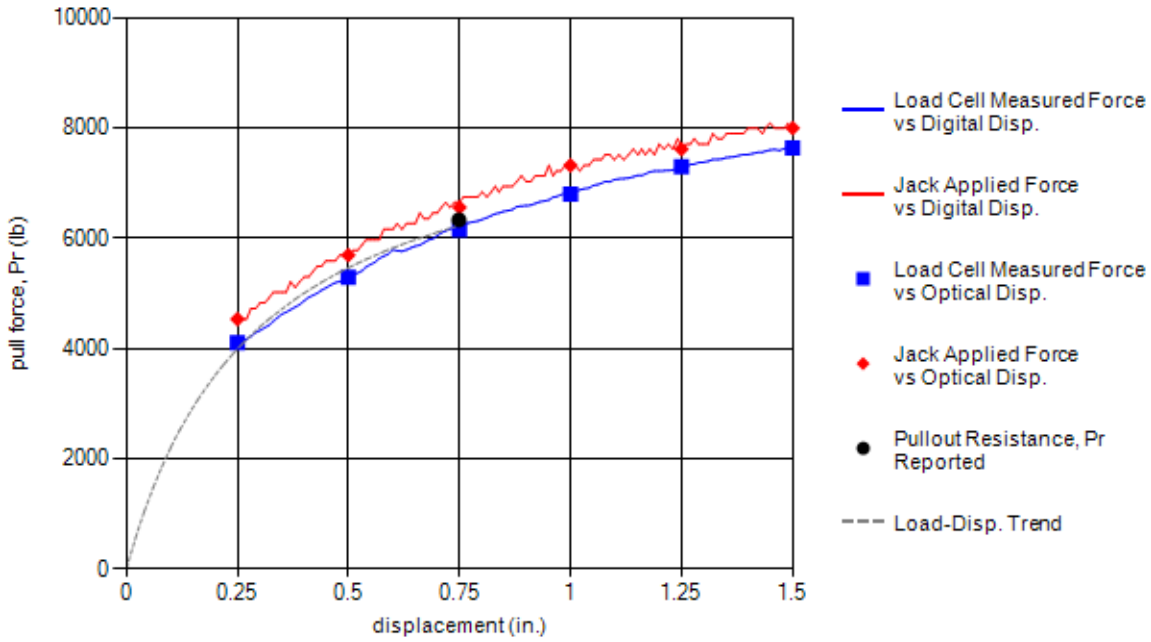
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	117.5 ±1.0
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	6.7 ±0.3%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	94.4 ±0.8%

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	1527	6330	12.2	**2.07**

Load-Displacement Curve

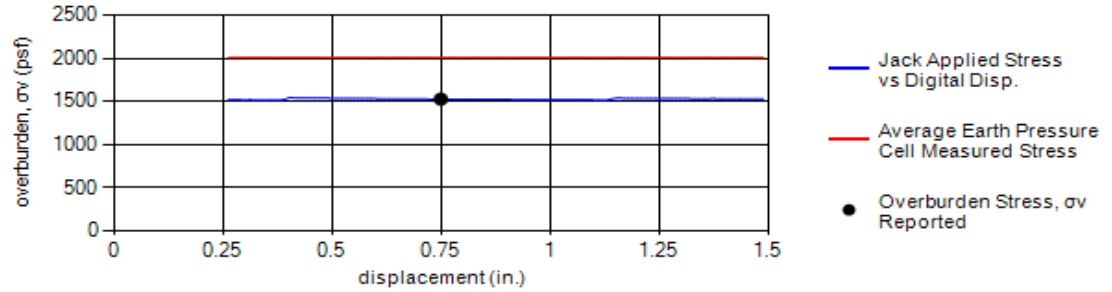


Comments

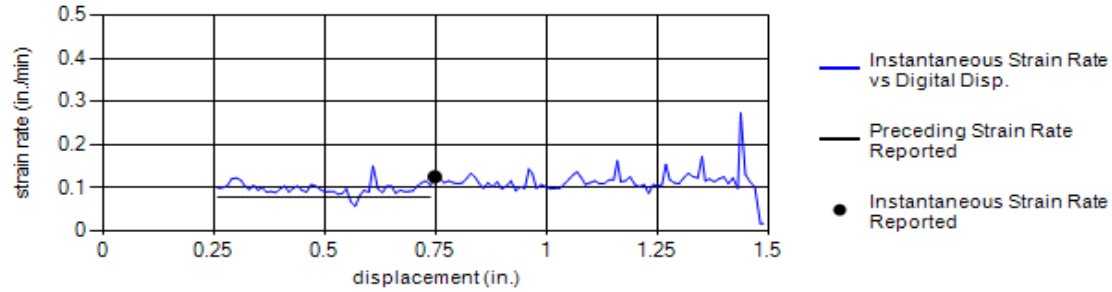
Personnel

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

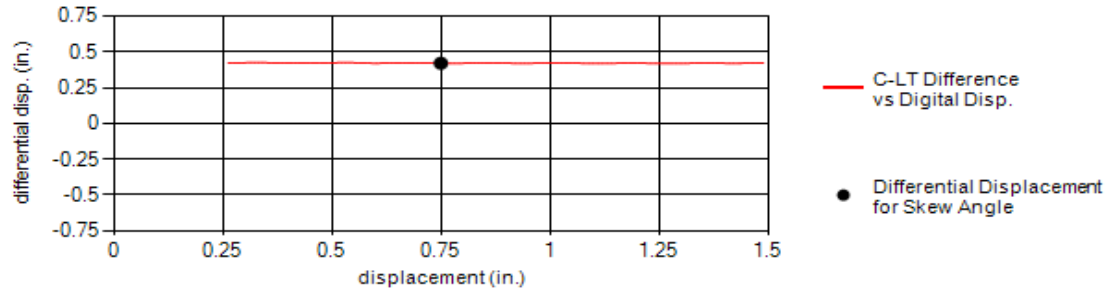
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2326	No Data	2014	1987	1704	2008	3.29	1526



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*
No Data	No Data	0.42	No Data	3.02	CCW



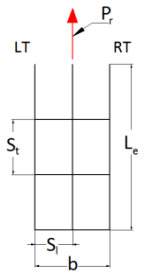
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	12/23/2010 11:48:00 AM
Test Identification:	TS19.04-G-12x12-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.):	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

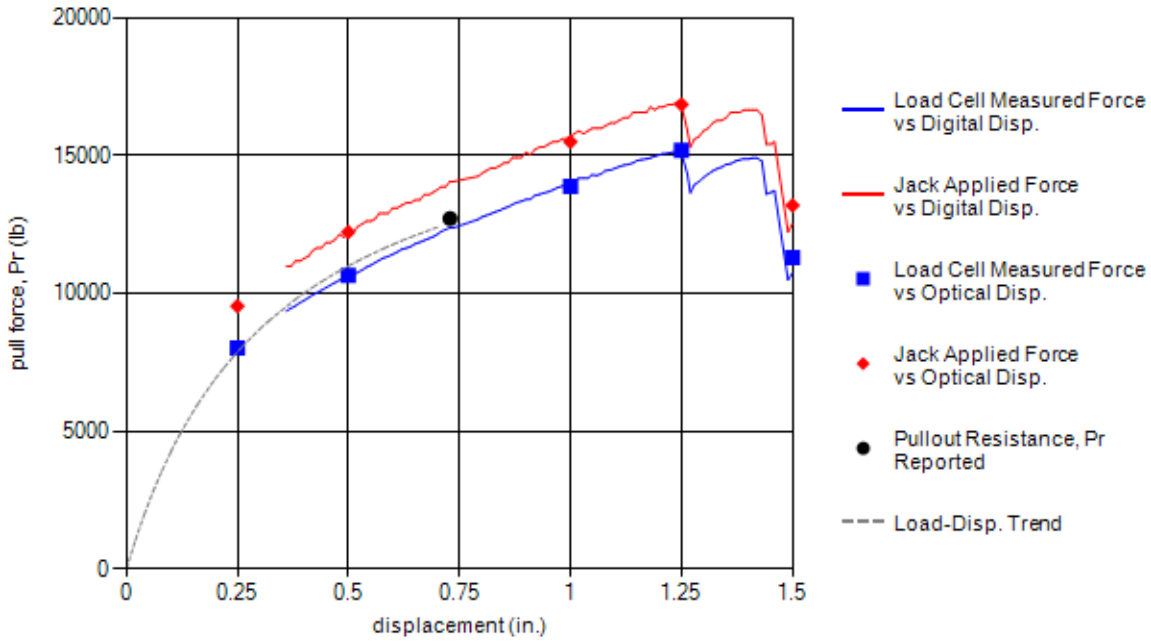
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	117.5 ±1.0
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	6.7 ±0.3%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	94.4 ±0.8%

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	1528	12706	12.2	**0.69**

Load-Displacement Curve

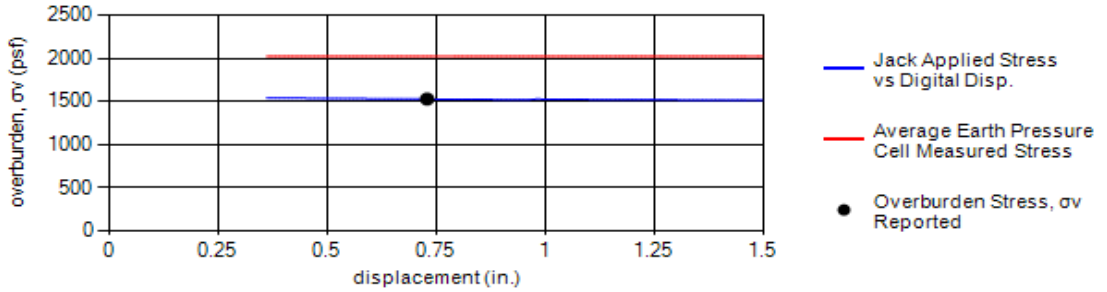


Comments

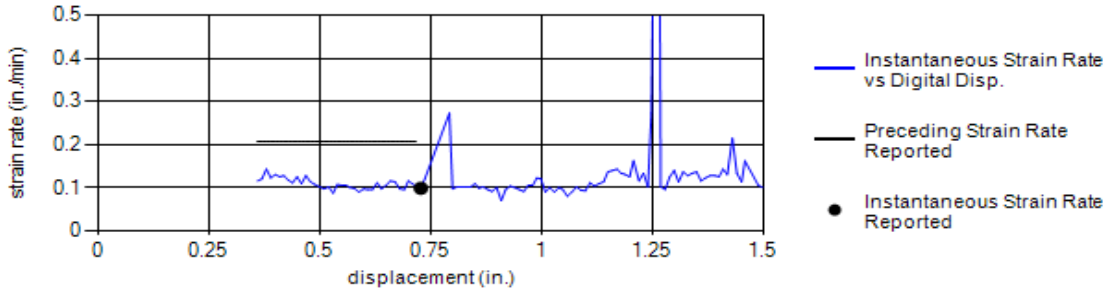
Personnel

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

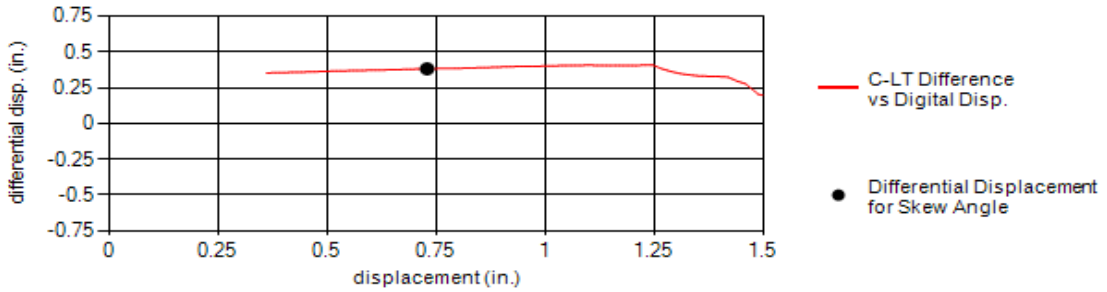
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2305	No Data	2052	2013	1725	2024	3.28	1528



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.10	0.21	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	0.38	No Data	0.46	CCW



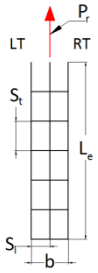
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	12/23/2010 9:08:00 AM
Test Identification:	TS19.05-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

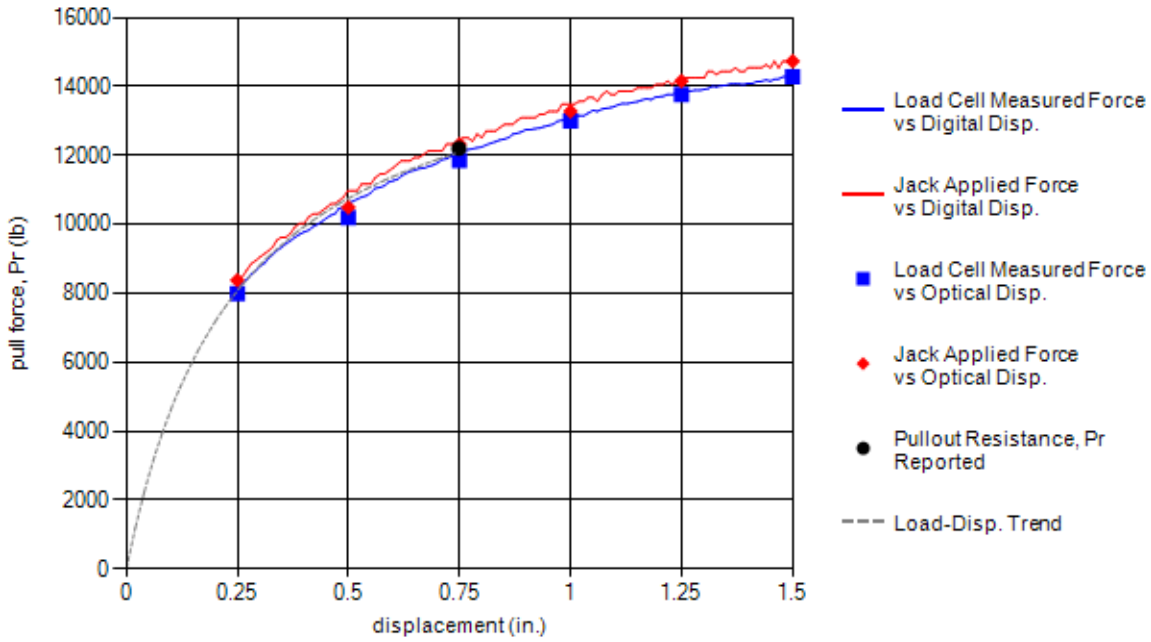
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	117.5 ±1.0
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	6.7 ±0.3%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	94.4 ±0.8%

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	667	12198	5.3	**4.57**

Load-Displacement Curve

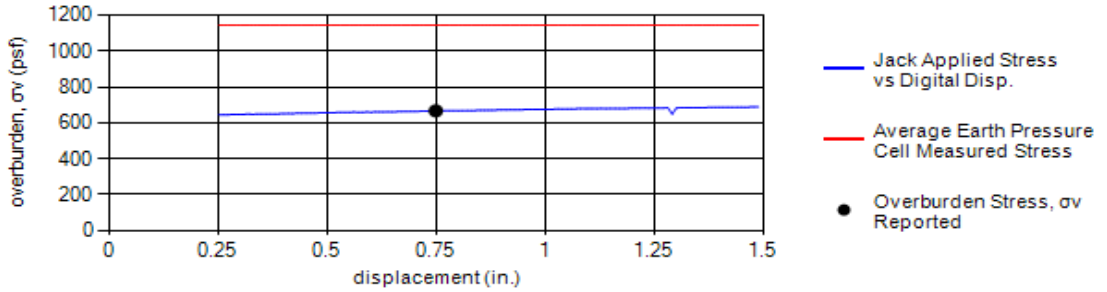


Comments

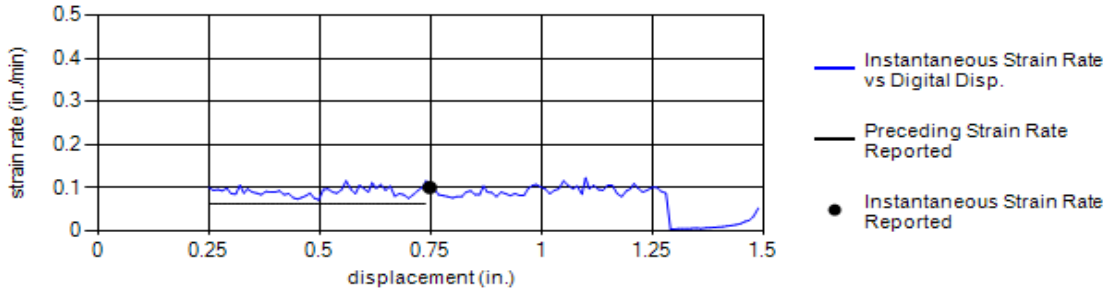
Personnel

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

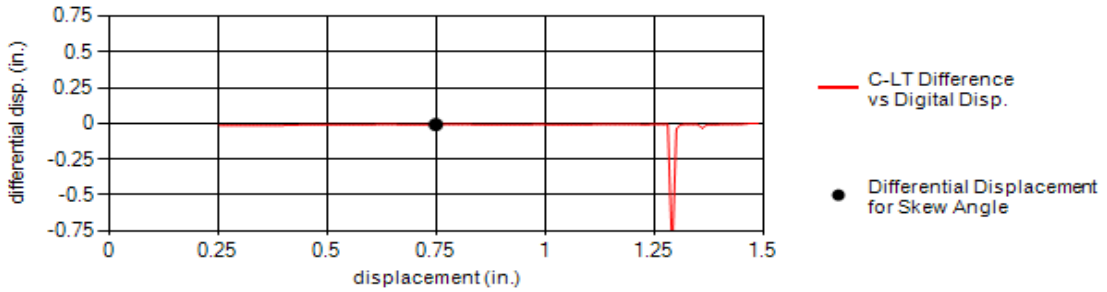
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1616	No Data	916	1172	875	1145	7.70	667



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.10	0.06	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	-0.01	No Data	-0.05	CW



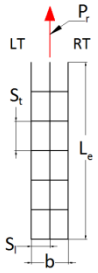
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	12/23/2010 3:47:00 PM
Test Identification:	TS19.06-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

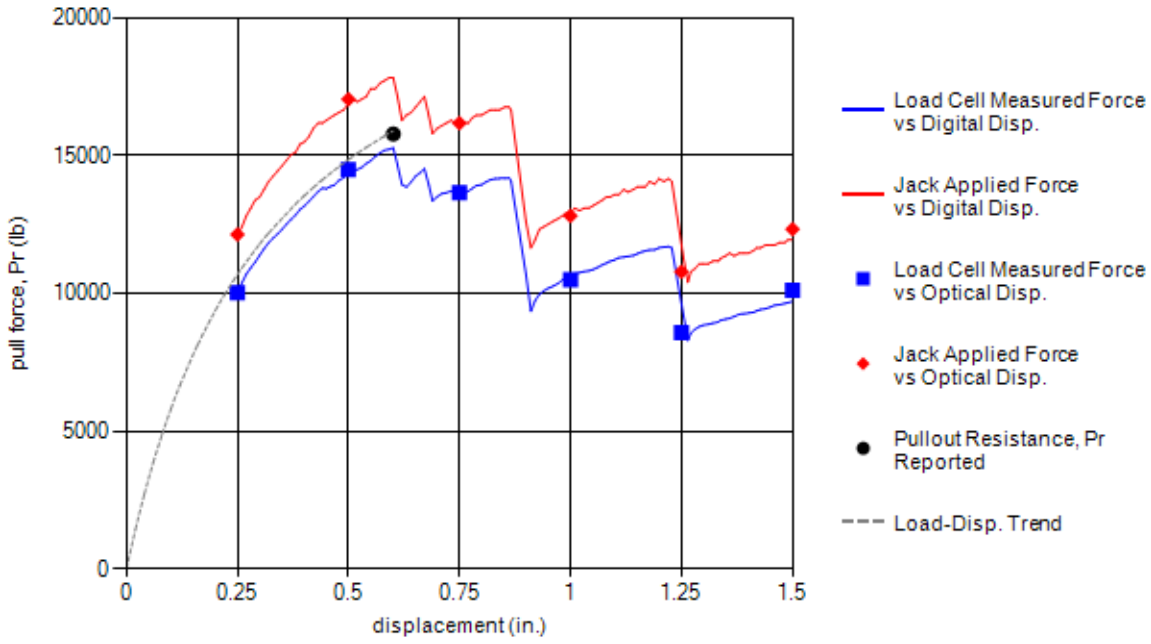
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	117.5 ±1.0
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	6.7 ±0.3%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	94.4 ±0.8%

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	627	15775	5.0	**1.05**

Load-Displacement Curve

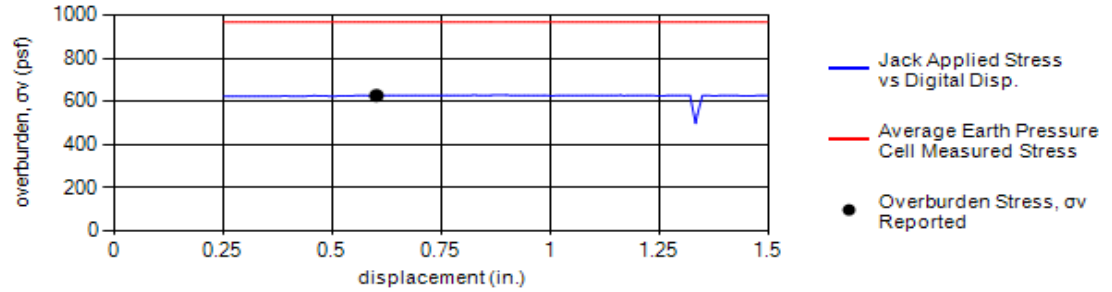


Comments

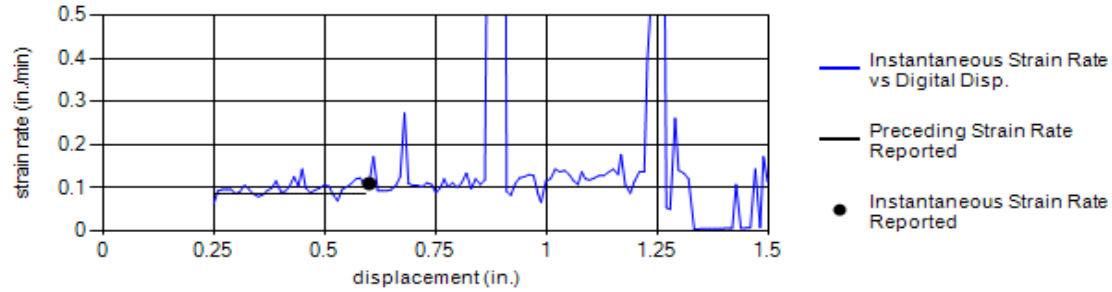
Personnel

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

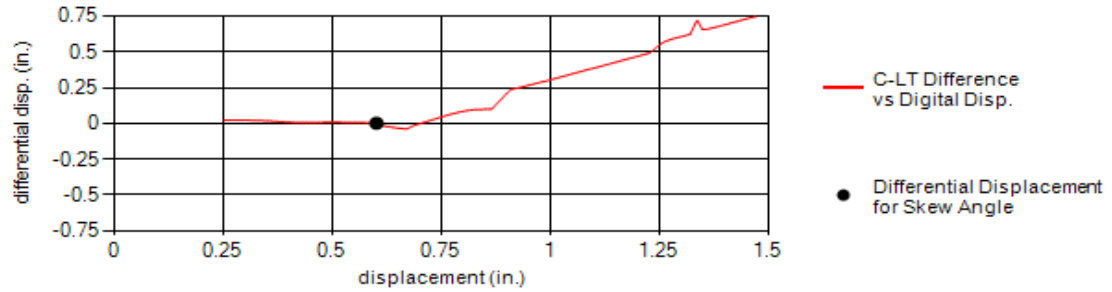
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1123	No Data	794	1098	812	969	8.20	627



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.11	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	0.00	No Data	0.00	CCW



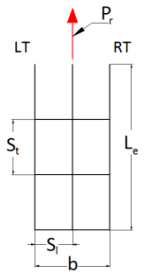
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	12/23/2010 3:26:00 PM
Test Identification:	TS19.07-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

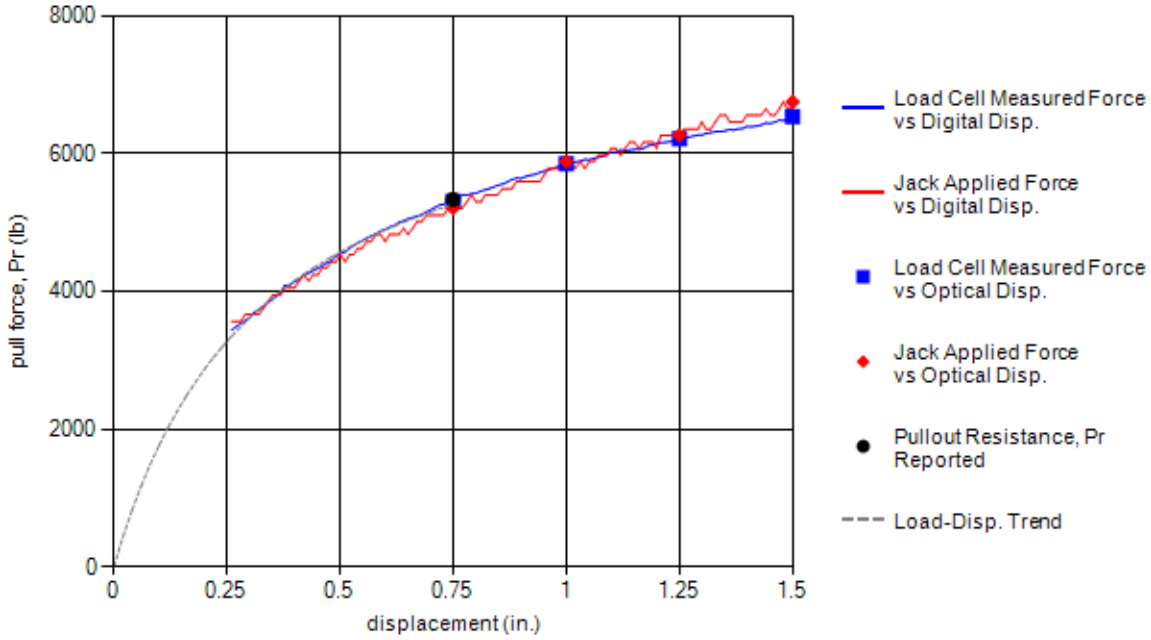
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	117.5 ±1.0
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	6.7 ±0.3%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	94.4 ±0.8%

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	5330	12.1	**1.76**

Load-Displacement Curve

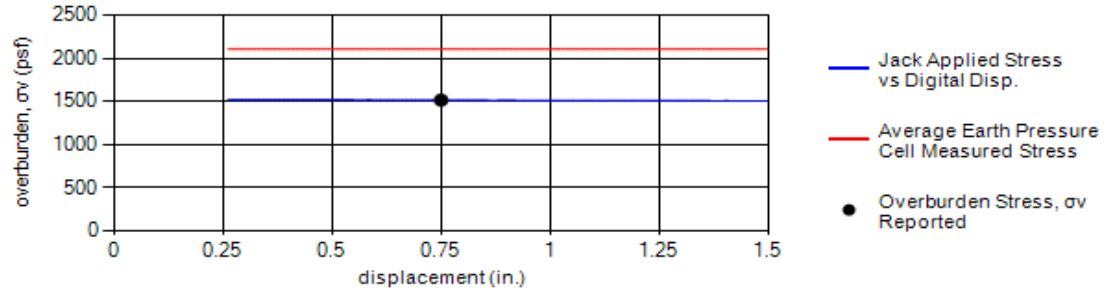


Comments

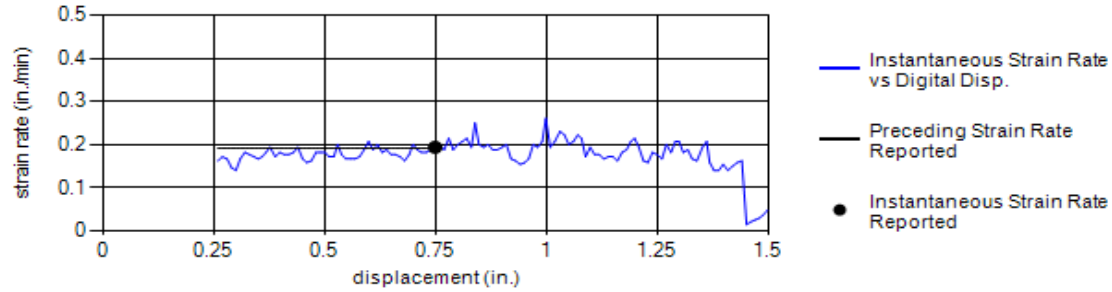
Personnel

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

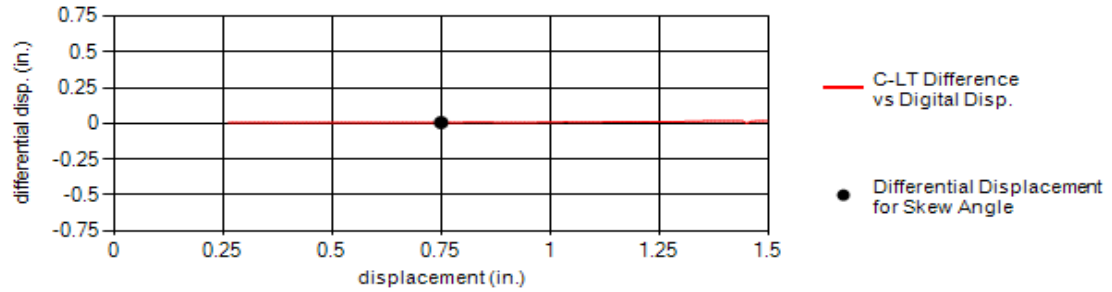
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2229	No Data	1962	2128	No Data	2106	4.05	1516



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.19	0.19	0.18



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	No Data	0.01	No Data	0.05	CCW



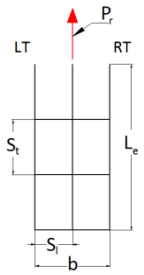
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	12/23/2010 3:06:00 PM
Test Identification:	TS19.08-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 B

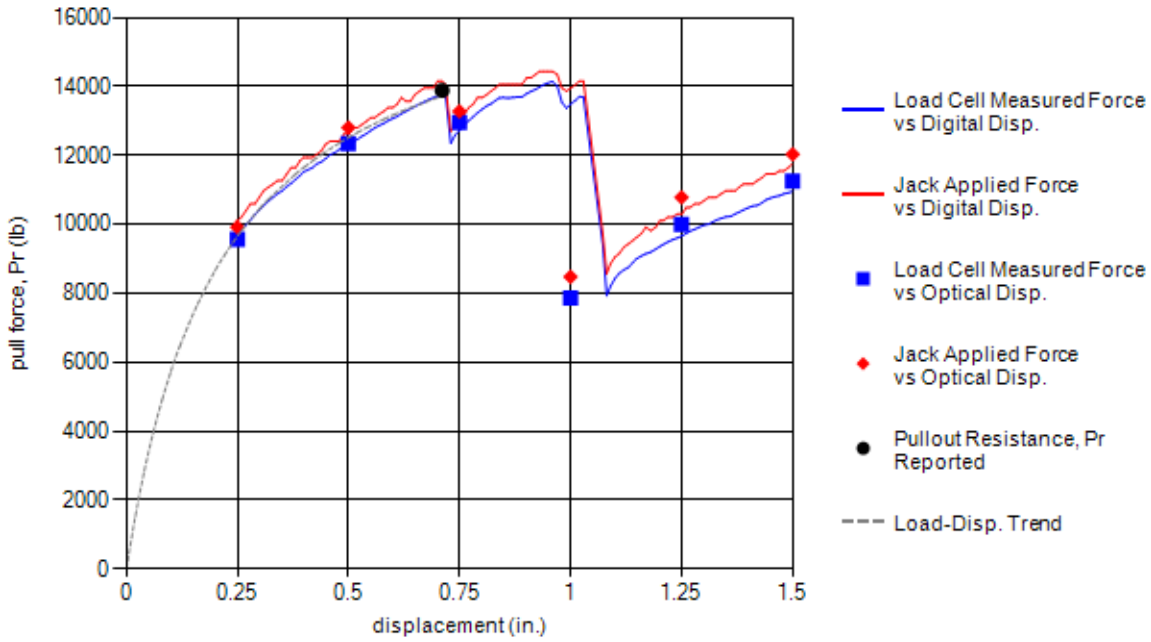
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	117.5	±1.0
Moisture Content, w (%):	6.7	±0.3%
Relative Compaction, C_R (%):	94.4	±0.8%

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	1513	13883	12.1	**0.76**

Load-Displacement Curve

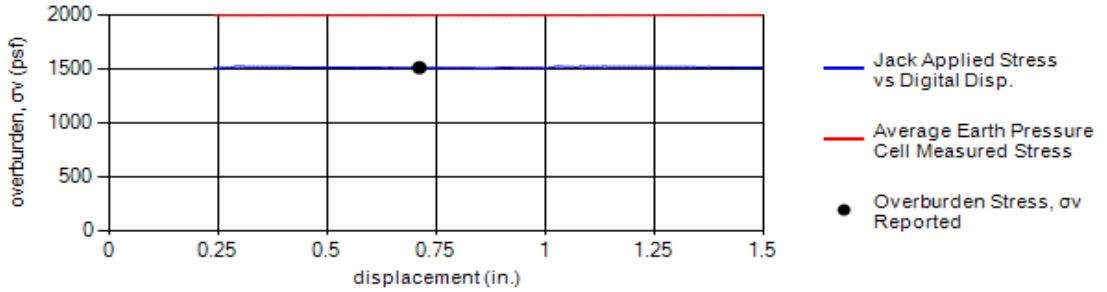


Comments

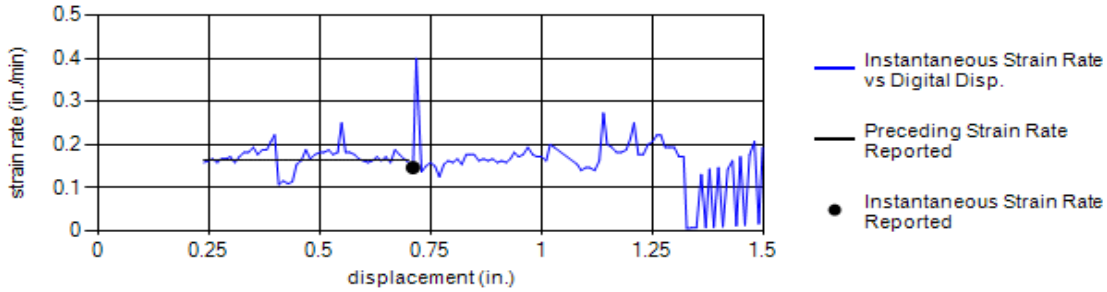
Personnel

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

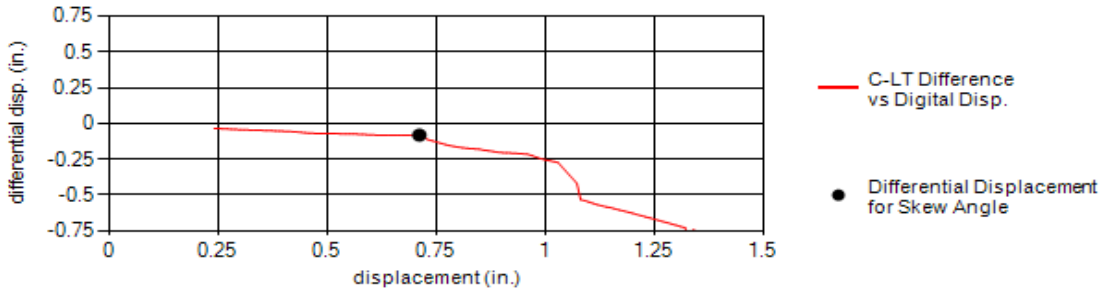
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2212	No Data	1948	2124	1688	1997	3.40	1513



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.15	0.16	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	-0.08	No Data	-0.10	CW



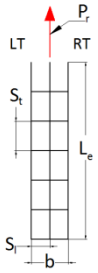
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	12/23/2010 1:26:00 PM
Test Identification:	TS19.09-G-2x12-W9.5xW11-L6-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):	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

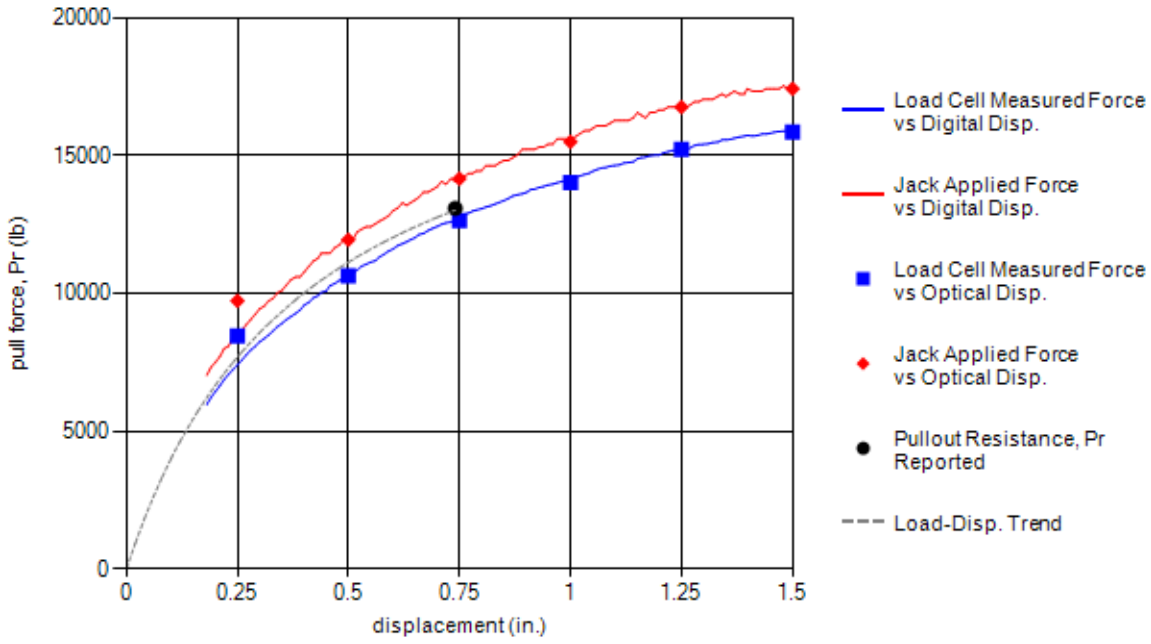
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	117.5 ±1.0
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	6.7 ±0.3%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	94.4 ±0.8%

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	636	13078	5.1	**5.14**

Load-Displacement Curve

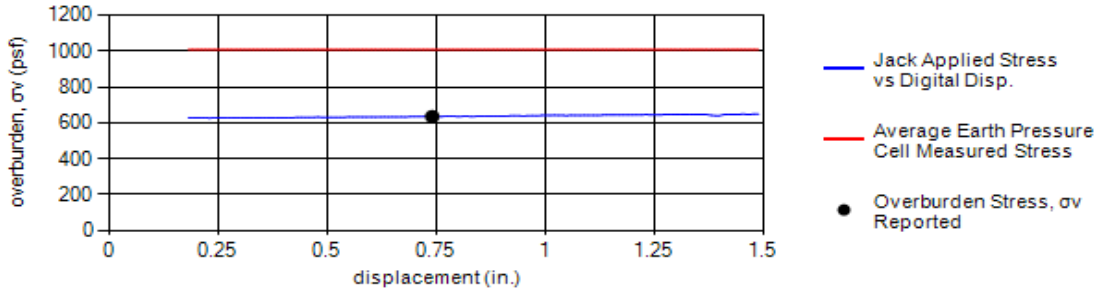


Comments

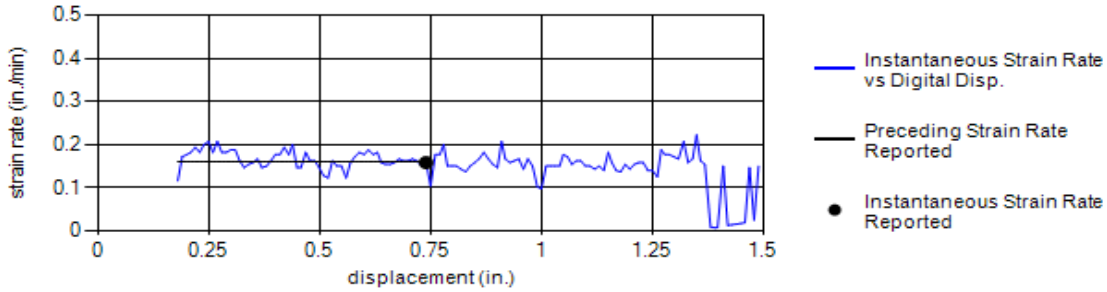
Personnel

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

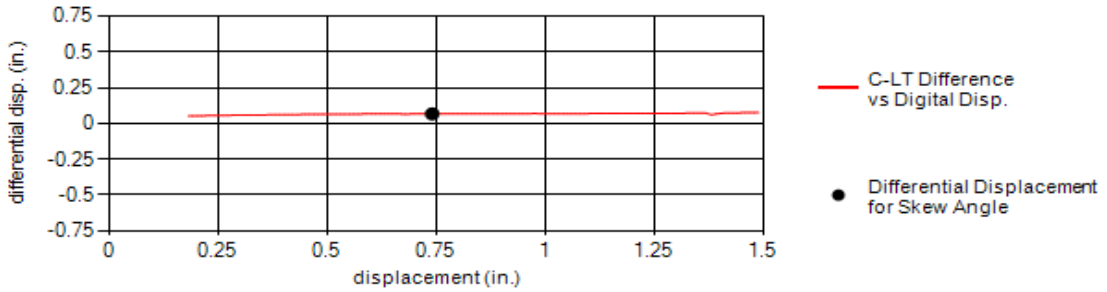
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1594	No Data	734	981	726	1009	8.28	636



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.16	0.16	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	0.07	No Data	0.48	CCW



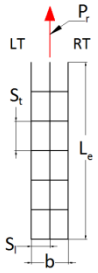
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	12/23/2010 1:52:00 PM
Test Identification:	TS19.10-G-12x12-W9.5xW11-L6-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):	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

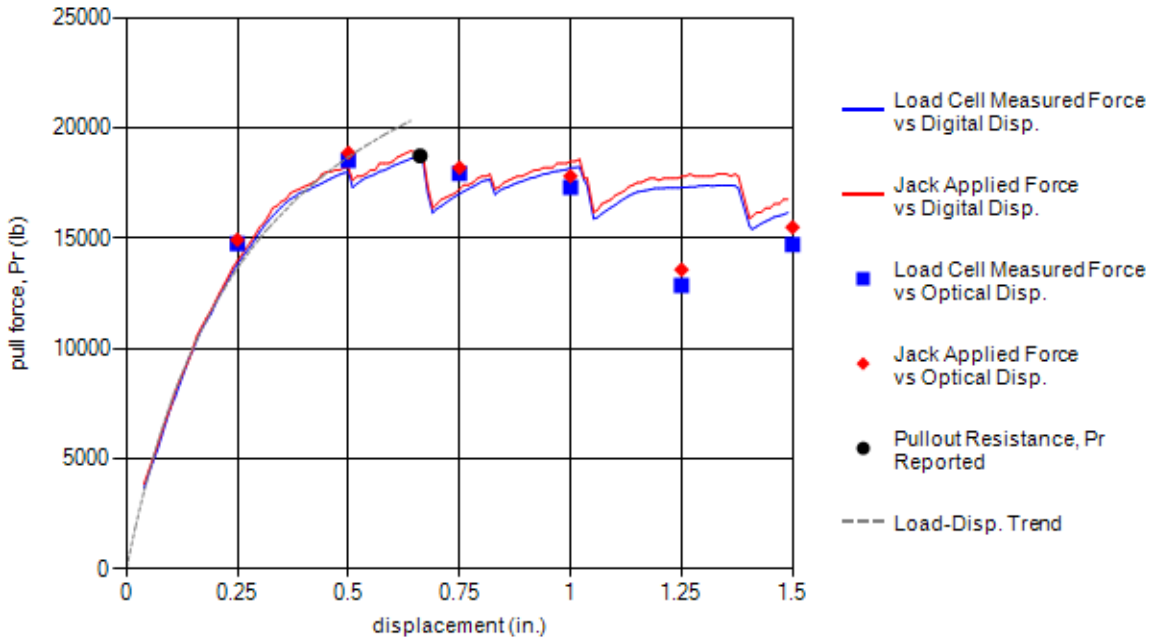
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	117.5 ±1.0
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	6.7 ±0.3%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	94.4 ±0.8%

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	650	18729	5.2	**1.20**

Load-Displacement Curve

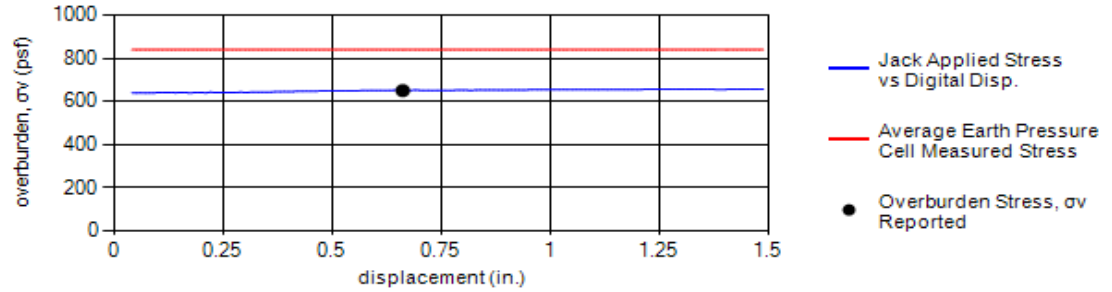


Comments

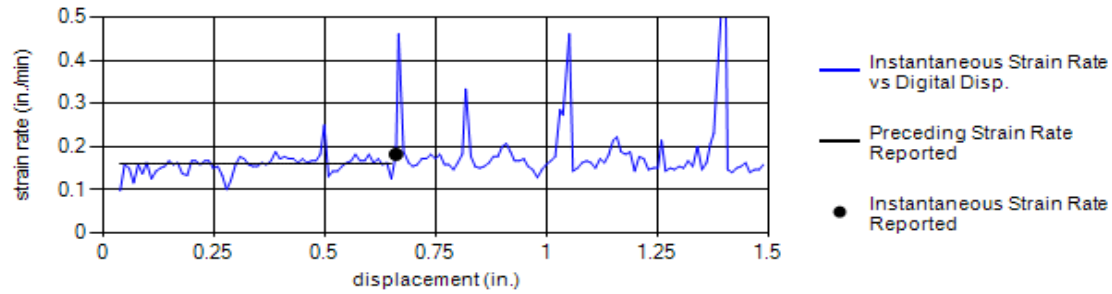
Personnel

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

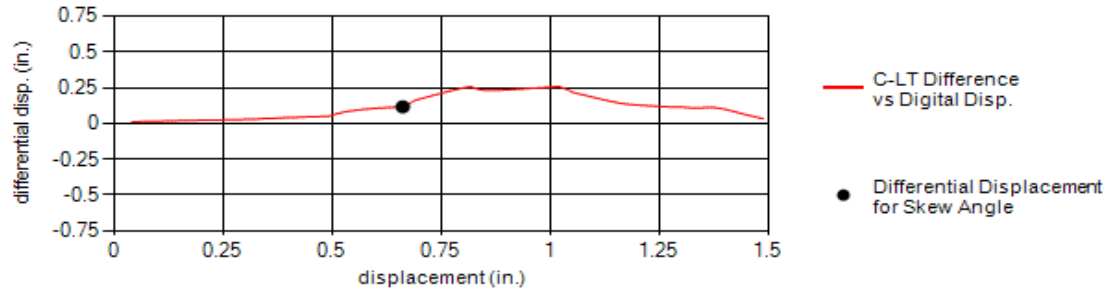
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
992	No Data	629	992	741	840	8.10	650



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.18	0.16	0.16



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	No Data	0.12	No Data	0.14	CCW



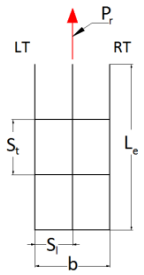
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	12/23/2010 2:15:00 PM
Test Identification:	TS19.11-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

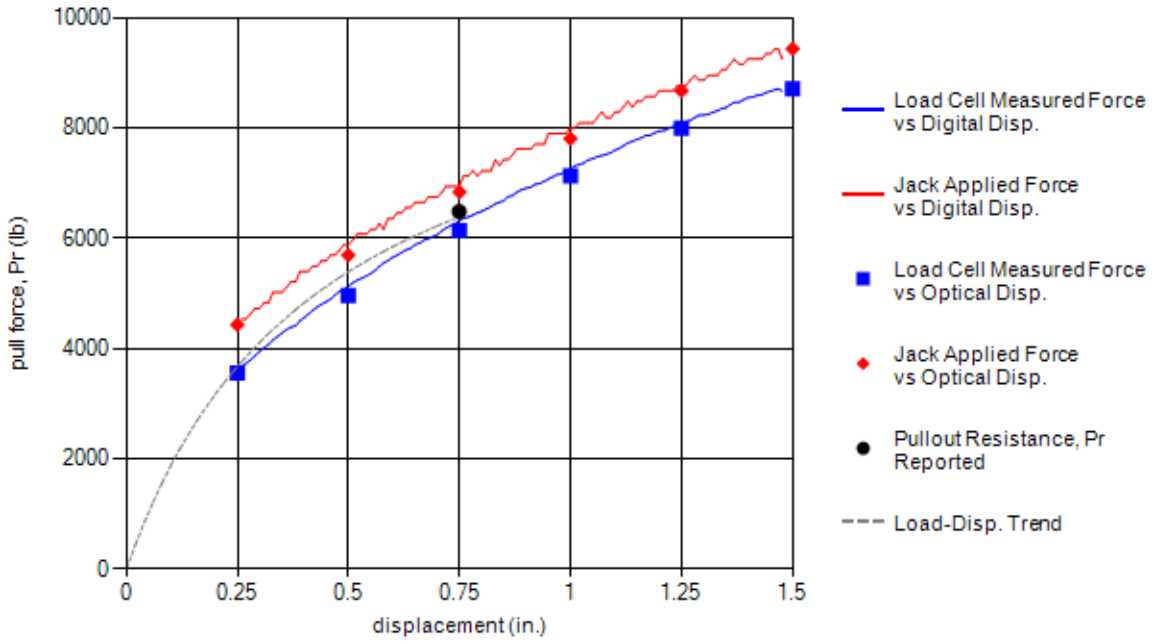
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	117.5 ±1.0
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	6.7 ±0.3%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	94.4 ±0.8%

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	1532	6482	12.2	**2.12**

Load-Displacement Curve

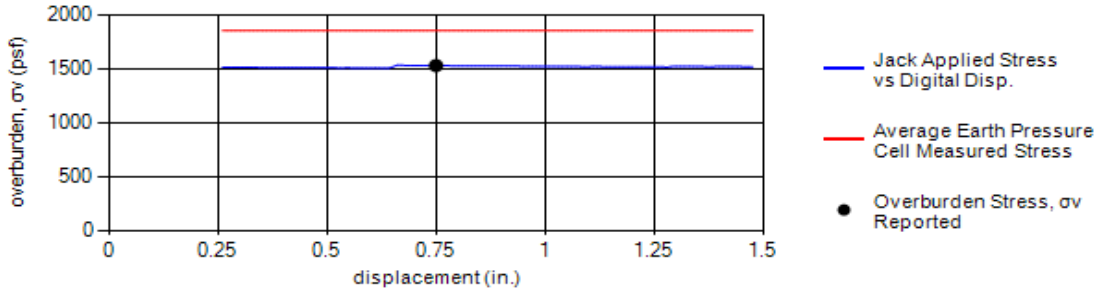


Comments

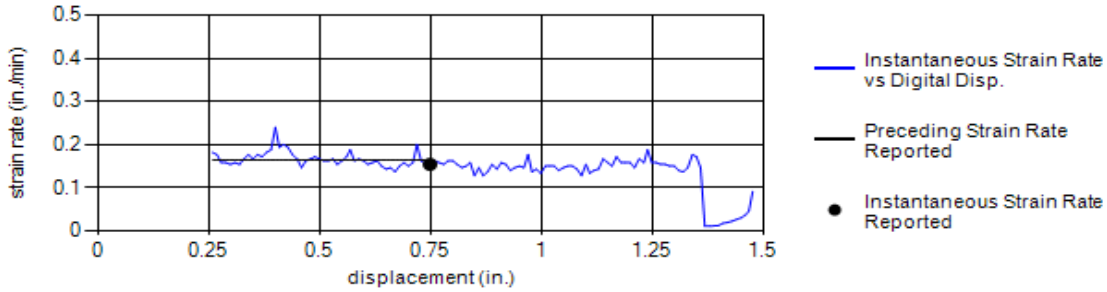
Personnel

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

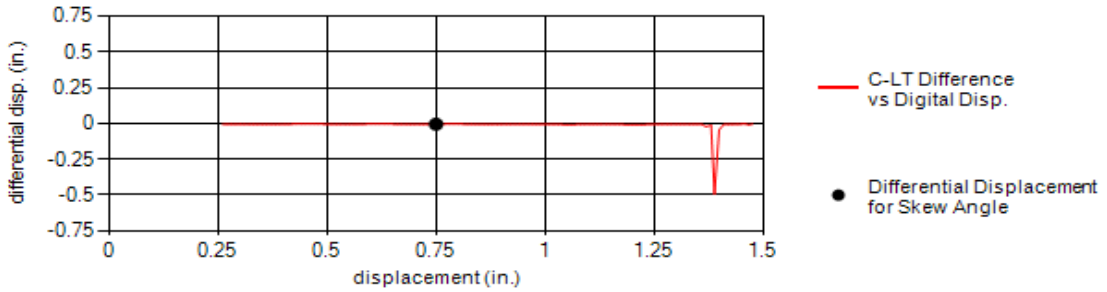
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2071	No Data	1788	1990	1576	1856	3.44	1532



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.15	0.16	0.16



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	No Data	0.00	No Data	-0.03	CW



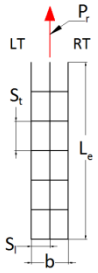
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	12/23/2010 2:36:00 PM
Test Identification:	TS19.12-G-12x12-W9.5xW11-L6-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.):	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

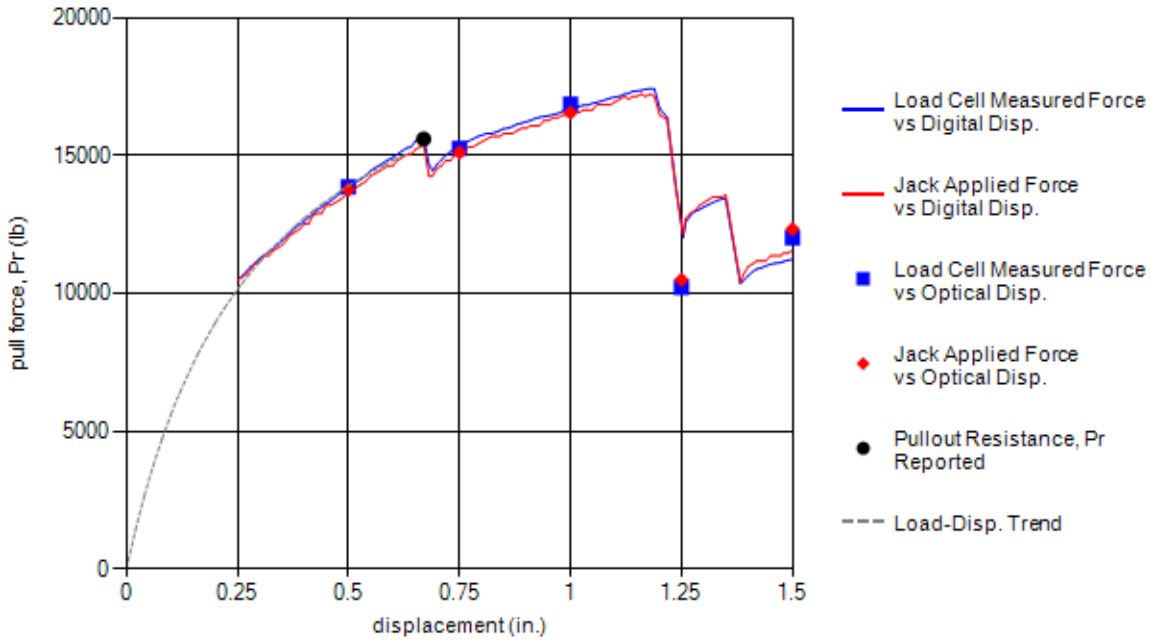
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	117.5 ±1.0
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	6.7 ±0.3%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	94.4 ±0.8%

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	1523	15592	12.1	**0.43**

Load-Displacement Curve

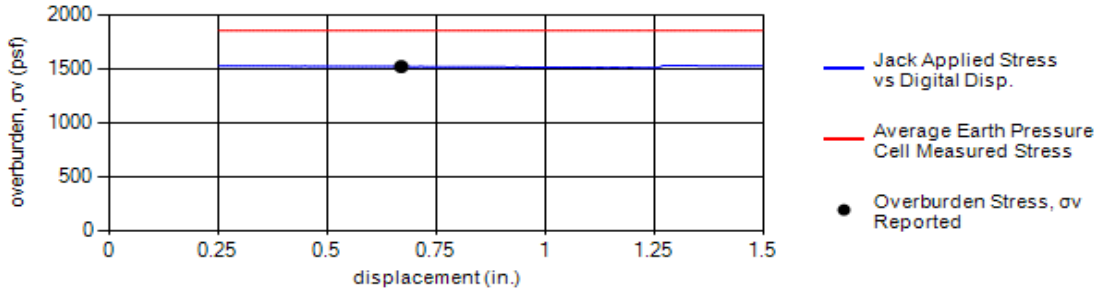


Comments

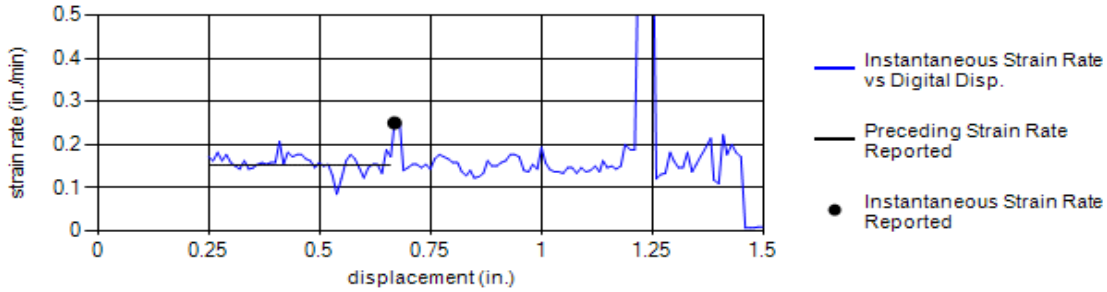
Personnel

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

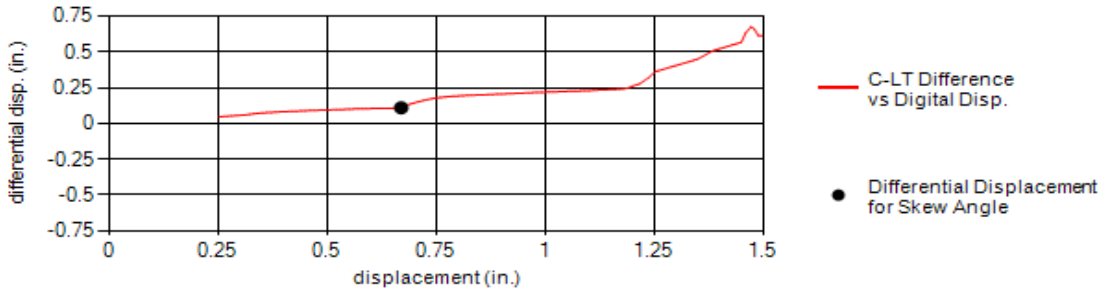
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2055	No Data	1792	2002	1584	1858	3.46	1523



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.25	0.15	0.16



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	No Data	0.11	No Data	0.13	CCW



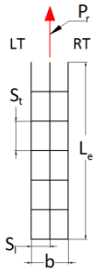
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/6/2011 9:57:00 AM
Test Identification:	TS20.01-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

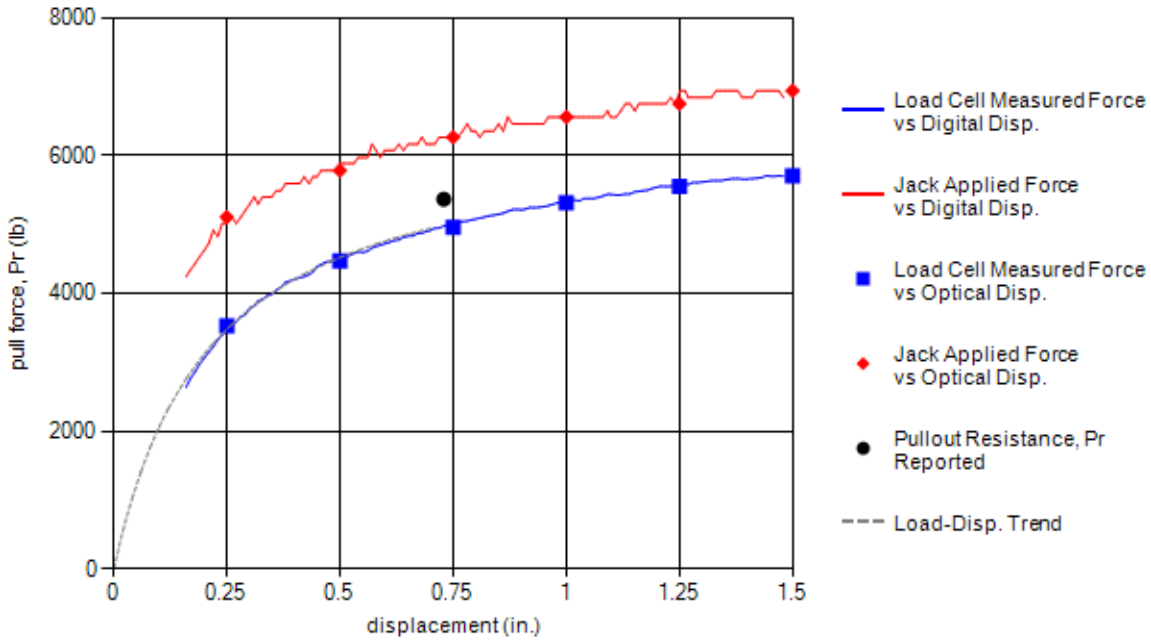
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	116.1	±0.8
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	8.9	±0.3%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	93.3	±0.6%

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	627	5364	5.0	**2.14**

Load-Displacement Curve

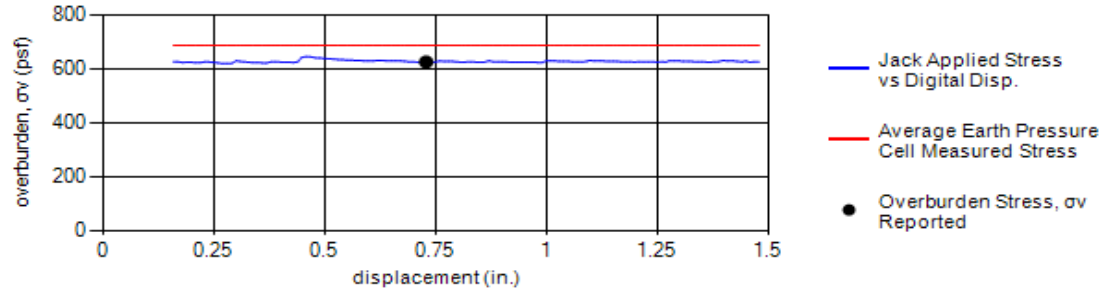


Comments

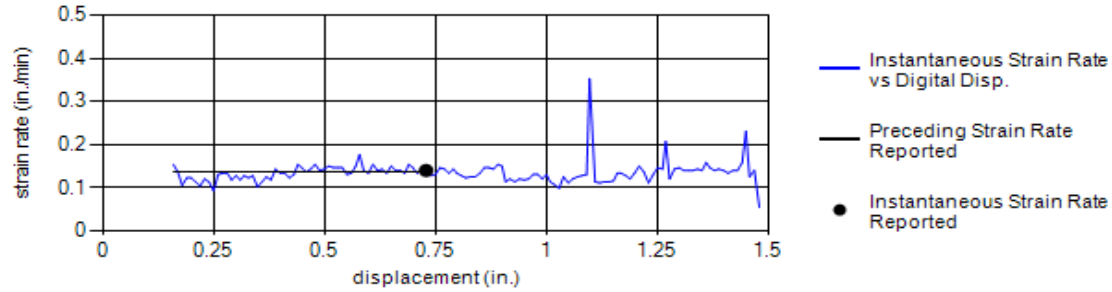
Personnel

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

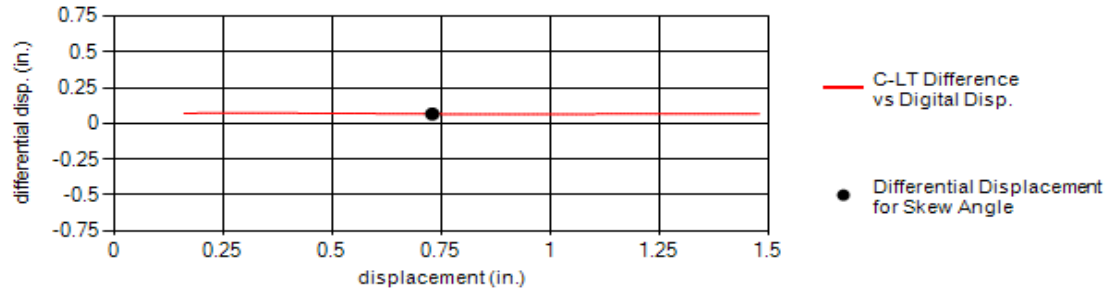
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
731	No Data	677	656	No Data	688	1.03	626



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.14	0.14	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	0.07	No Data	0.48	CCW



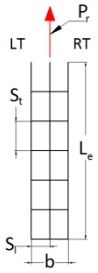
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/6/2011 10:35:00 AM
Test Identification:	TS20.02-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

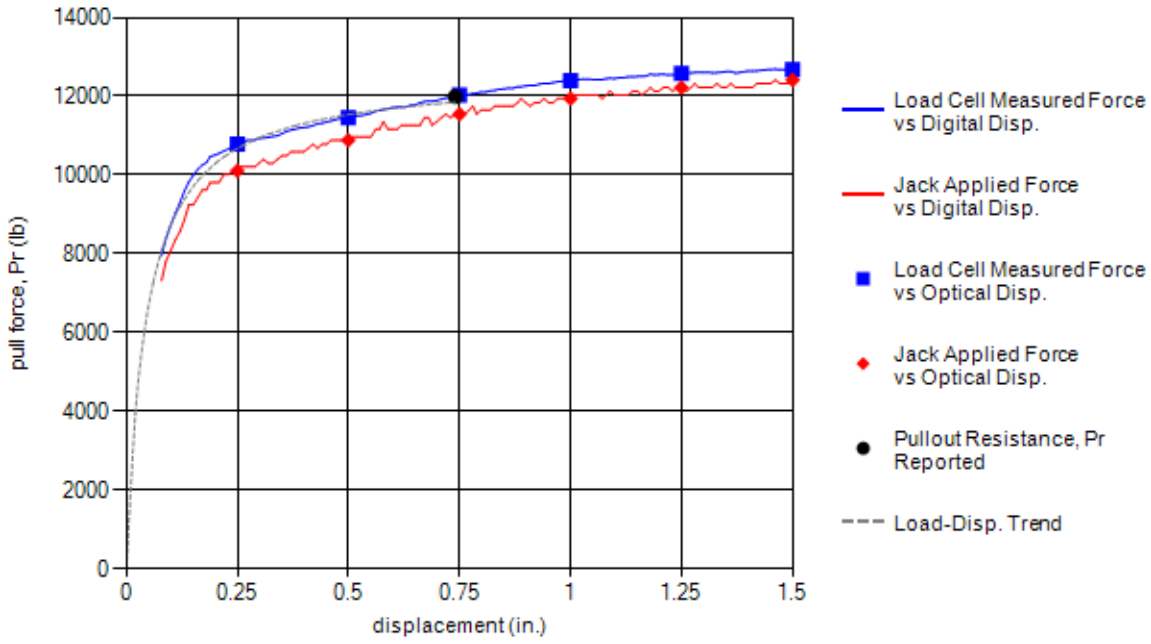
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	116.1	±0.8
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	8.9	±0.3%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	93.3	±0.6%

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	632	11990	5.0	**0.79**

Load-Displacement Curve

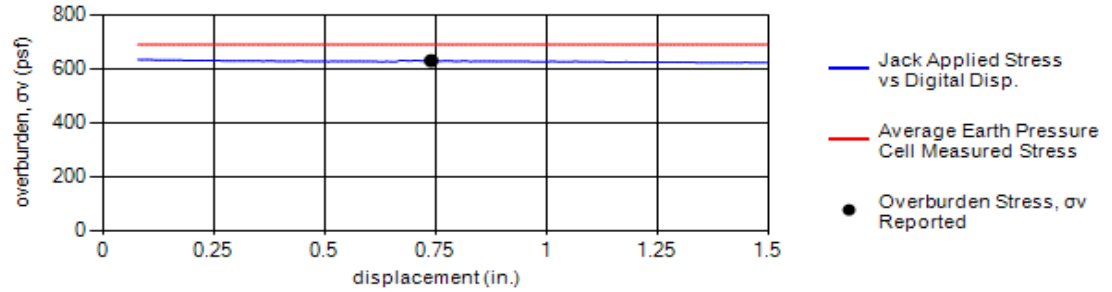


Comments

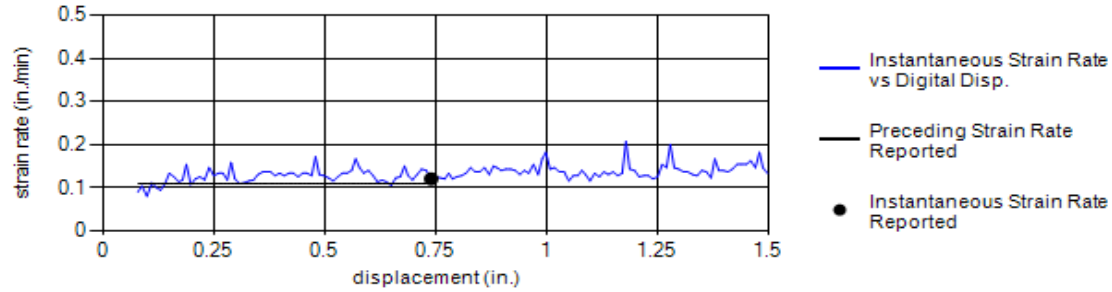
Personnel

Tested:	AS YW DH
Prepared:	SB TW
Checked:	WL PJ

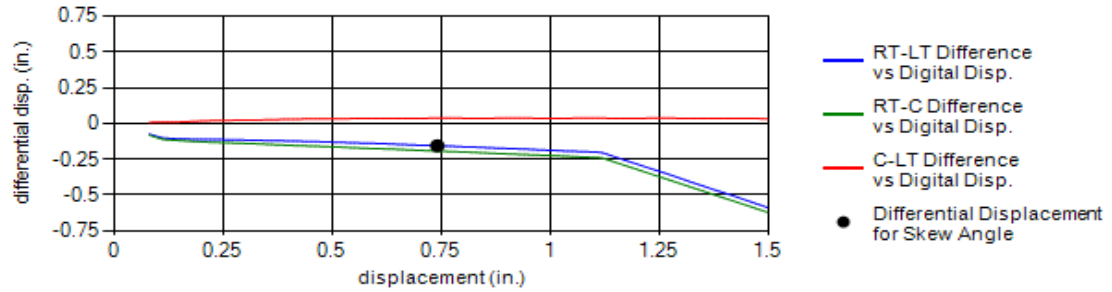
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
781	No Data	635	656	No Data	691	1.05	631



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



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
-0.16	-0.19	0.04	No Data	-0.37	CW



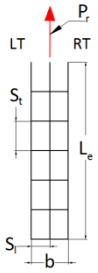
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/6/2011 11:14:00 AM
Test Identification:	TS20.03-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

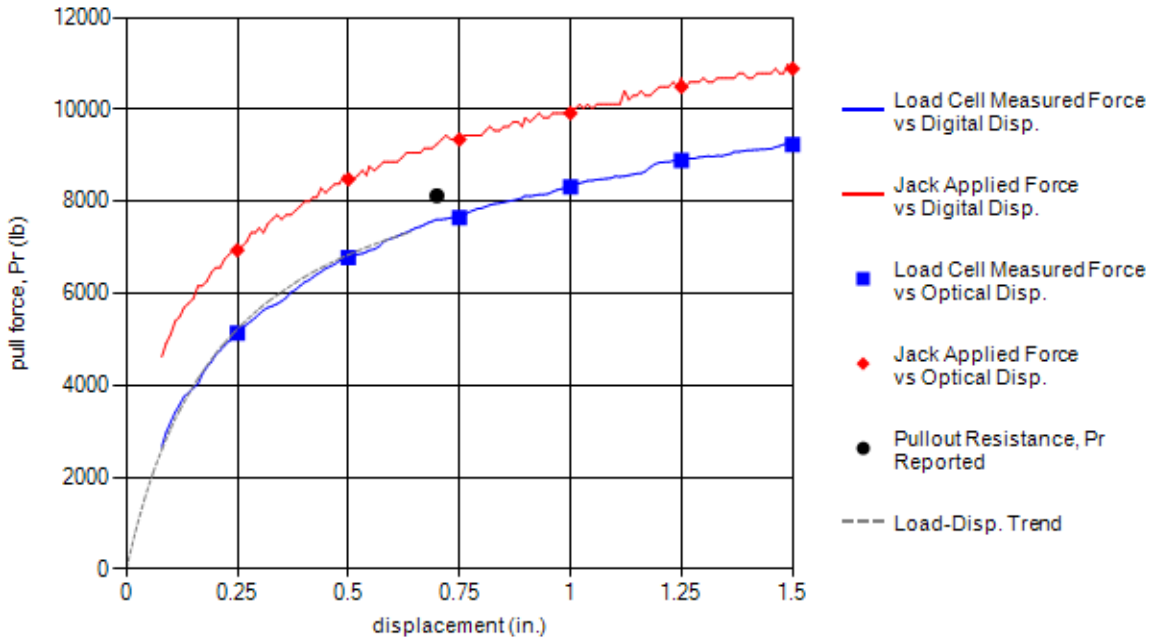
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	116.1	±0.8
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	8.9	±0.3%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	93.3	±0.6%

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	0.70	1472	8120	11.6	**1.38**

Load-Displacement Curve

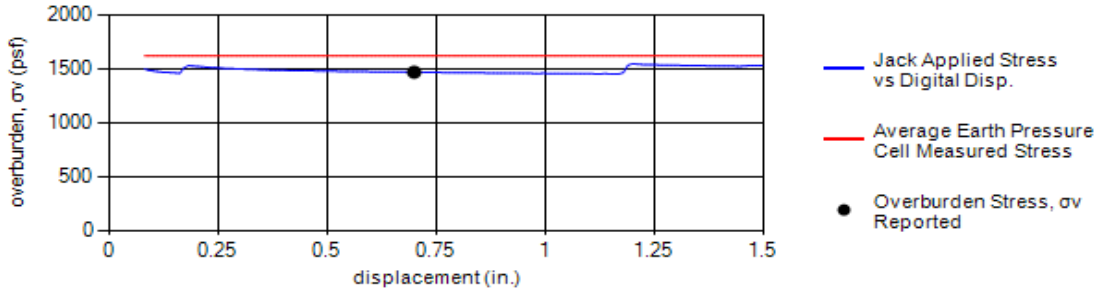


Comments

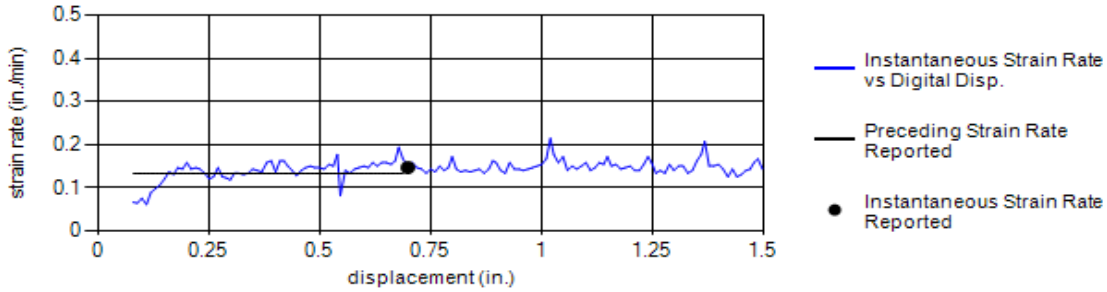
Personnel

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

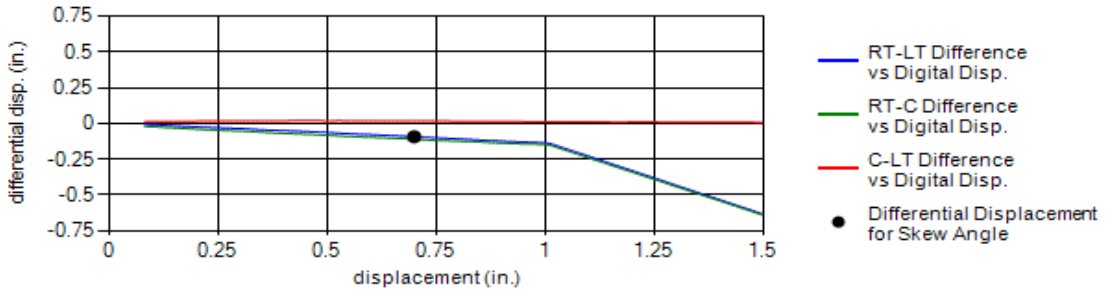
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1789	No Data	1587	1490	No Data	1622	1.07	1472



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



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
-0.09	-0.11	0.02	No Data	-1.32	CW



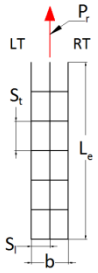
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/6/2011 11:47:00 AM
Test Identification:	TS20.04-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

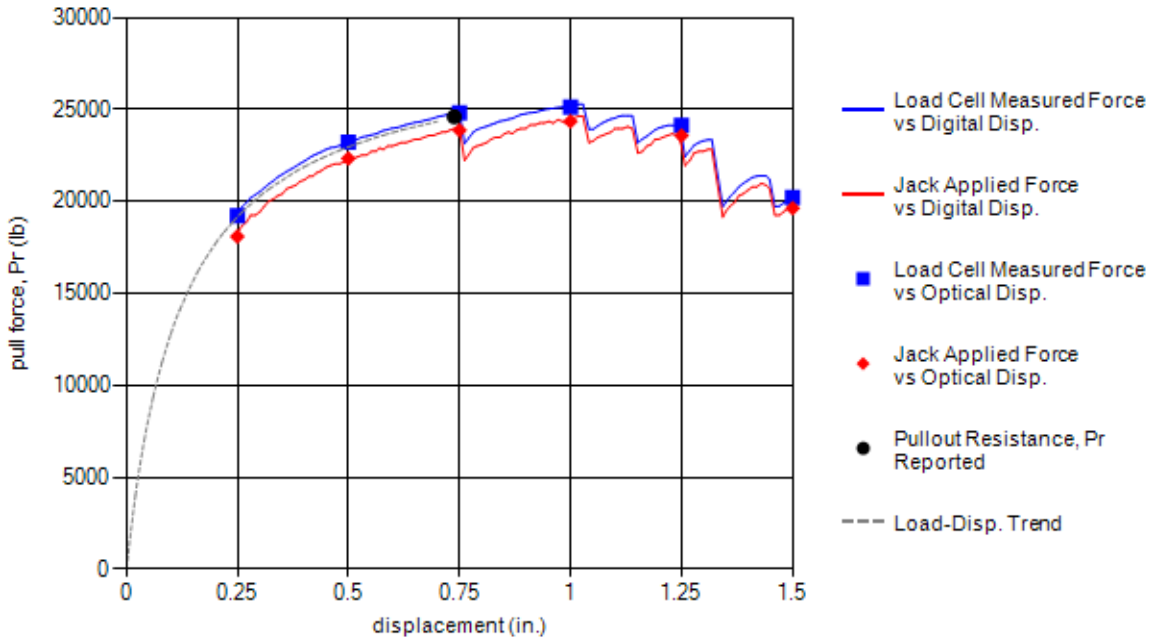
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	116.1	±0.8
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	8.9	±0.3%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	93.3	±0.6%

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	1524	24596	12.1	**0.67**

Load-Displacement Curve

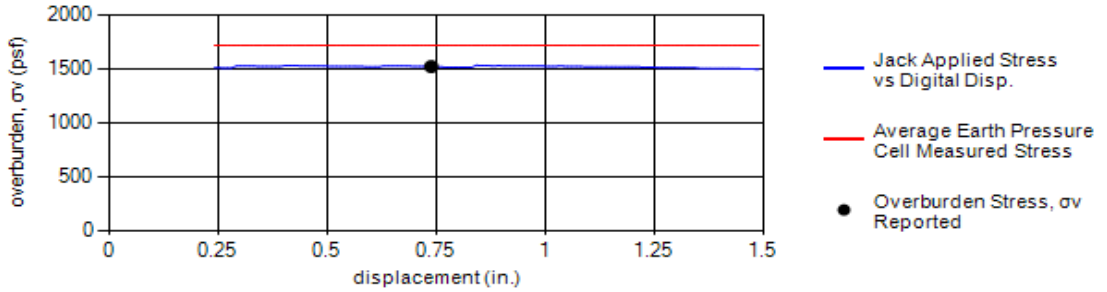


Comments

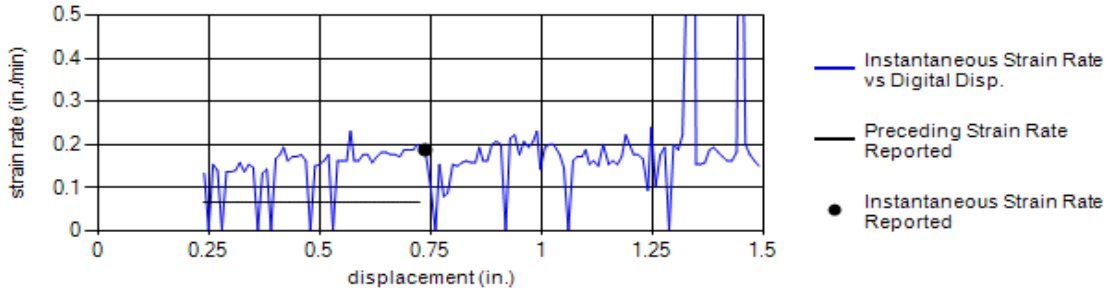
Personnel

Tested:	AS YW DH
Prepared:	SB TW
Checked:	WL PJ

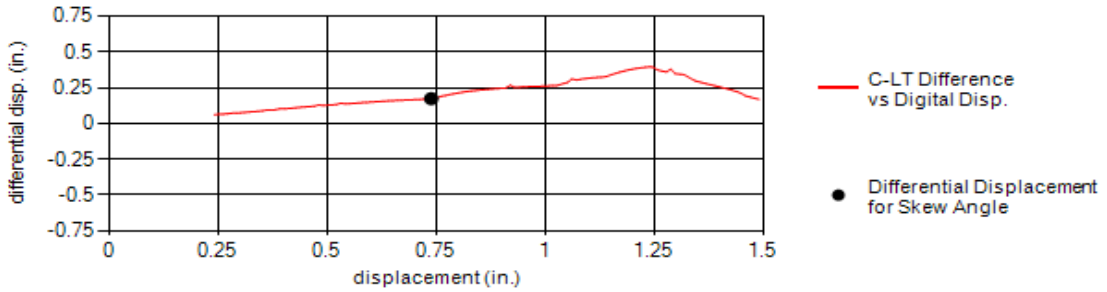
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1884	No Data	1720	1558	No Data	1721	1.02	1524



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.19	0.06	0.20



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	No Data	0.17	No Data	0.21	CCW



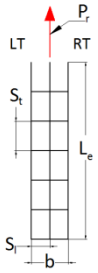
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/6/2011 3:59:00 PM
Test Identification:	TS20.05-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

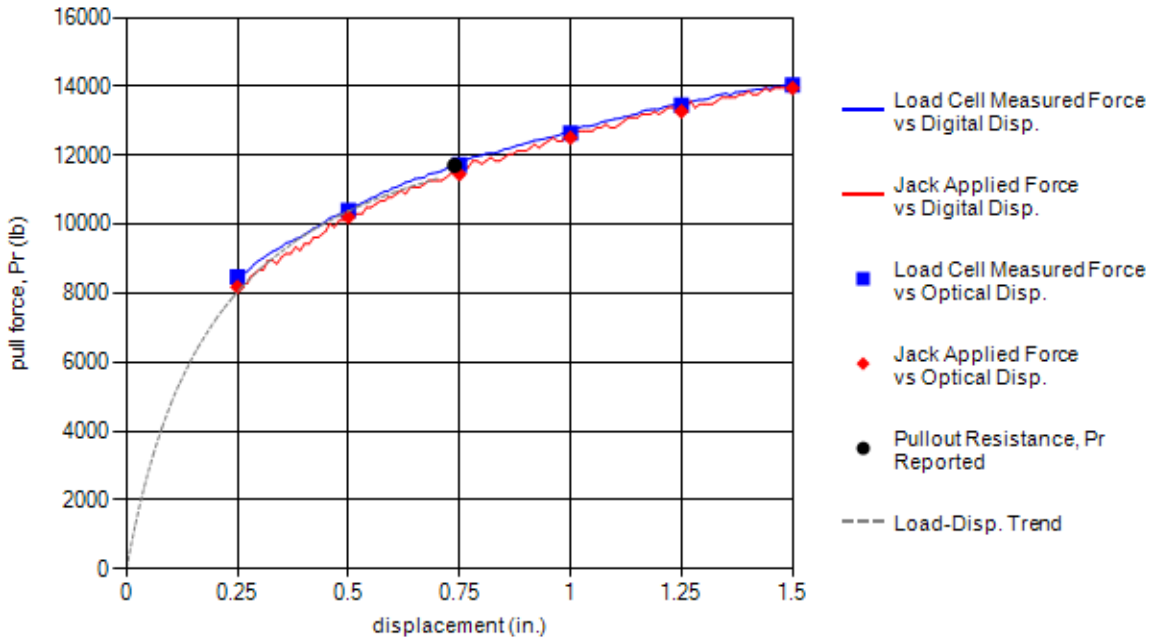
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	116.1	±0.8
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	8.9	±0.3%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	93.3	±0.6%

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)*	***Pullout Resistance Factor, F****
Pullout	0.74	643	11709	5.1	**4.55**

Load-Displacement Curve

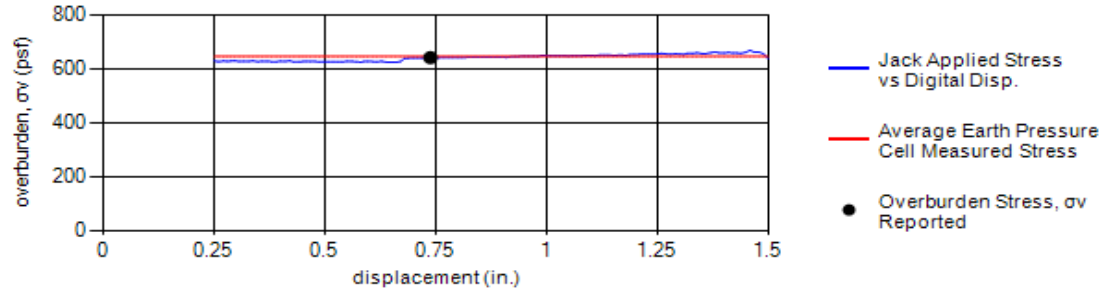


Comments

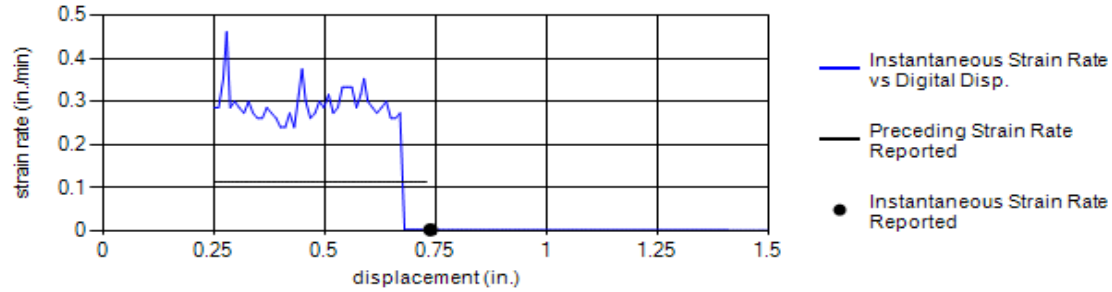
Personnel

Tested:	AS YW DH
Prepared:	SB TW
Checked:	WL PJ

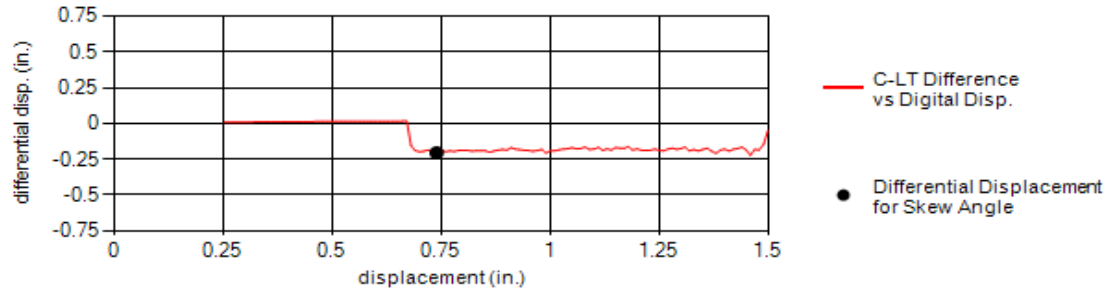
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
895	No Data	473	572	No Data	647	2.85	643



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.00	0.11	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	-0.20	No Data	-1.46	CW



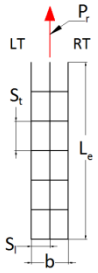
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/6/2011 4:21:00 PM
Test Identification:	TS20.06-G-12x12-W20xW11-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.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	12

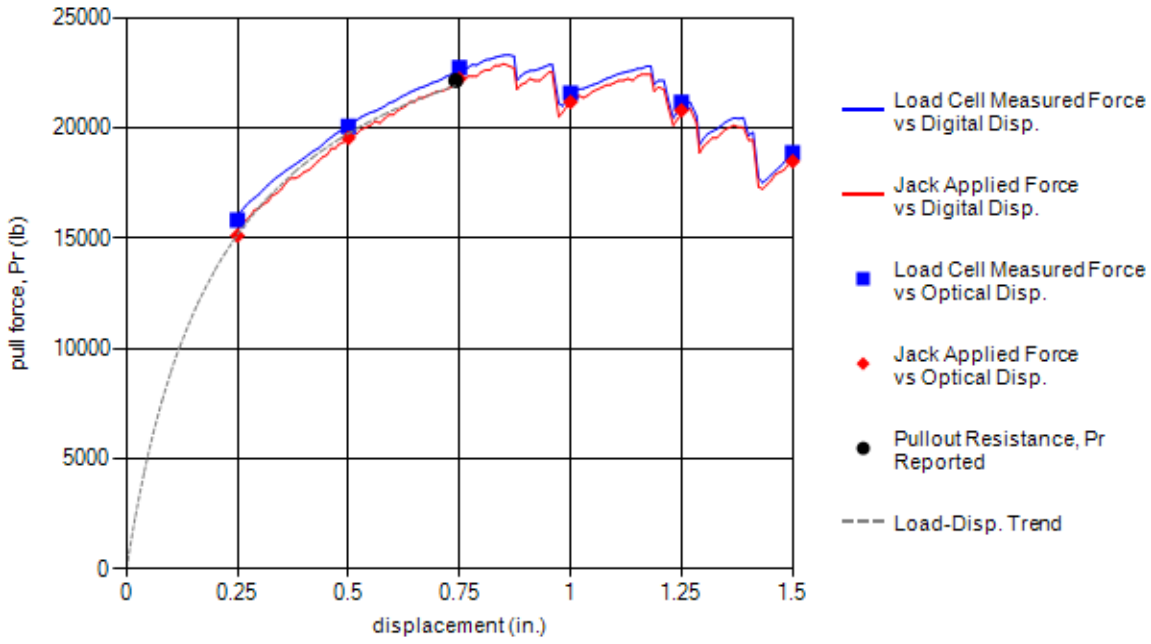
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	116.1 ±0.8
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	8.9 ±0.3%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	93.3 ±0.6%

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	642	22137	5.1	**1.44**

Load-Displacement Curve

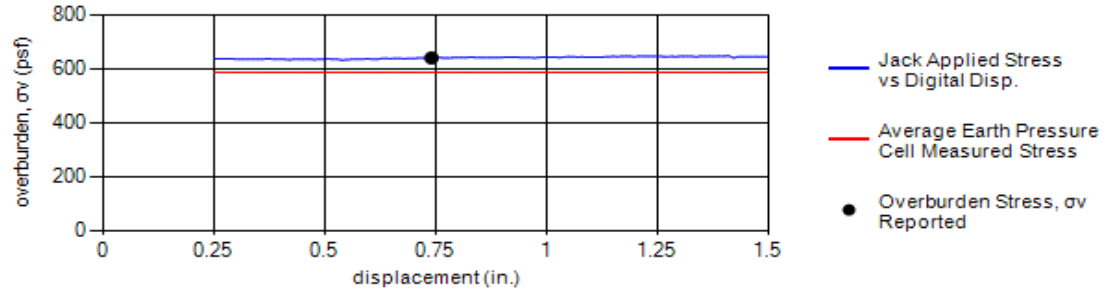


Comments

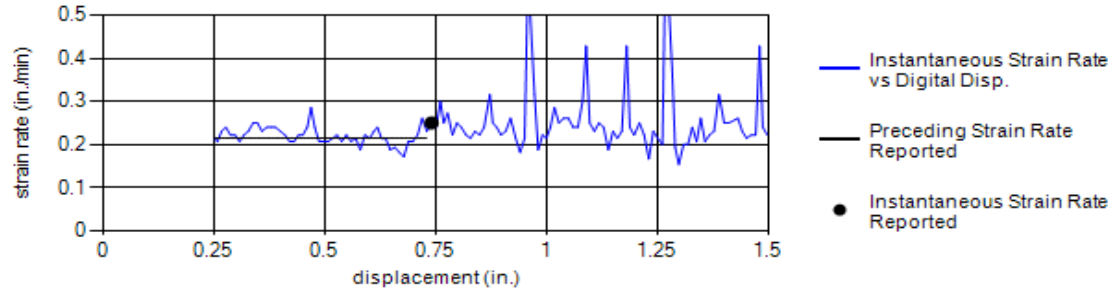
Personnel

Tested:	AS YW DH
Prepared:	SB TW
Checked:	WL PJ

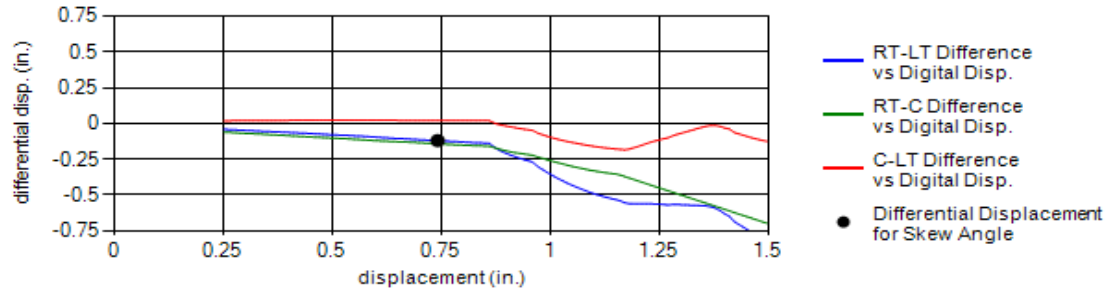
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
699	No Data	488	578	No Data	588	3.14	642



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.25	0.22	0.22



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
-0.12	-0.14	0.02	No Data	-0.28	CW



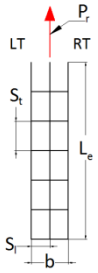
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/6/2011 4:48:00 PM
Test Identification:	TS20.07-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

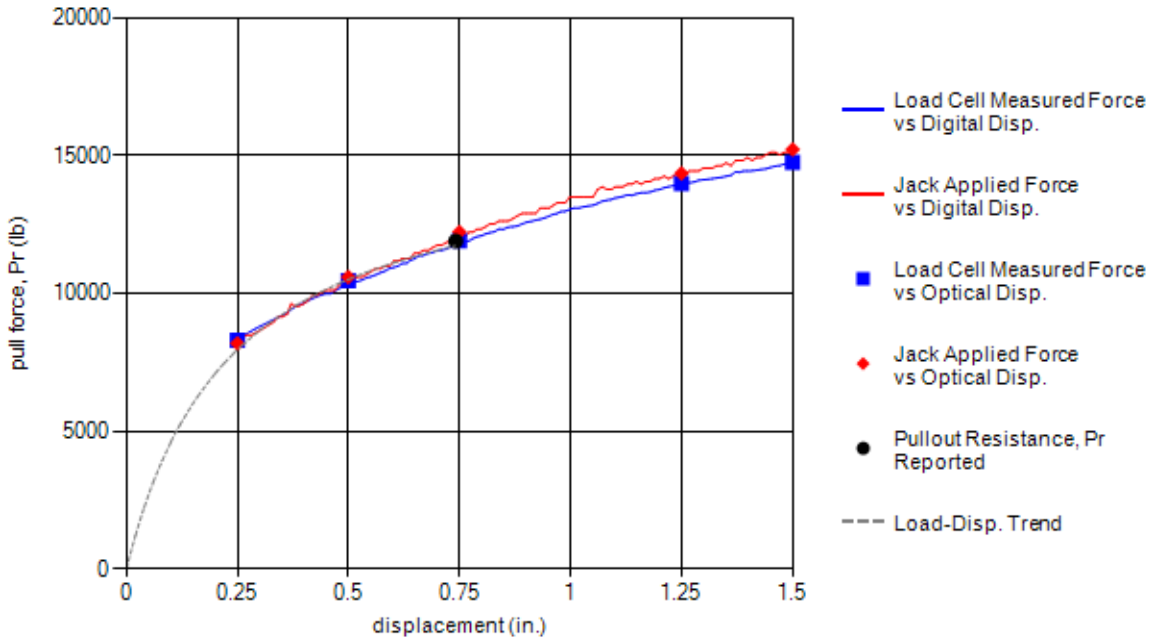
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	116.1	±0.8
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	8.9	±0.3%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	93.3	±0.6%

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	1511	11891	12.0	**1.97**

Load-Displacement Curve

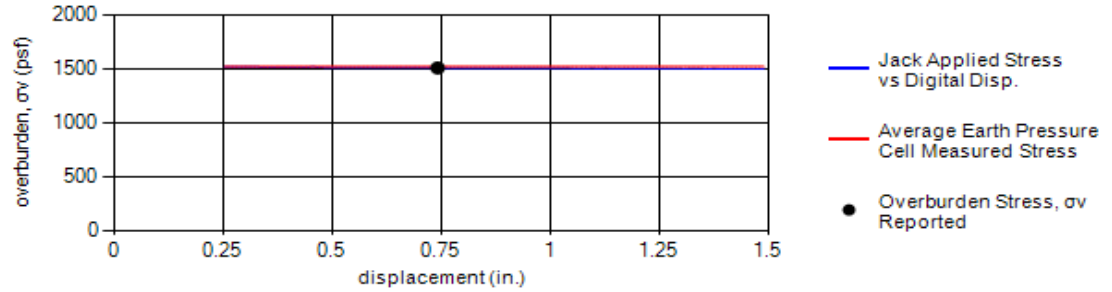


Comments

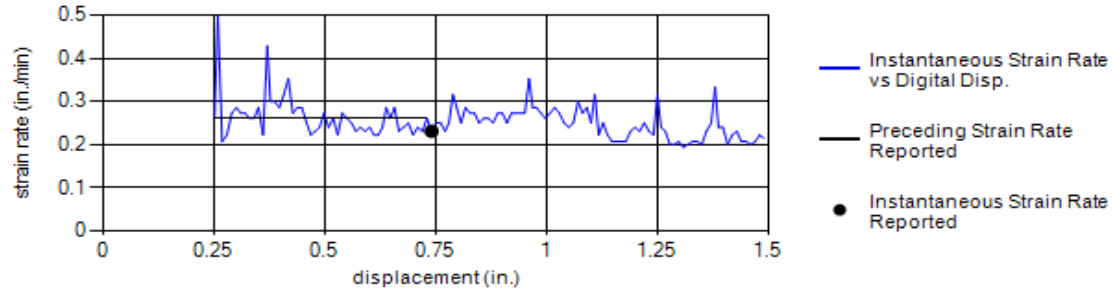
Personnel

Tested:	AS YW DH
Prepared:	SB TW
Checked:	WL PJ

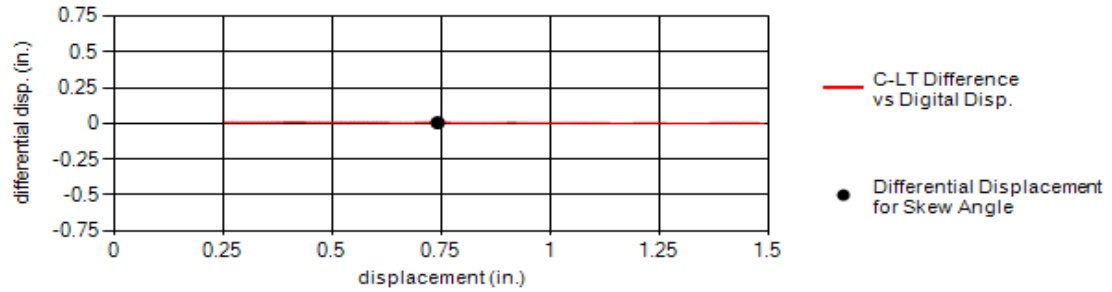
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1613	No Data	1526	1435	No Data	1524	1.21	1511



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.23	0.26	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	0.01	No Data	0.04	CCW



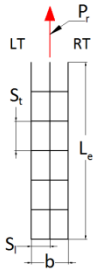
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/7/2011 9:46:00 AM
Test Identification:	TS20.08-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

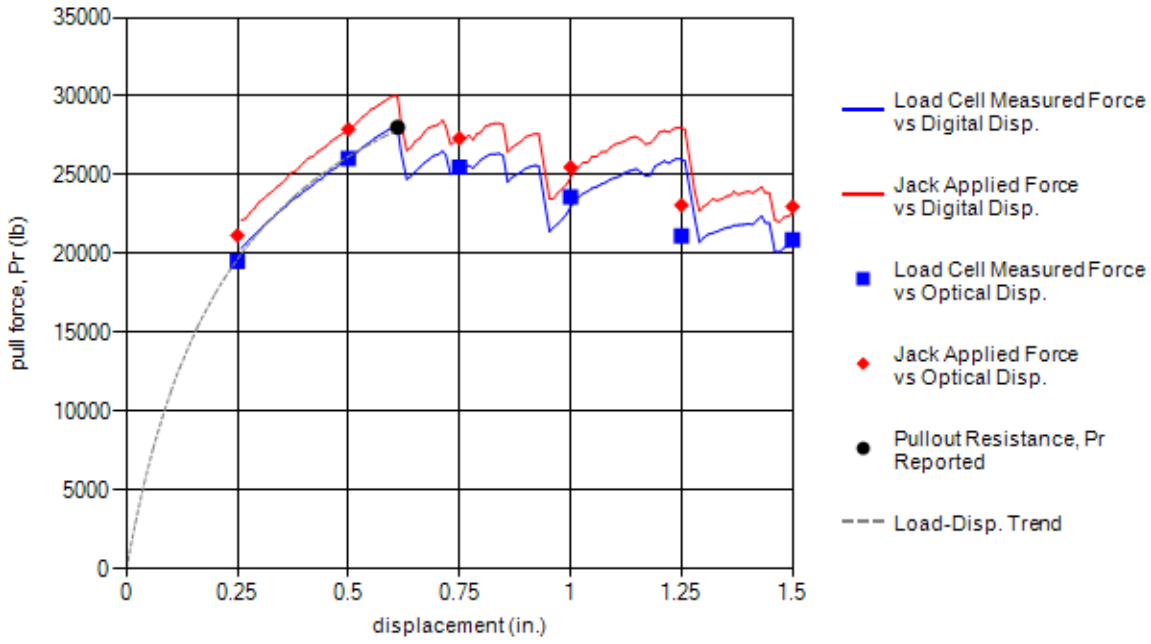
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	116.1	±0.8
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	8.9	±0.3%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	93.3	±0.6%

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	0.61	1537	28024	12.2	**0.76**

Load-Displacement Curve

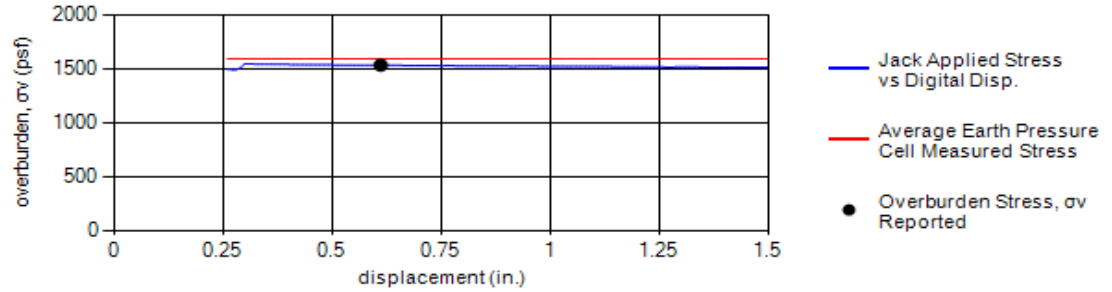


Comments

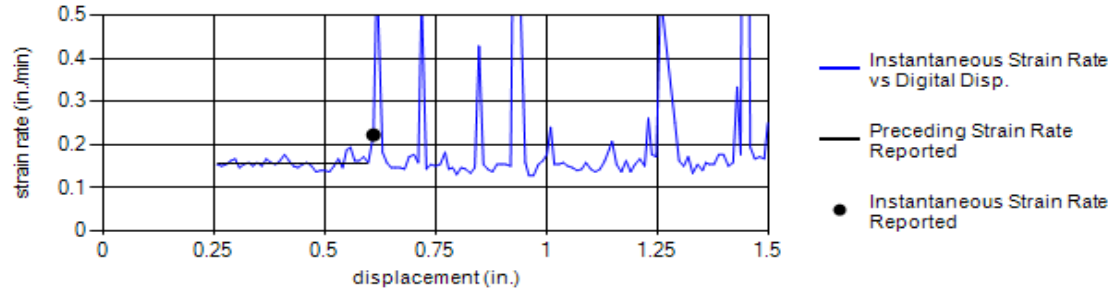
Personnel

Tested:	AS YW DH
Prepared:	SB TW
Checked:	WL PJ

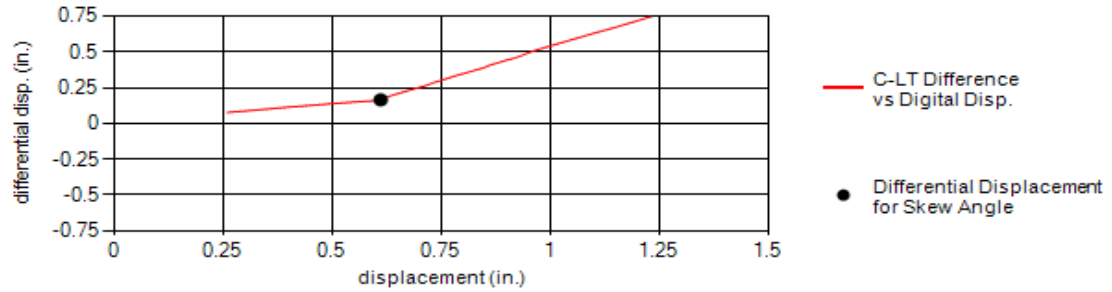
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1665	No Data	1600	1524	No Data	1596	1.16	1536



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.22	0.16	0.16



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	No Data	0.17	No Data	0.20	CCW



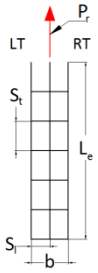
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/6/2011 3:30:00 PM
Test Identification:	TS20.09-G-2x12-W9.5xW11-L6-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):	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

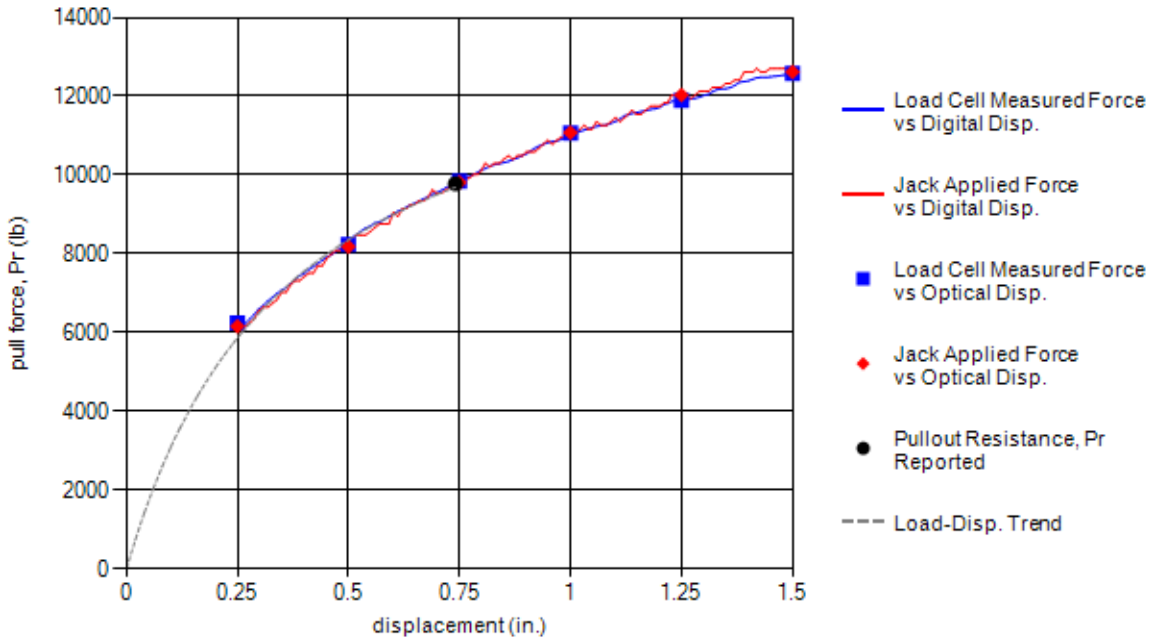
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	116.1 ±0.8
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	8.9 ±0.3%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	93.3 ±0.6%

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	638	9779	5.0	**3.83**

Load-Displacement Curve

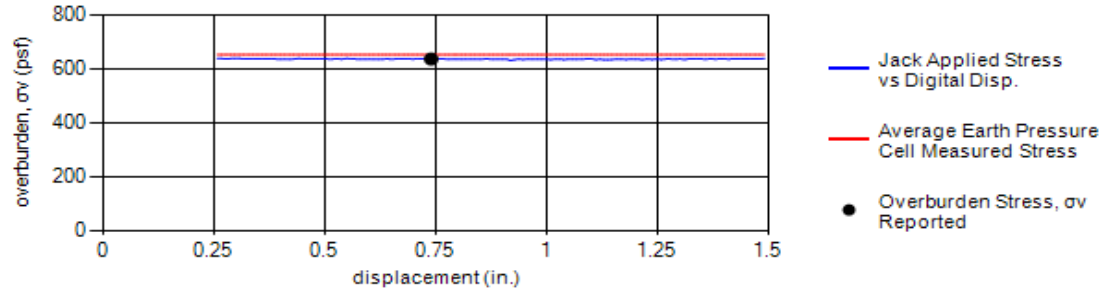


Comments

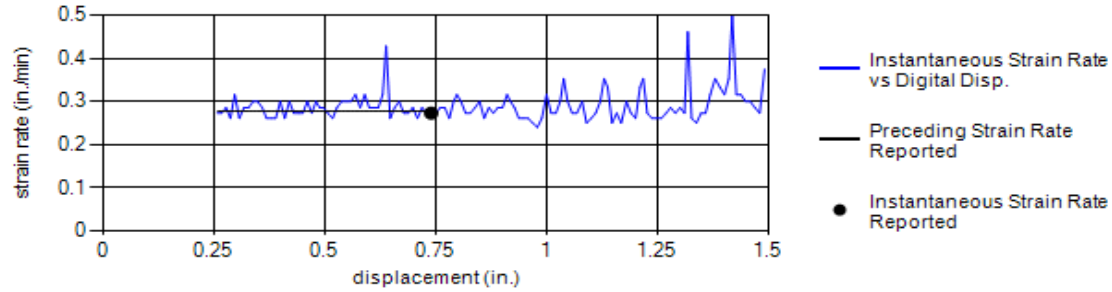
Personnel

Tested:	AS YW DH
Prepared:	SB TW
Checked:	WL PJ

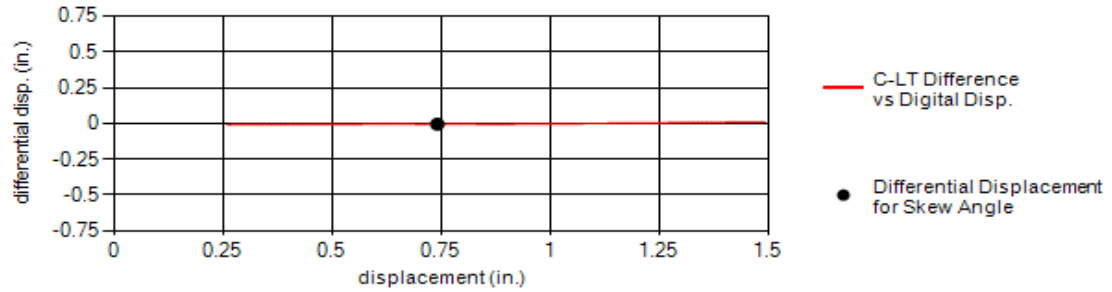
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
853	No Data	497	611	No Data	654	3.06	638



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.27	0.28	0.27



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	No Data	0.00	No Data	-0.03	CW



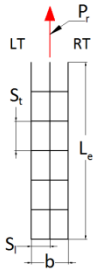
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/6/2011 3:02:00 PM
Test Identification:	TS20.10-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

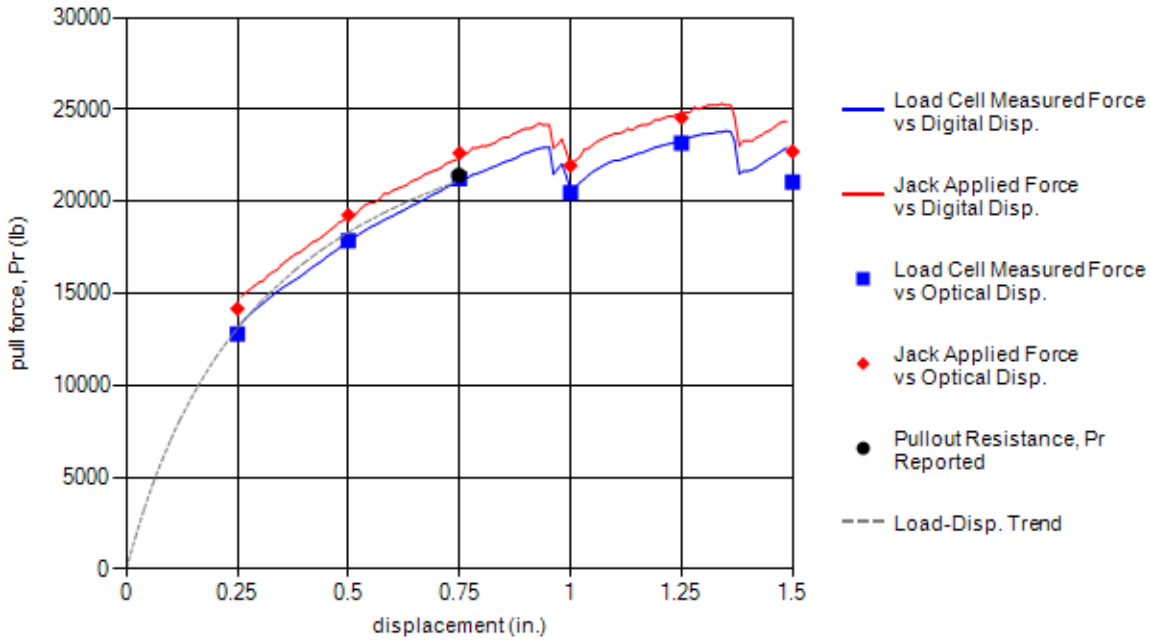
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	116.1	±0.8
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	8.9	±0.3%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	93.3	±0.6%

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	651	21421	5.1	**1.37**

Load-Displacement Curve

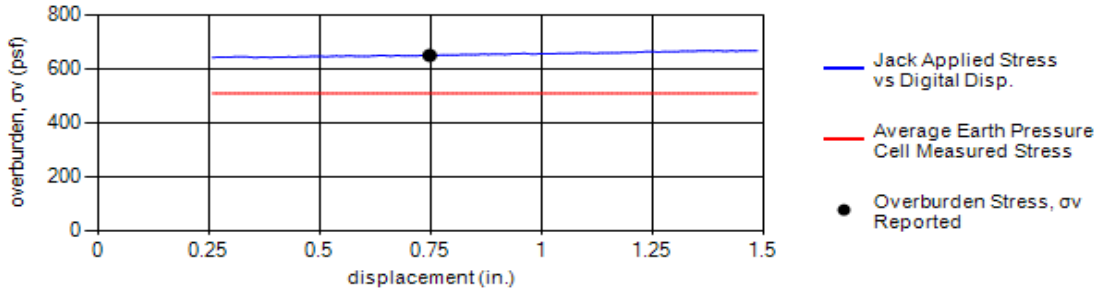


Comments

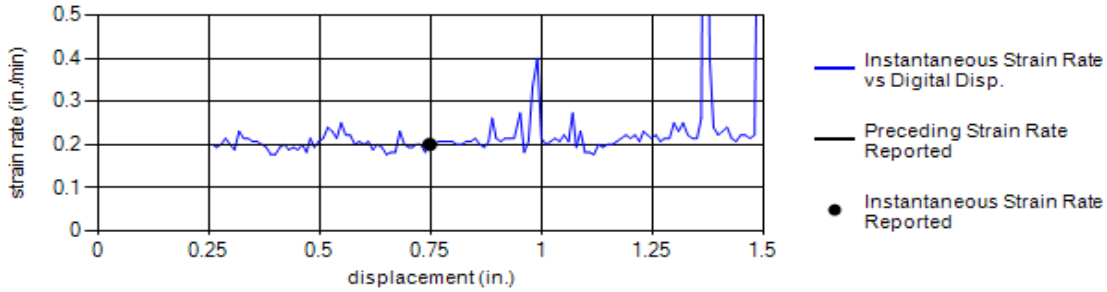
Personnel

Tested:	AS YW DH
Prepared:	SB TW
Checked:	WL PJ

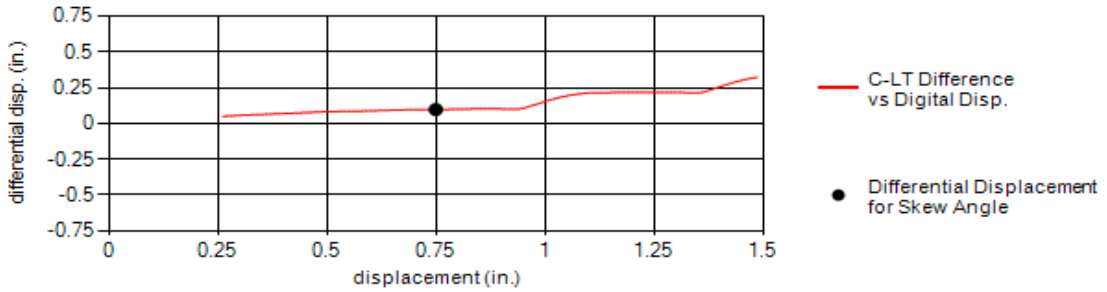
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
446	No Data	450	634	No Data	510	3.92	651



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



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	No Data	0.10	No Data	0.12	CCW



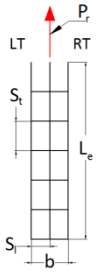
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/6/2011 12:27:00 PM
Test Identification:	TS20.11-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

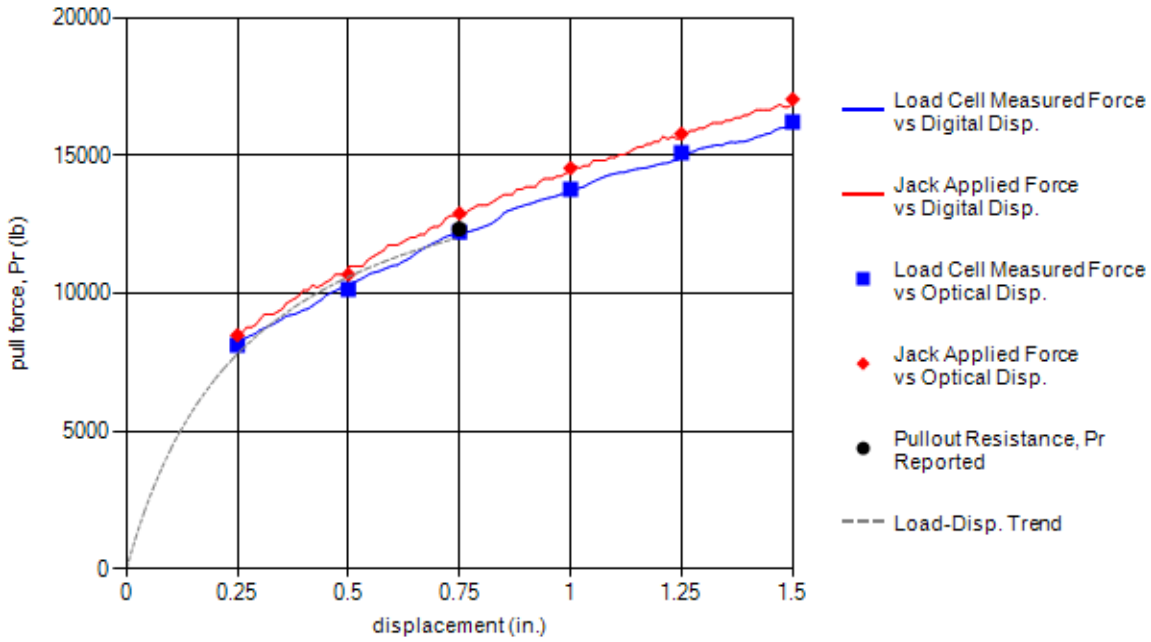
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	116.1	±0.8
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	8.9	±0.3%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	93.3	±0.6%

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)*	***Pullout Resistance Factor, F****
Pullout	0.75	1538	12332	12.2	**2.00**

Load-Displacement Curve

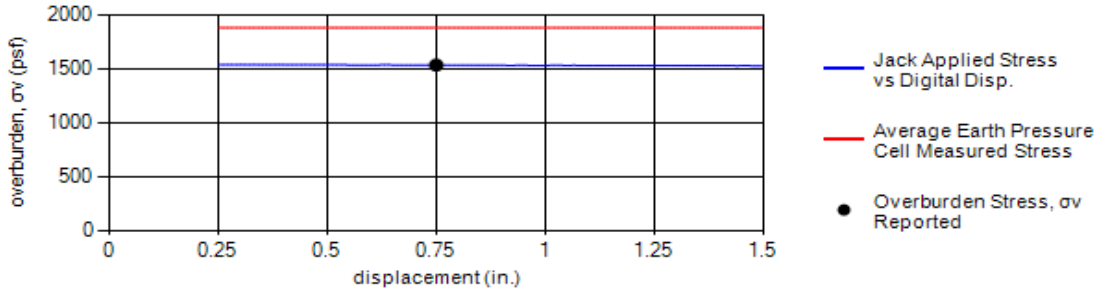


Comments

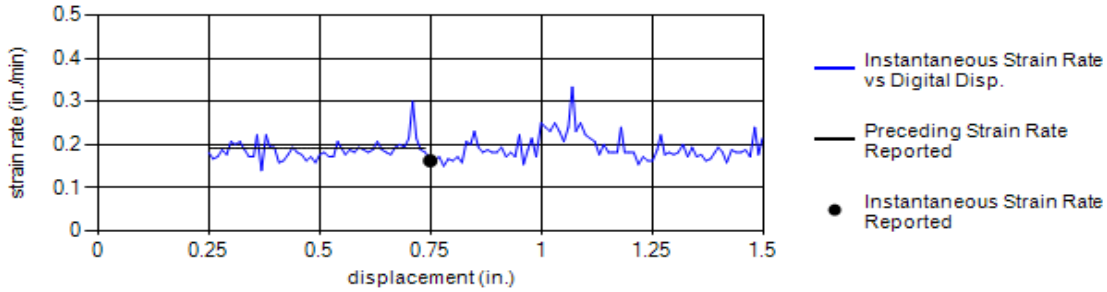
Personnel

Tested:	AS YW DH
Prepared:	SB TW
Checked:	WL PJ

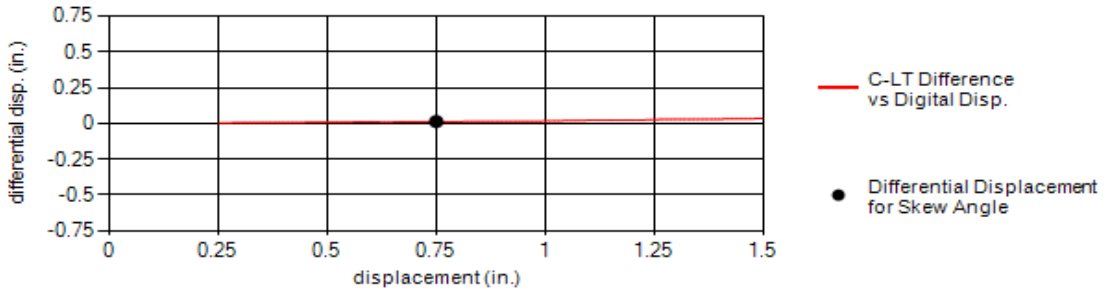
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2074	No Data	1891	1691	No Data	1885	1.16	1537



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.16	0.19	0.18



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	No Data	0.01	No Data	0.10	CCW



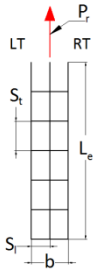
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/6/2011 1:50:00 PM
Test Identification:	TS20.12-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

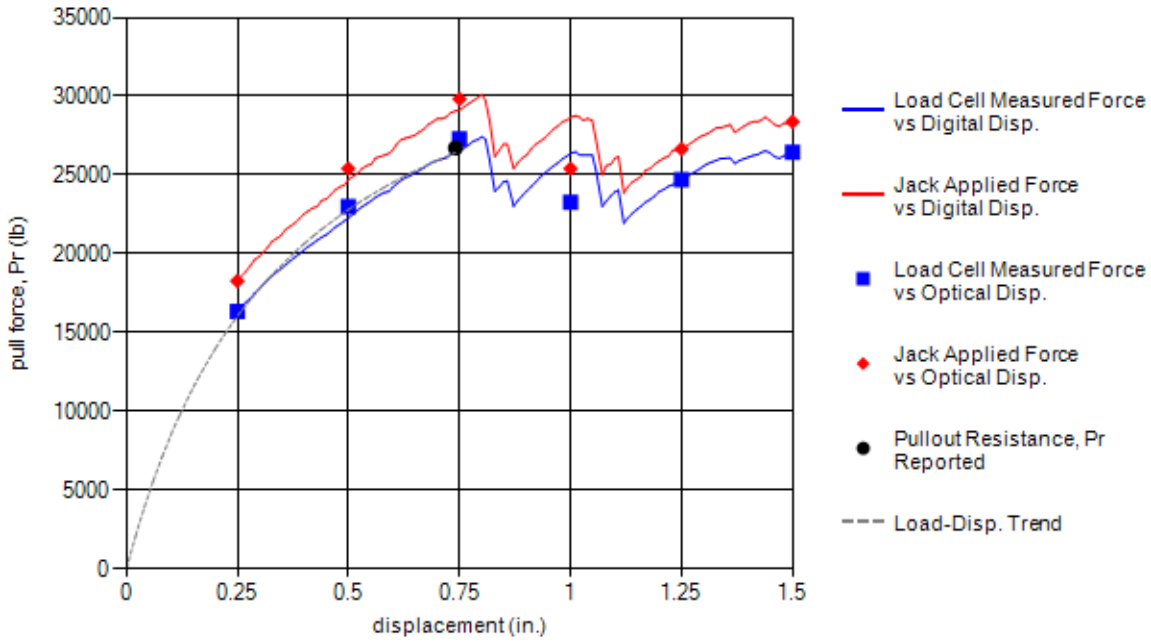
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	116.1	±0.8
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	8.9	±0.3%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	93.3	±0.6%

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	1521	26711	12.0	**0.73**

Load-Displacement Curve

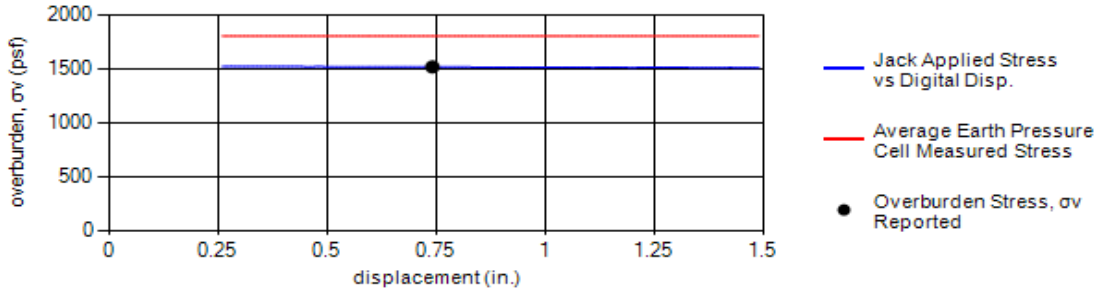


Comments

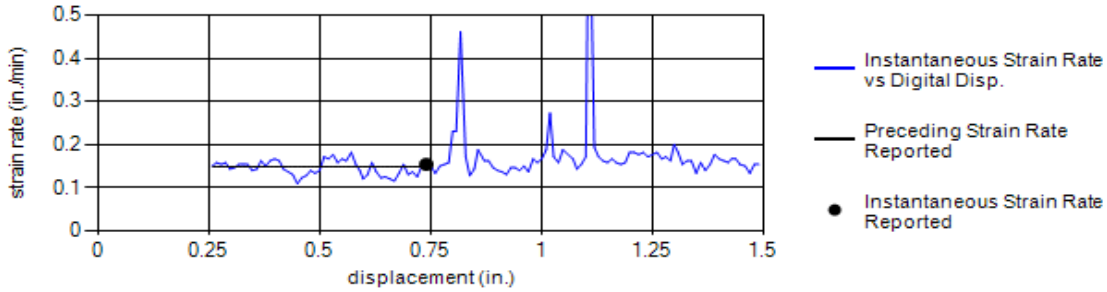
Personnel

Tested:	AS YW DH
Prepared:	SB TW
Checked:	WL PJ

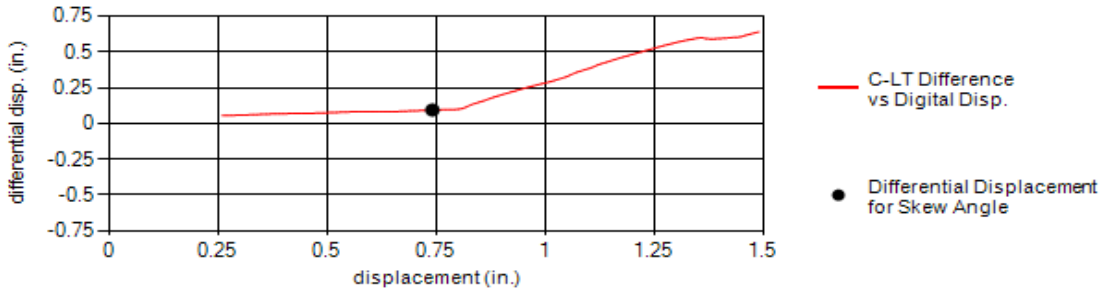
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2005	No Data	1753	1666	No Data	1808	1.17	1521



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.15	0.15	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	0.11	CCW



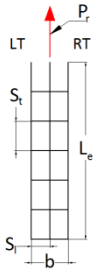
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/19/2011 1:36:00 PM
Test Identification:	TS21.01-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

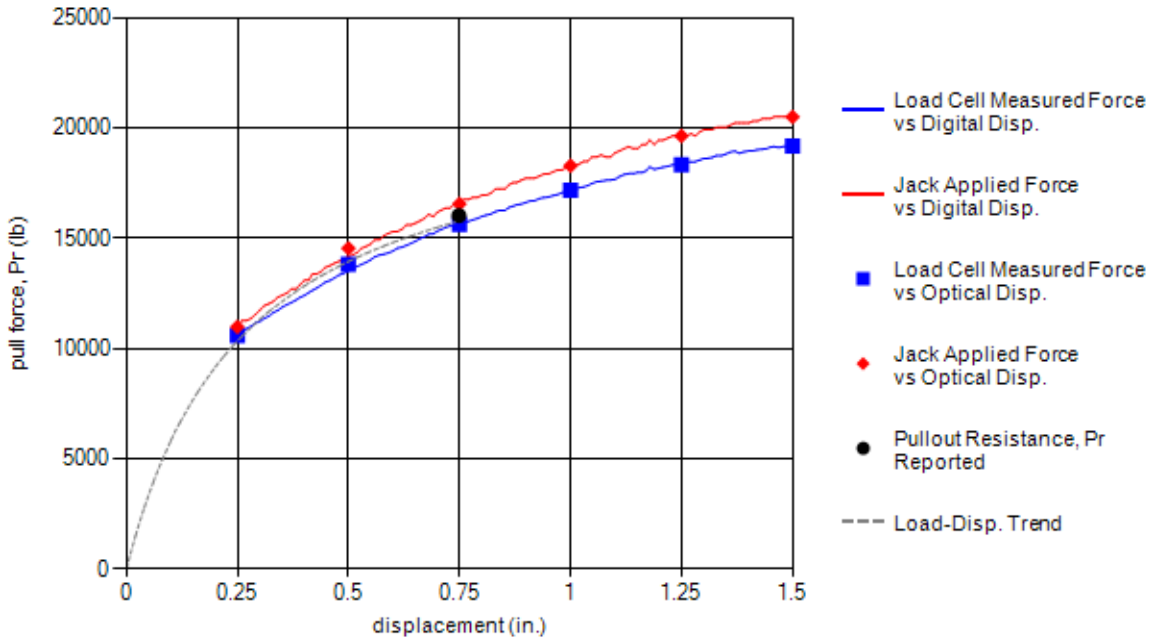
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	119.1	±2.0
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	8.0	±0.4%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	95.6	±1.6%

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	2551	16023	19.8	**1.57**

Load-Displacement Curve

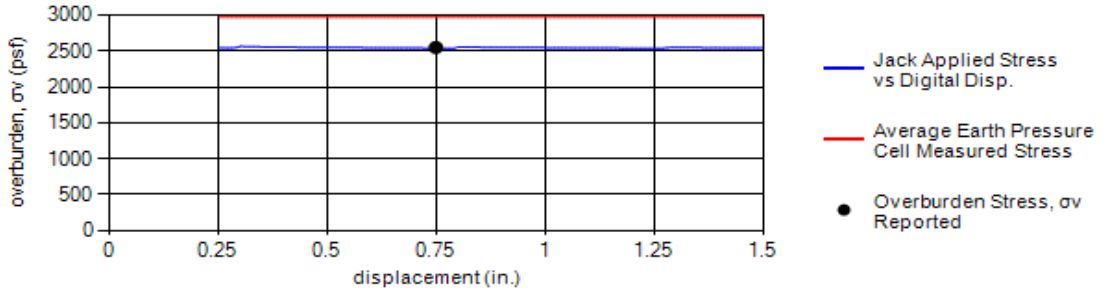


Comments

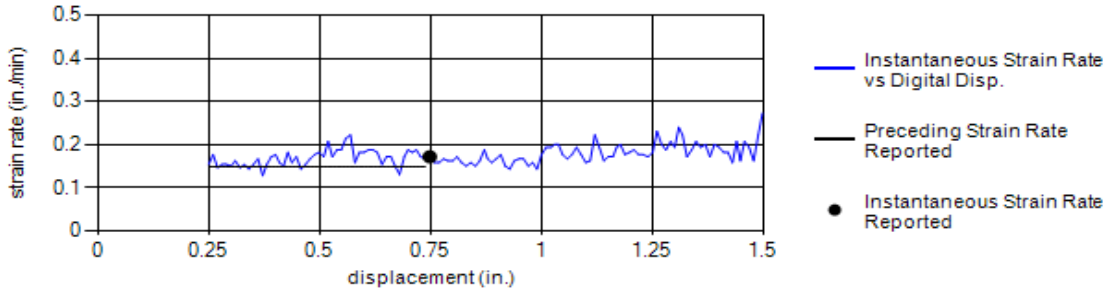
Personnel

Tested:	AS JL DH
Prepared:	SB TW
Checked:	WL PJ

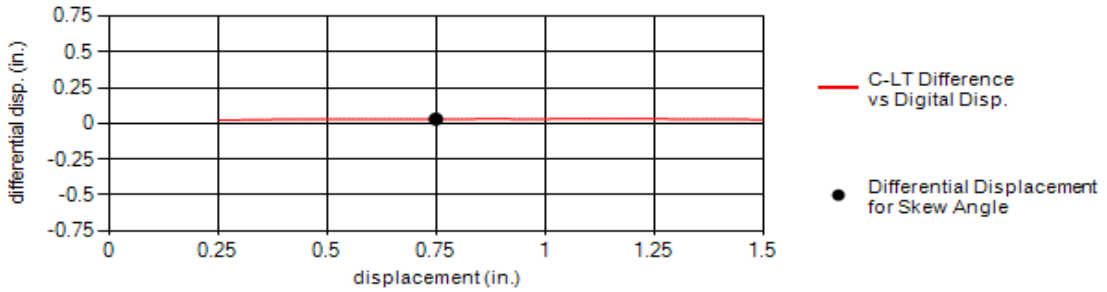
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2973	No Data	2961	2991	No Data	2975	1.03	2543



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.17	0.15	0.16



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	No Data	0.03	No Data	0.22	CCW



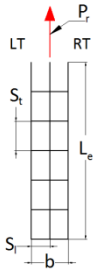
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/19/2011 2:35:00 PM
Test Identification:	TS21.02-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

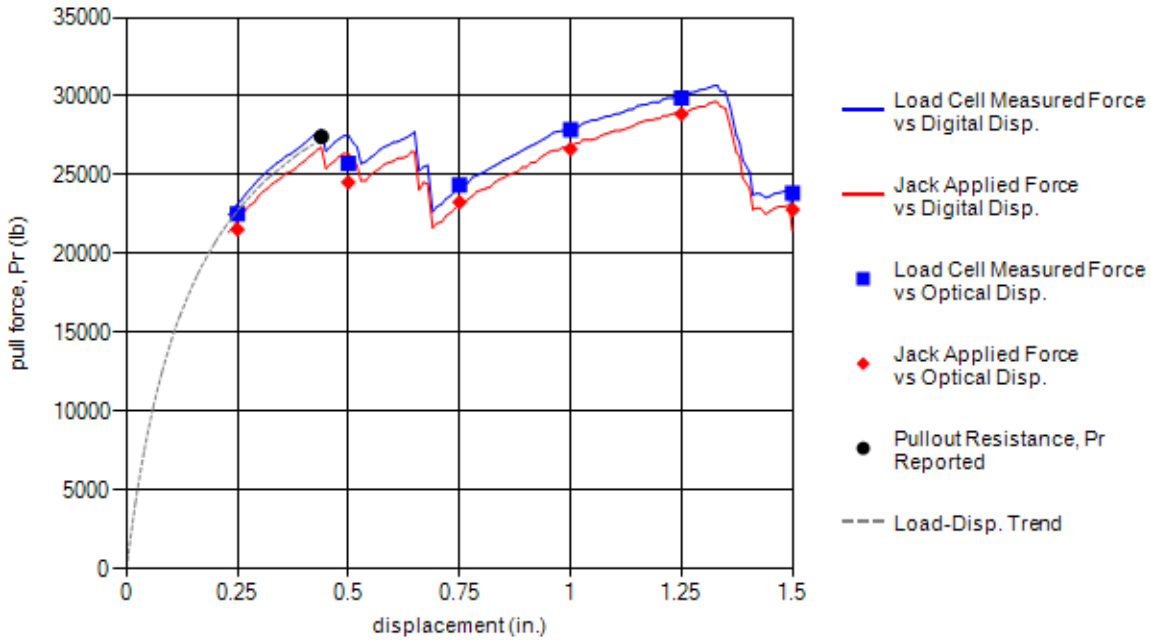
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	119.1	±2.0
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	8.0	±0.4%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	95.6	±1.6%

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	2555	27431	19.9	**0.45**

Load-Displacement Curve

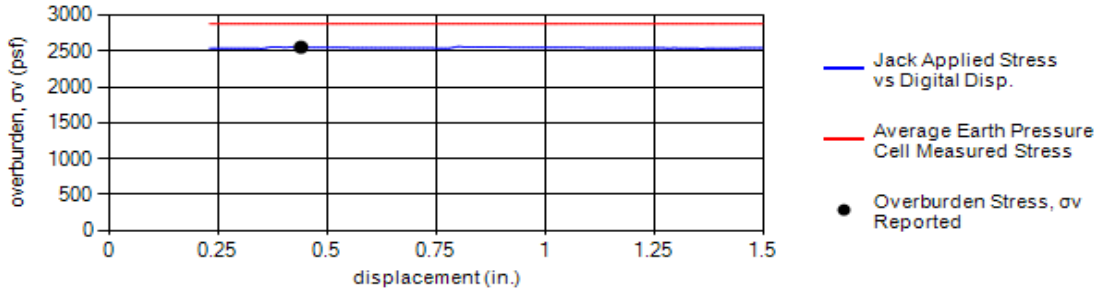


Comments

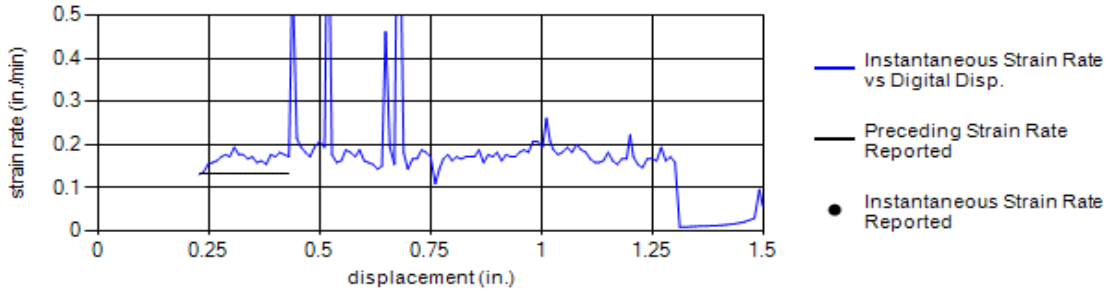
Personnel

Tested:	AS JL YW
Prepared:	SB TW
Checked:	WL PJ

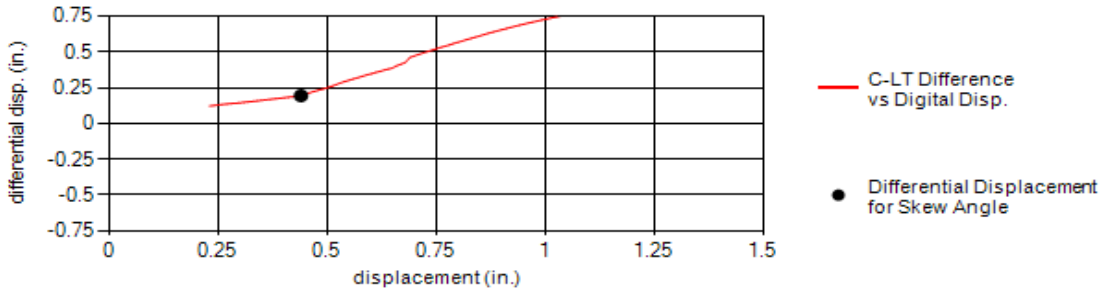
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2808	No Data	2837	3000	No Data	2882	1.06	2554



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.60	0.13	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	0.19	No Data	0.23	CCW



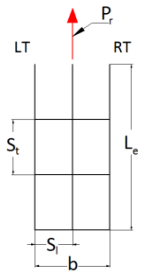
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/19/2011 3:15:00 PM
Test Identification:	TS21.03-G-2x12-W20xW11-L3-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):	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

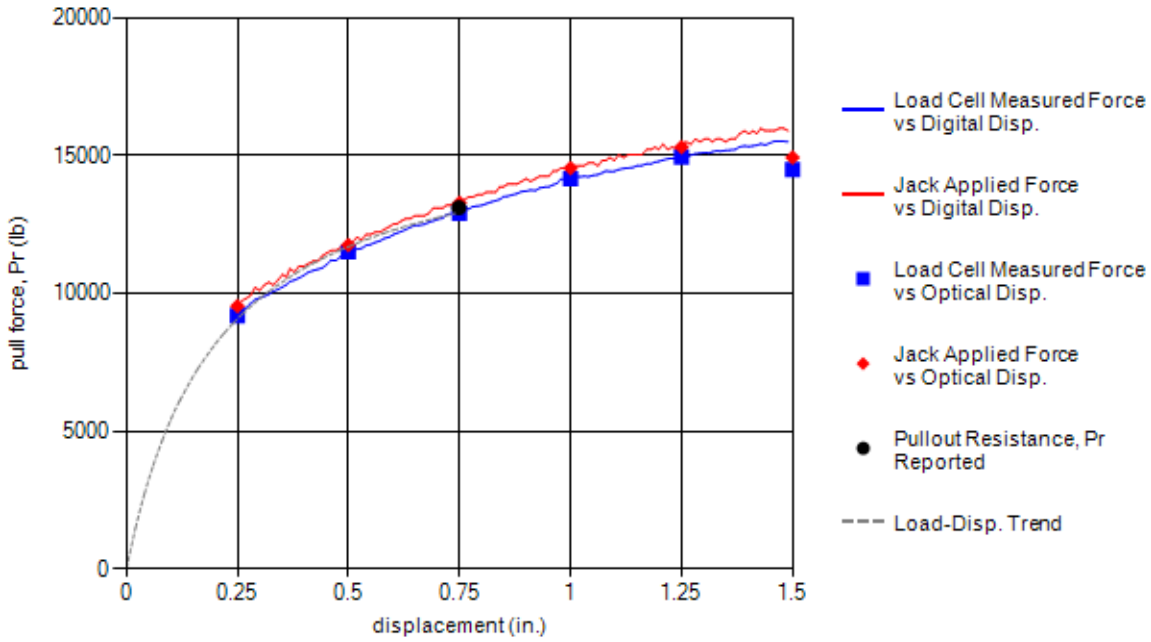
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	119.1 ±2.0
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	8.0 ±0.4%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	95.6 ±1.6%

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	5066	13104	39.4	**1.29**

Load-Displacement Curve

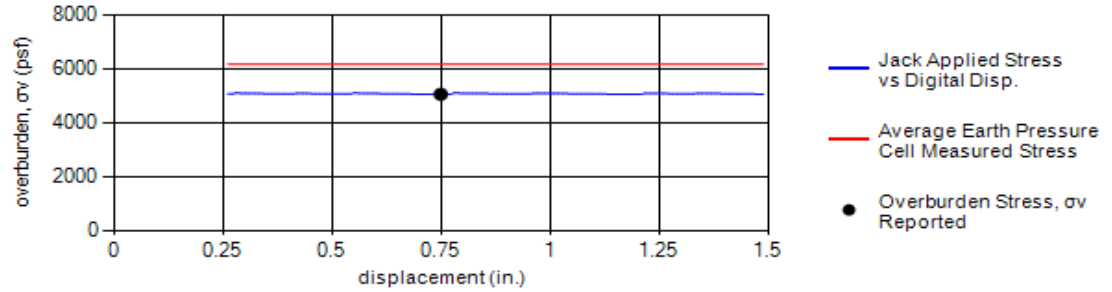


Comments

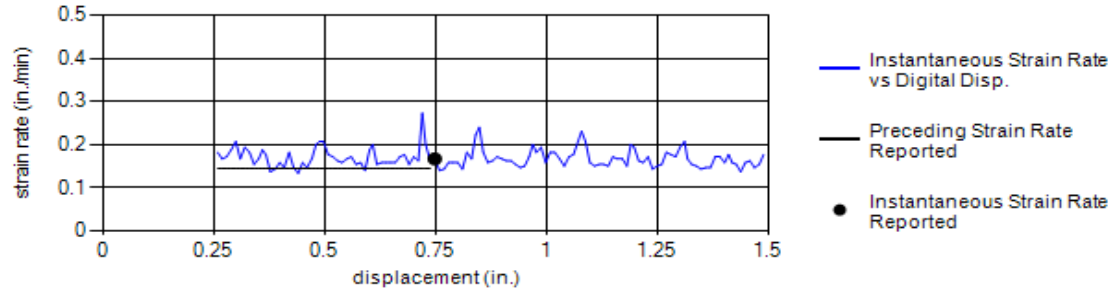
Personnel

Tested:	AS JL YW
Prepared:	SB TW
Checked:	WL PJ

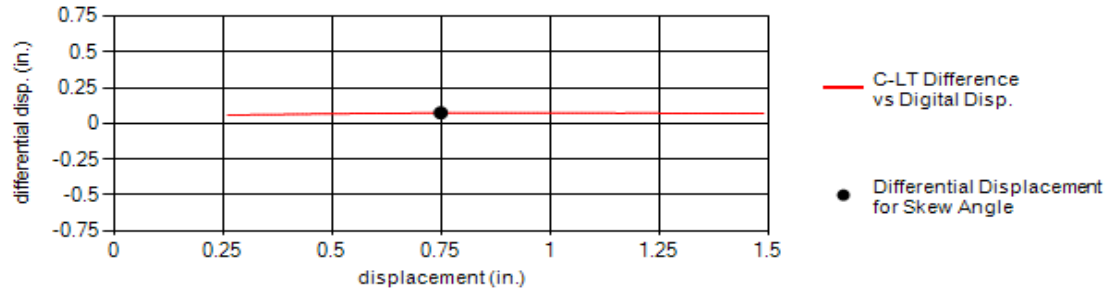
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
6399	No Data	5937	6218	No Data	6184	1.02	5065



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*
No Data	No Data	0.07	No Data	0.54	CCW



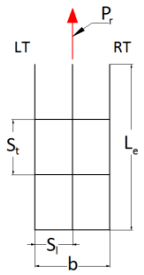
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/19/2011 3:44:00 PM
Test Identification:	TS21.04-G-12x12-W20xW11-L3-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):	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

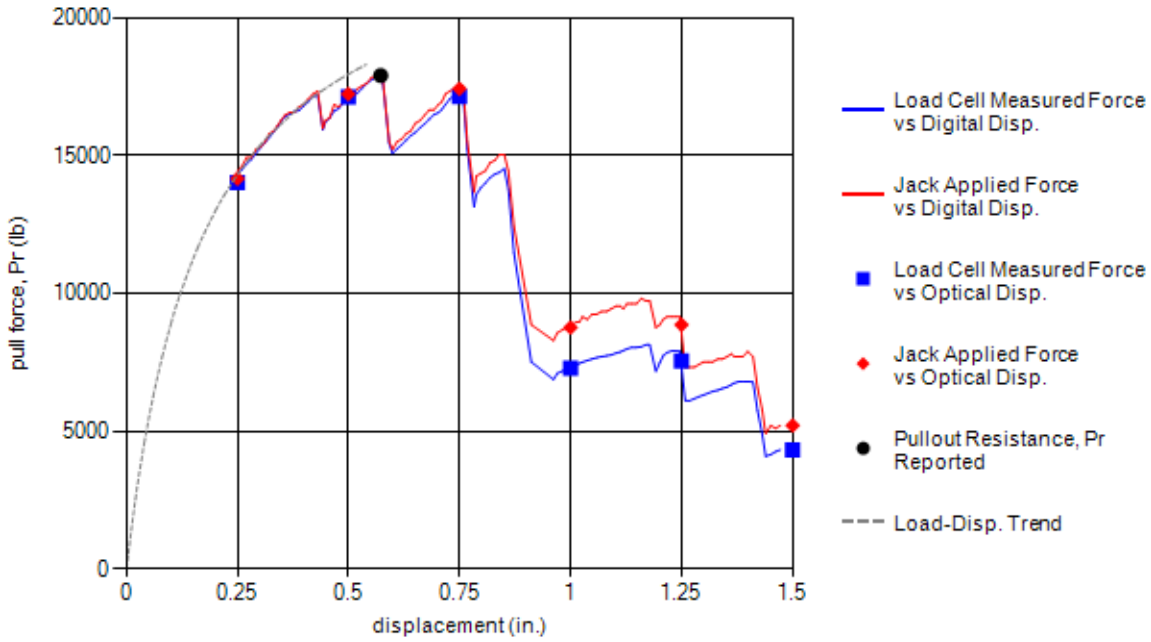
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	119.1 ±2.0
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	8.0 ±0.4%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	95.6 ±1.6%

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	0.57	5039	17895	39.2	**0.30**

Load-Displacement Curve

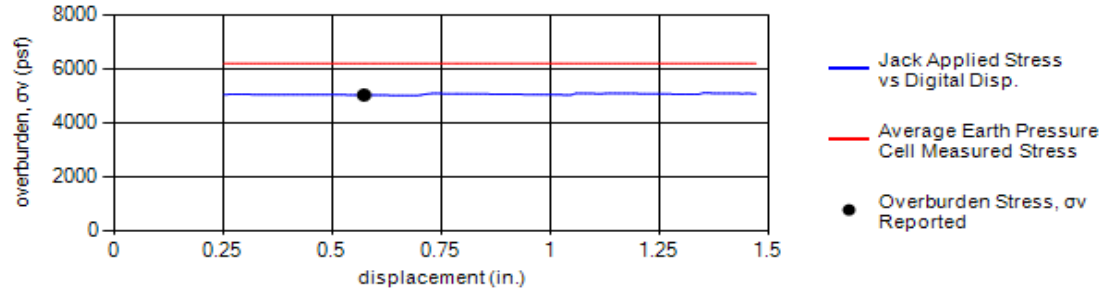


Comments

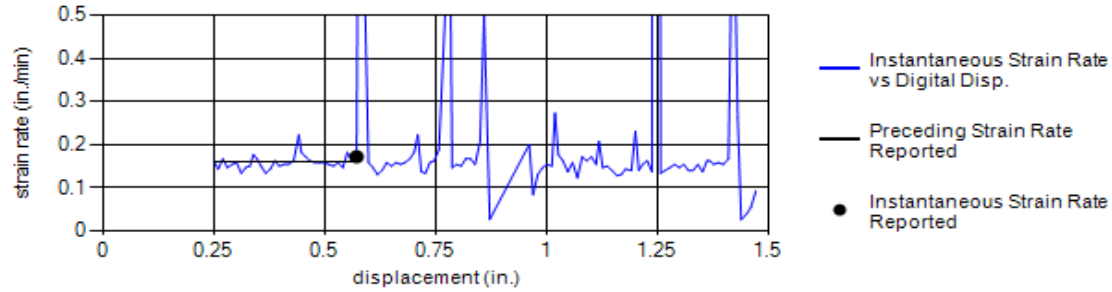
Personnel

Tested:	AS JL YW
Prepared:	SB TW
Checked:	WL PJ

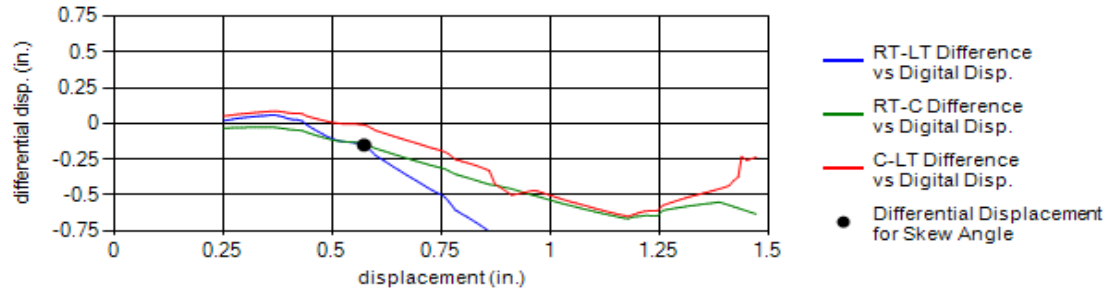
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
6484	No Data	5964	6175	No Data	6208	1.02	5038



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



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
-0.15	-0.14	-0.01	No Data	-0.36	CW



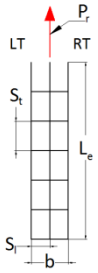
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/20/2011 11:01:00 AM
Test Identification:	TS21.05-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

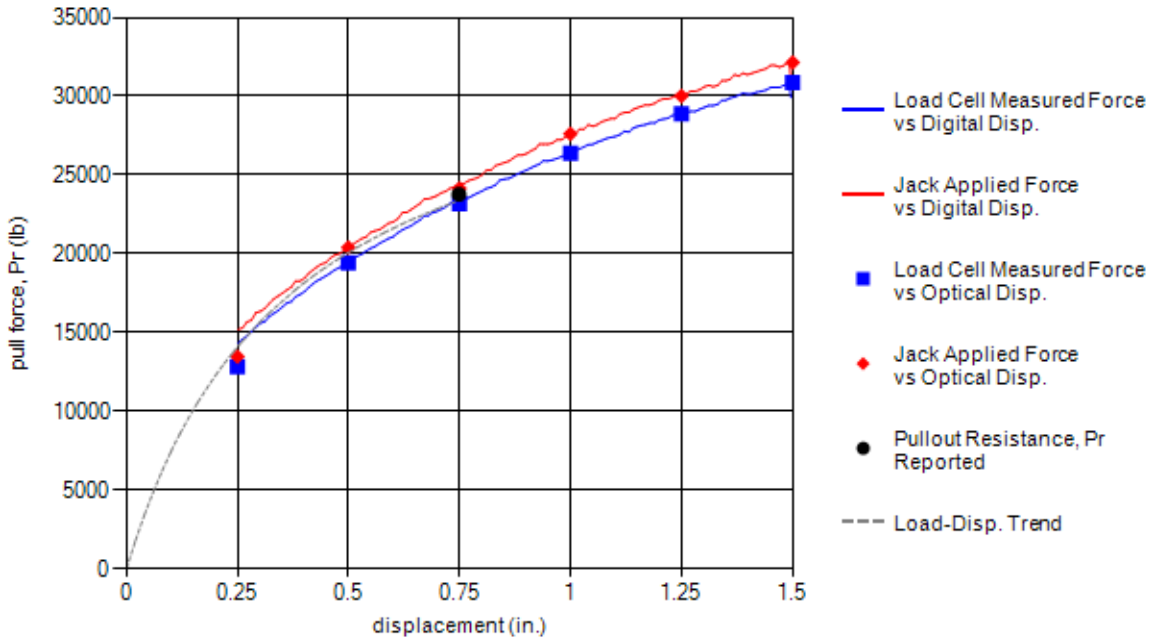
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	119.1	±2.0
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	8.0	±0.4%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	95.6	±1.6%

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	2549	23781	19.8	**2.33**

Load-Displacement Curve

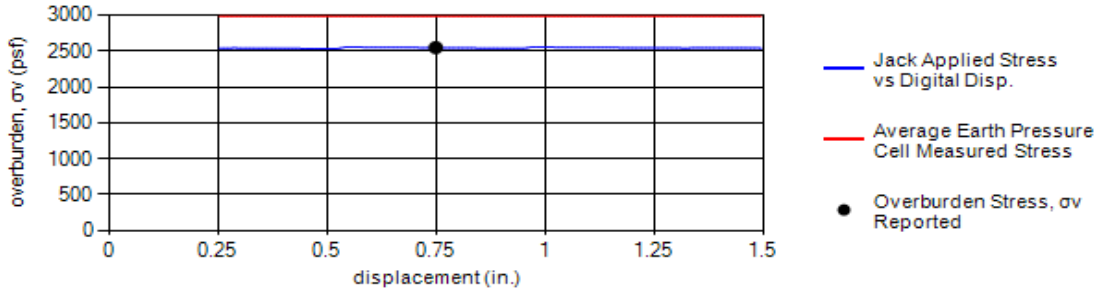


Comments

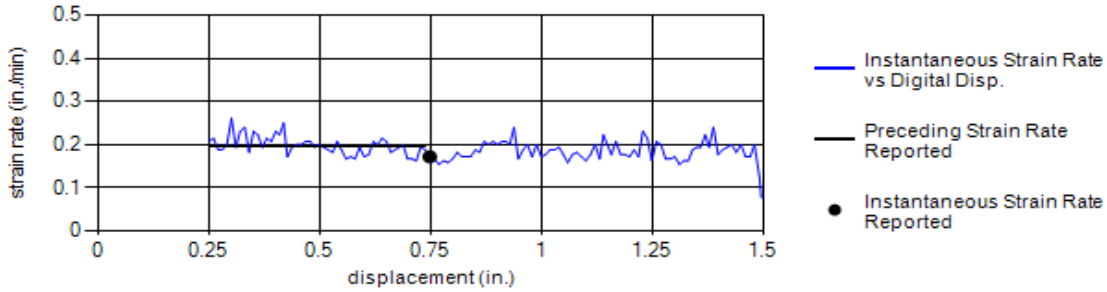
Personnel

Tested:	JL YW DH
Prepared:	SB TW
Checked:	WL PJ

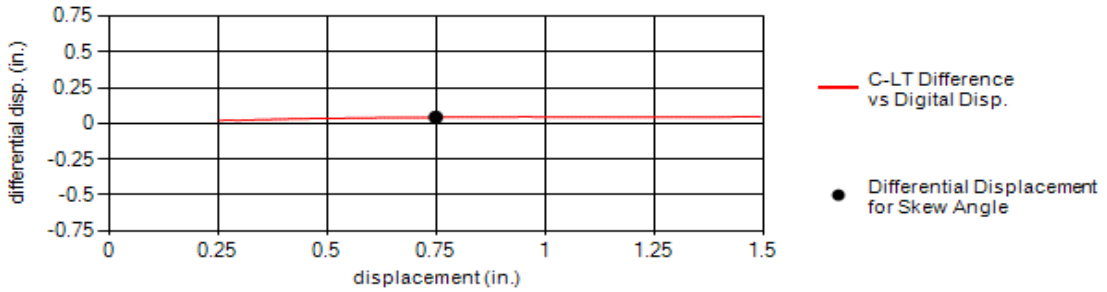
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3098	No Data	2741	3126	No Data	2988	2.16	2549



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.17	0.20	0.18



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	0.31	CCW



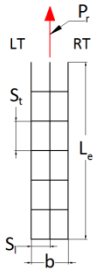
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/20/2011 11:39:00 AM
Test Identification:	TS21.06-G-12x12-W20xW11-L6-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):	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 B

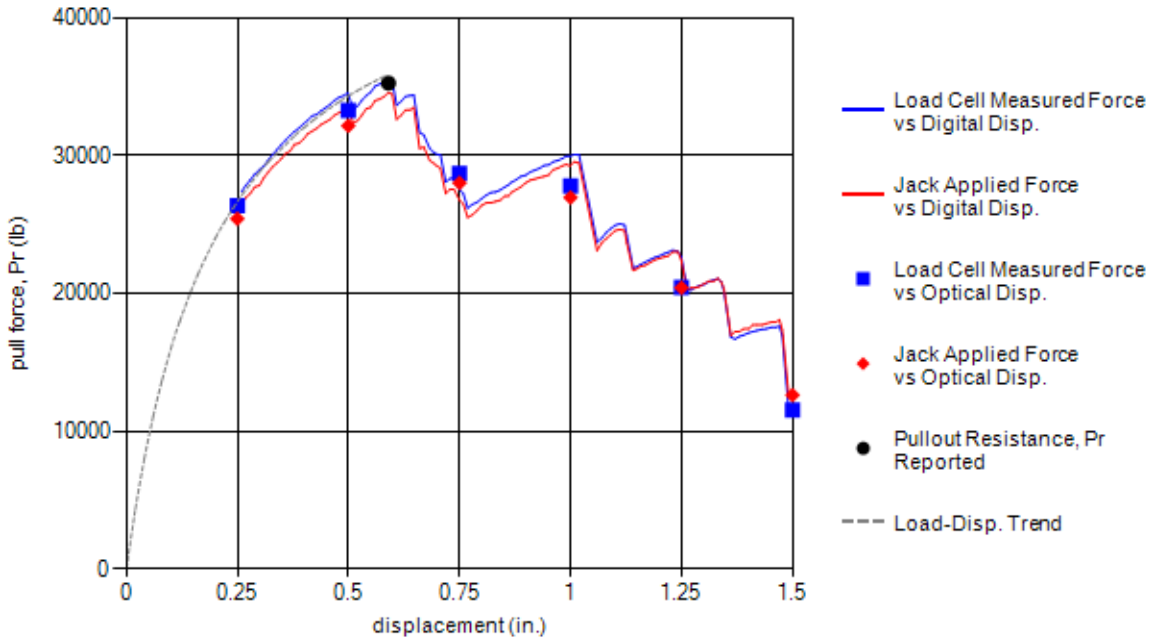
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	119.1	±2.0
Moisture Content, w (%):	8.0	±0.4%
Relative Compaction, C_R (%):	95.6	±1.6%

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	0.59	2507	35235	19.5	**0.59**

Load-Displacement Curve

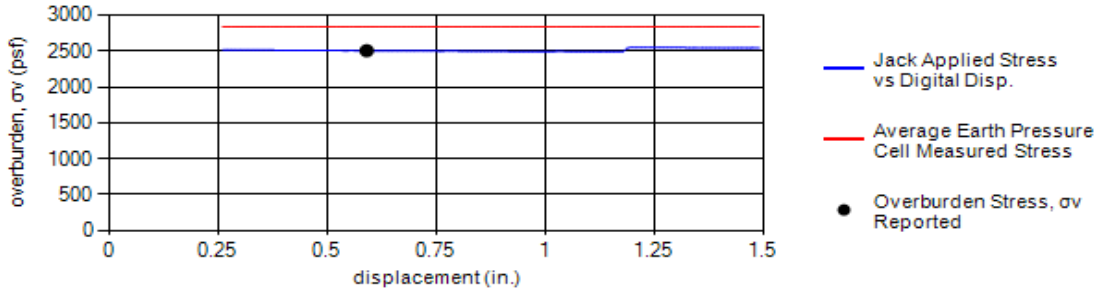


Comments

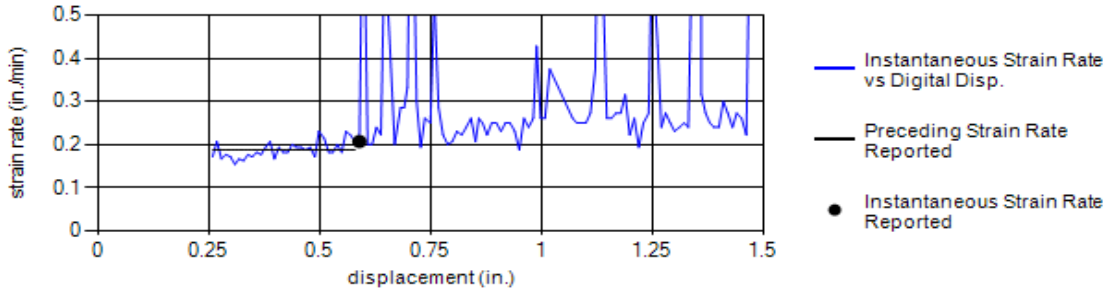
Personnel

Tested:	JL YW DH
Prepared:	SB TW
Checked:	WL PJ

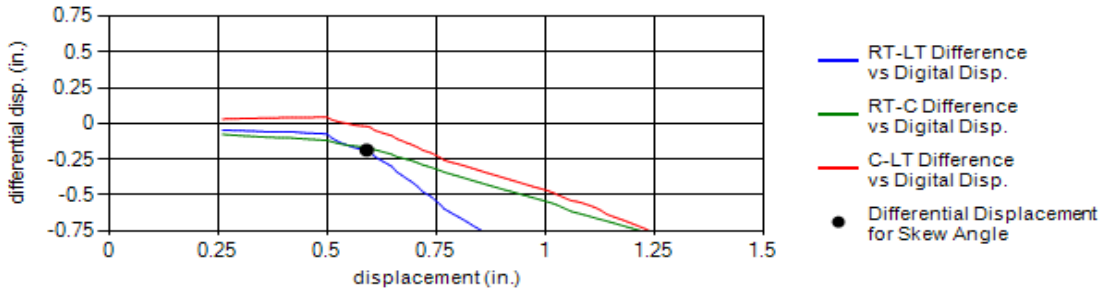
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2687	No Data	2682	3140	No Data	2837	2.28	2507



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.21	0.19	0.22



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
-0.19	-0.17	-0.02	No Data	-0.44	CW



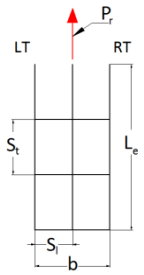
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/20/2011 12:04:00 PM
Test Identification:	TS21.07-G-2x12-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.):	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

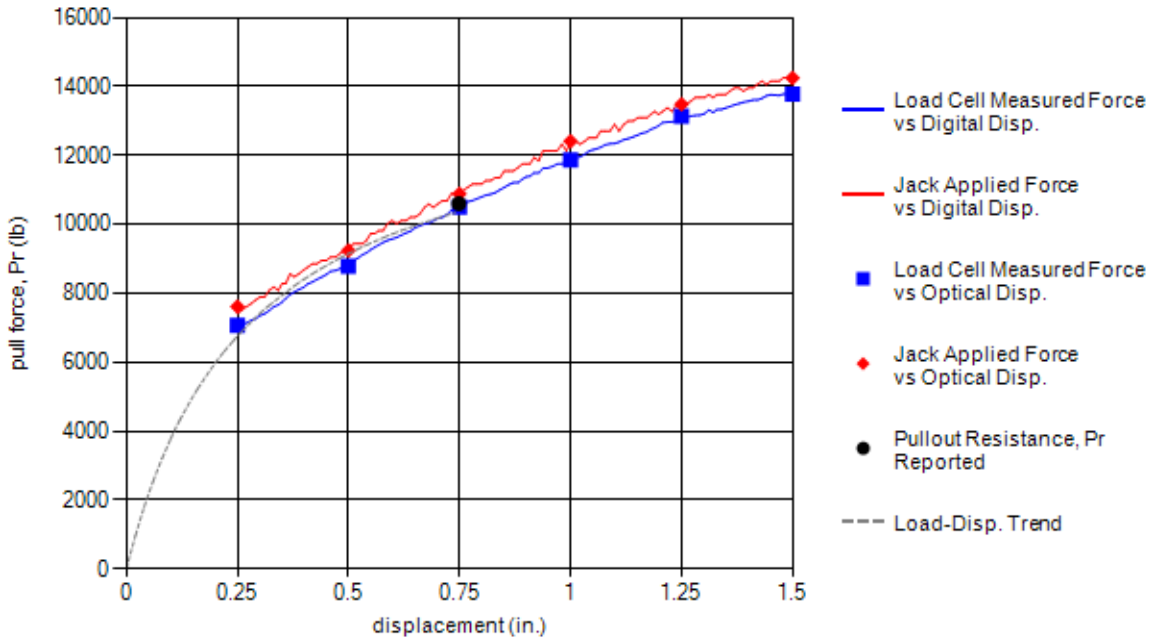
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	119.1 ±2.0
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	8.0 ±0.4%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	95.6 ±1.6%

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	5086	10601	39.5	**1.04**

Load-Displacement Curve

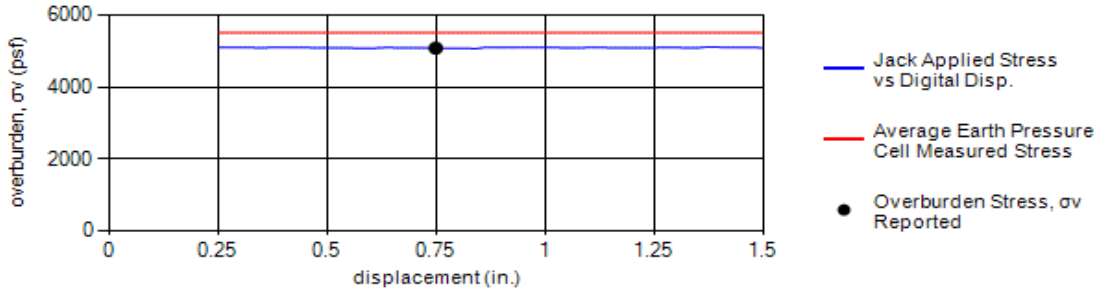


Comments

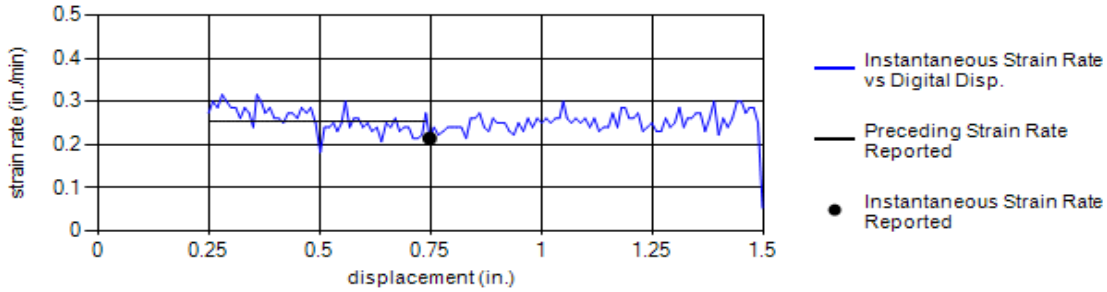
Personnel

Tested:	JL YW DH
Prepared:	SB TW
Checked:	WL PJ

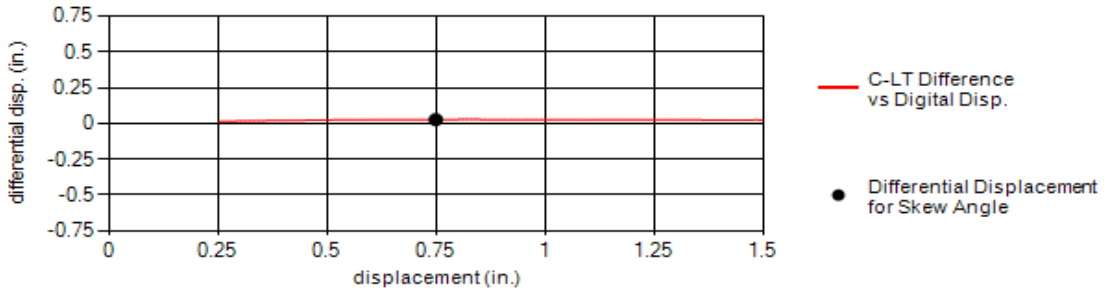
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
5118	No Data	5637	5792	No Data	5516	1.17	5086



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.21	0.26	0.25



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	No Data	0.03	No Data	0.20	CCW



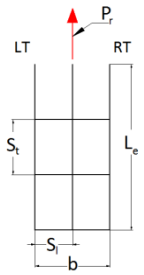
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/20/2011 12:42:00 PM
Test Identification:	TS21.08-G-12x12-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.):	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 B

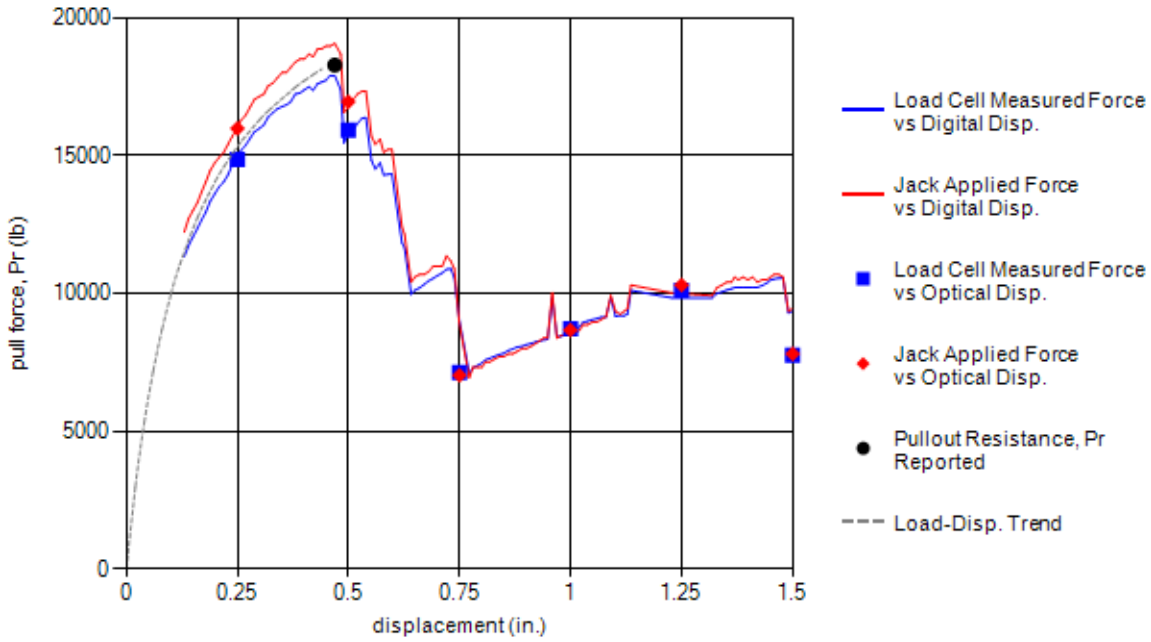
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	119.1	±2.0
Moisture Content, w (%):	8.0	±0.4%
Relative Compaction, C_R (%):	95.6	±1.6%

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	0.47	5123	18273	39.8	**0.30**

Load-Displacement Curve

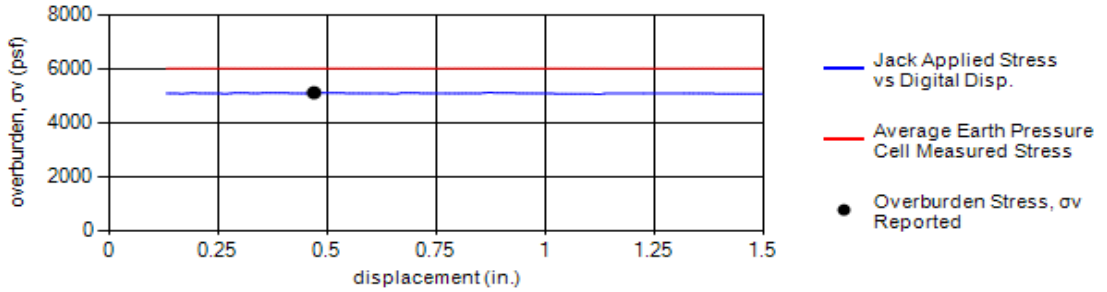


Comments

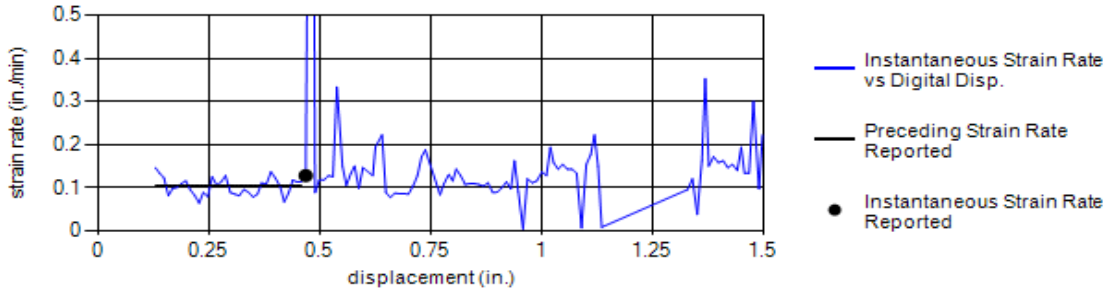
Personnel

Tested:	JL YW AS
Prepared:	SB TW
Checked:	WL PJ

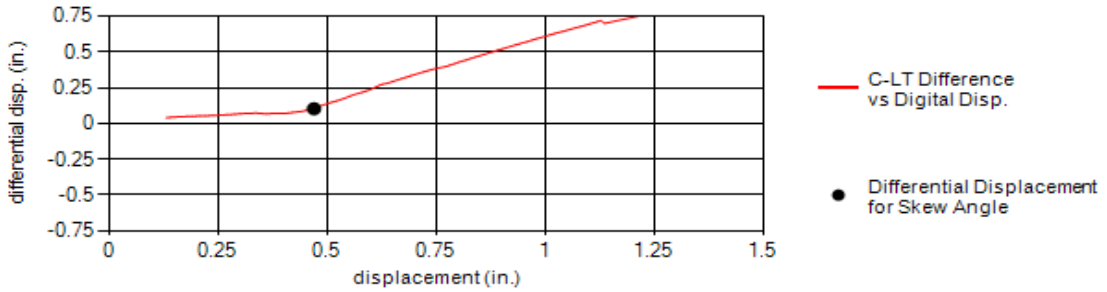
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
5683	No Data	6144	6241	No Data	6023	1.07	5122



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.13	0.10	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	0.10	No Data	0.12	CCW



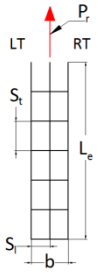
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/20/2011 9:43:00 AM
Test Identification:	TS21.10-G-12x12-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.):	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

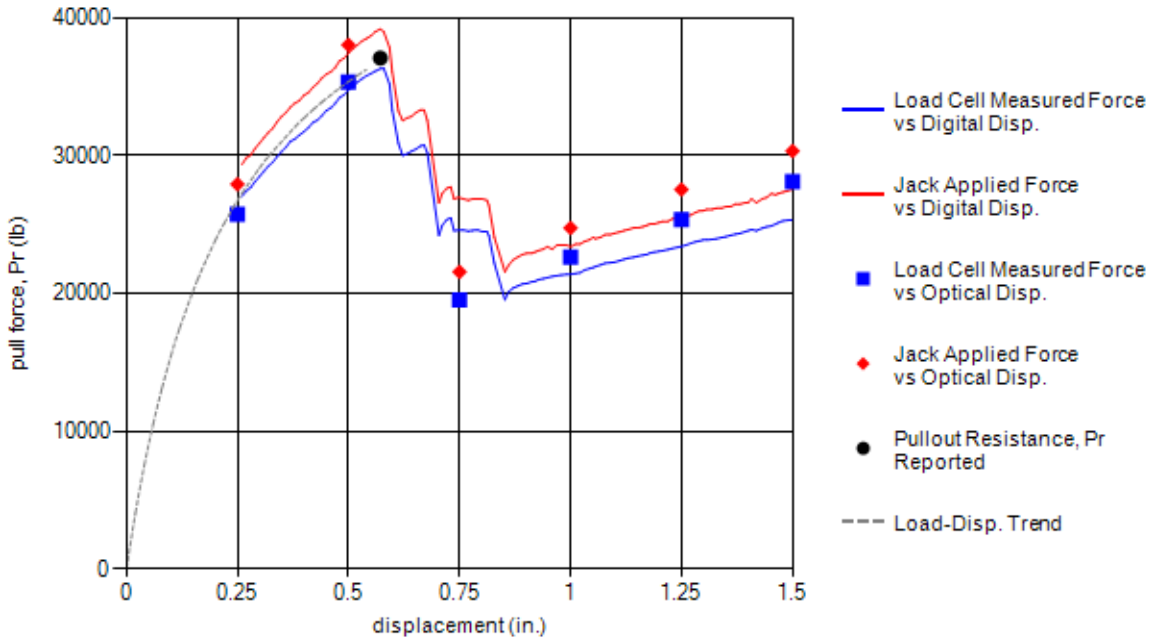
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	119.1 ±2.0
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	8.0 ±0.4%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	95.6 ±1.6%

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	0.57	2530	37054	19.7	**0.61**

Load-Displacement Curve

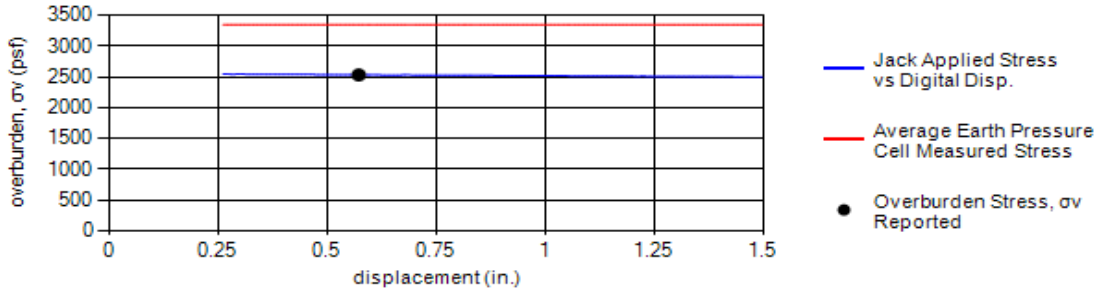


Comments

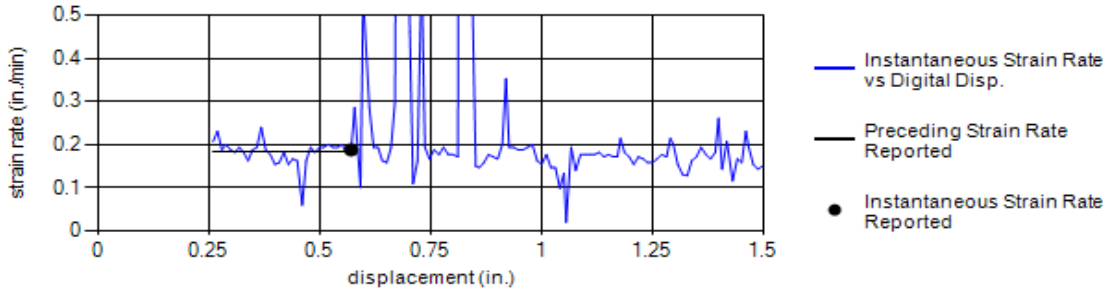
Personnel

Tested:	JL YW DH
Prepared:	SB TW
Checked:	WL PJ

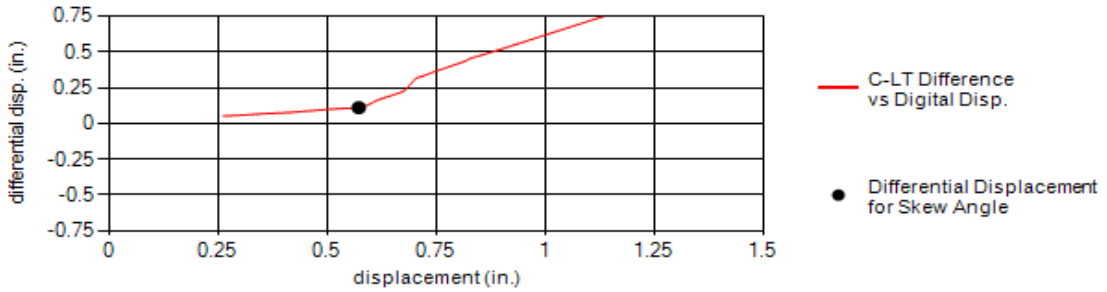
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3397	No Data	3018	3630	No Data	3348	2.10	2530



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.19	0.18	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	0.11	No Data	0.13	CCW



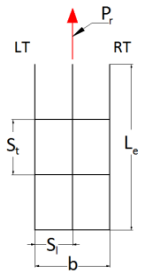
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/19/2011 4:46:00 PM
Test Identification:	TS21.11-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

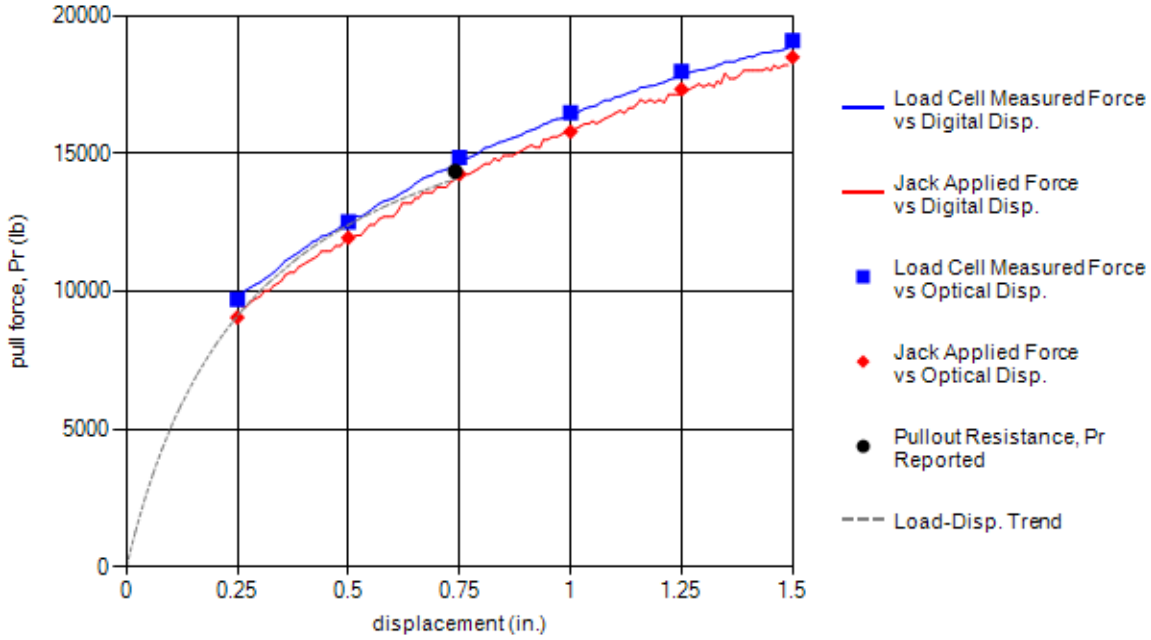
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	119.1	±2.0
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	8.0	±0.4%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	95.6	±1.6%

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	5068	14352	39.4	**1.42**

Load-Displacement Curve

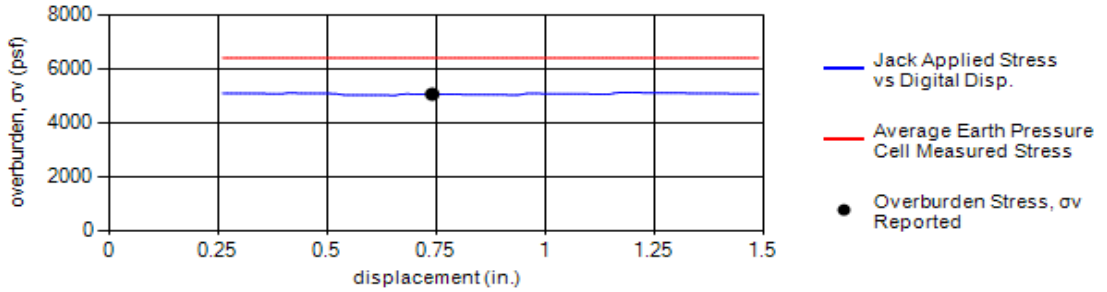


Comments

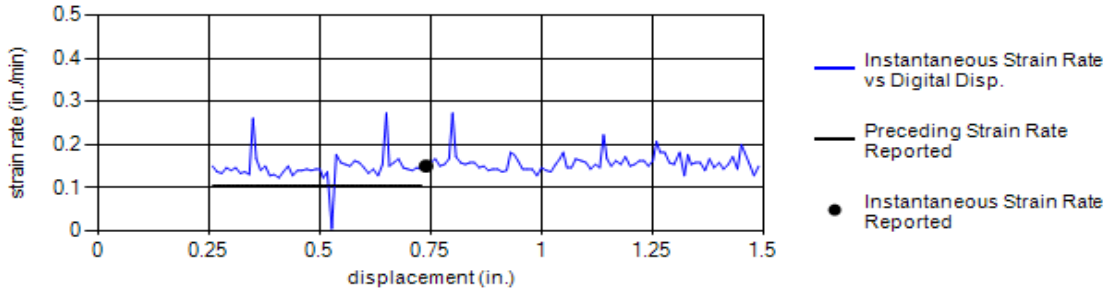
Personnel

Tested:	AS JL YW
Prepared:	SB TW
Checked:	WL PJ

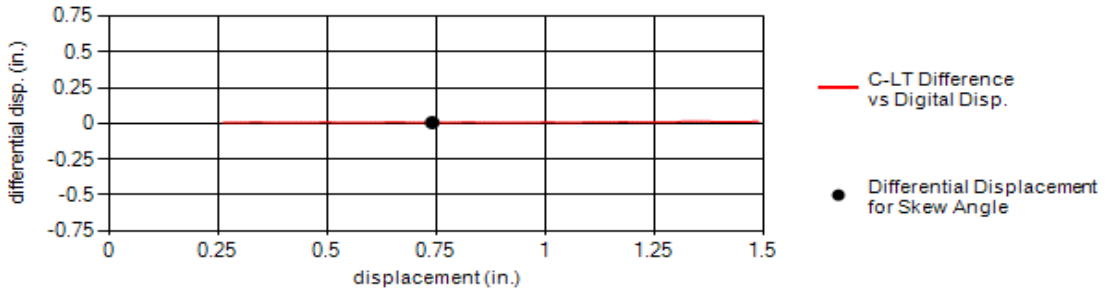
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
6701	No Data	6151	6400	No Data	6418	1.05	5068



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.15	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	0.01	No Data	0.05	CCW



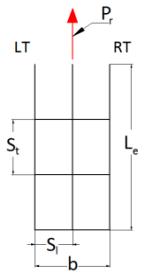
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/19/2011 4:18:00 PM
Test Identification:	TS21.12-G-12x12-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.):	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 B

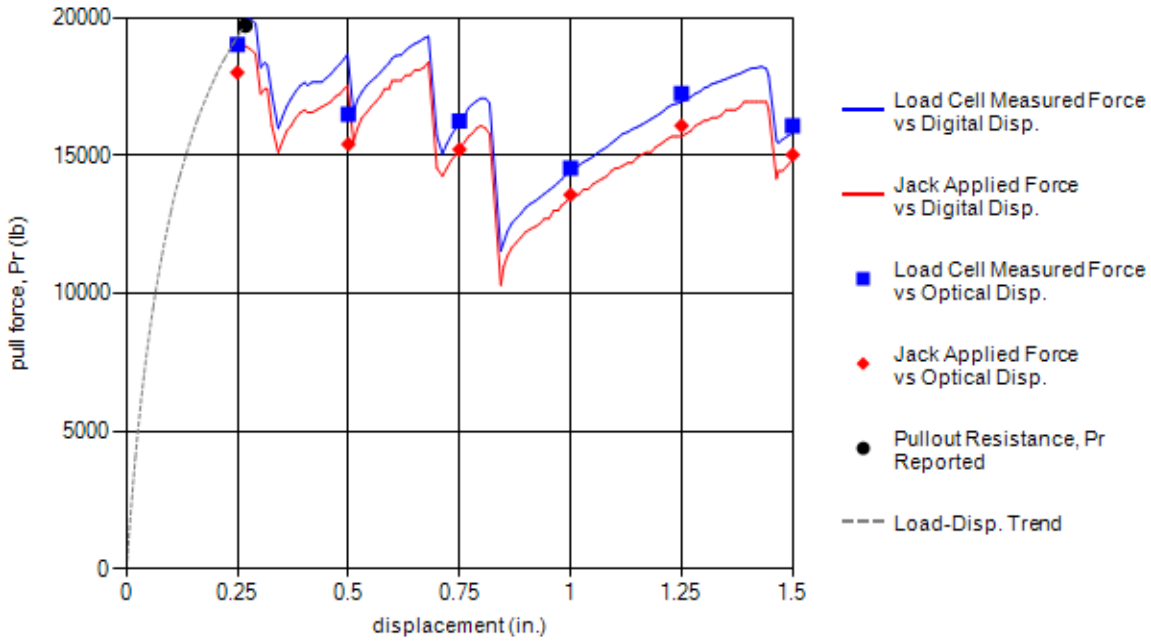
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	119.1	±2.0
Moisture Content, w (%):	8.0	±0.4%
Relative Compaction, C_R (%):	95.6	±1.6%

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	5095	19709	39.6	**0.32**

Load-Displacement Curve

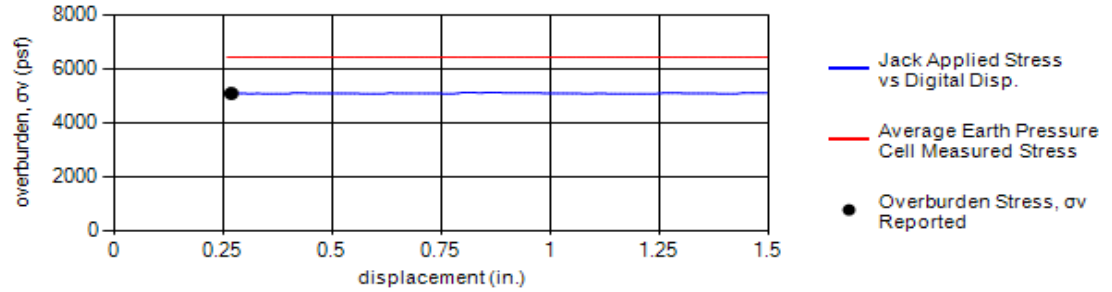


Comments

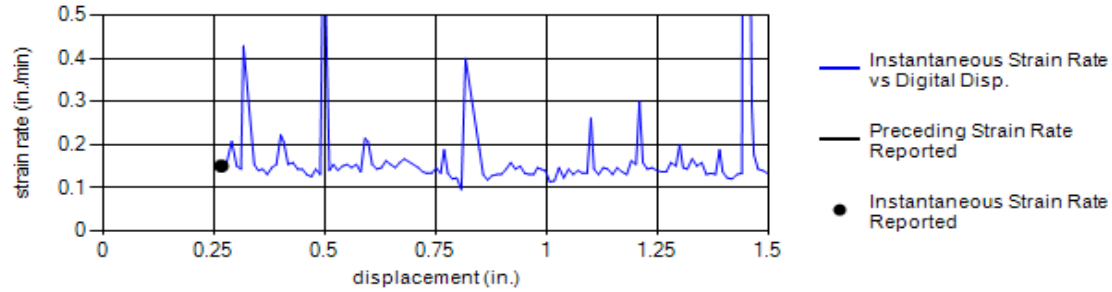
Personnel

Tested:	AS JL YW
Prepared:	SB TW
Checked:	WL PJ

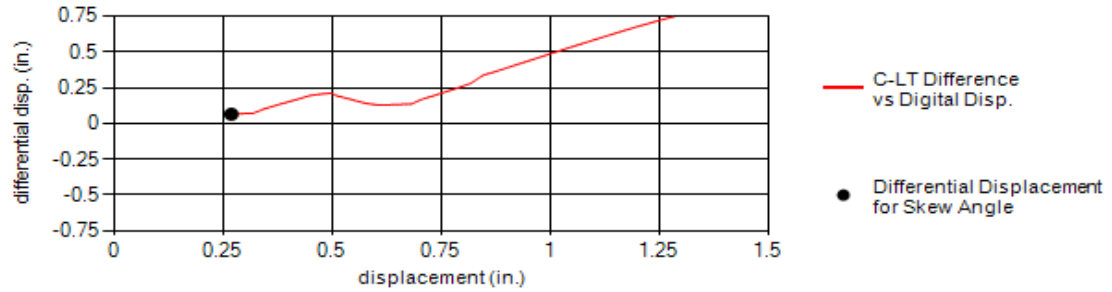
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
6685	No Data	6192	6446	No Data	6441	1.04	5095



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.15	0.16	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	0.07	No Data	0.08	CCW



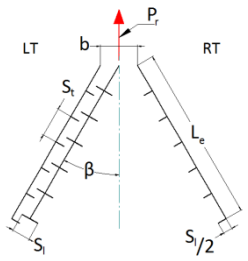
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	2/2/2011 4:12:00 PM
Test Identification:	TS22.01-G-9x12-W20xW11-L6-ß15°-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 (°):	15	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

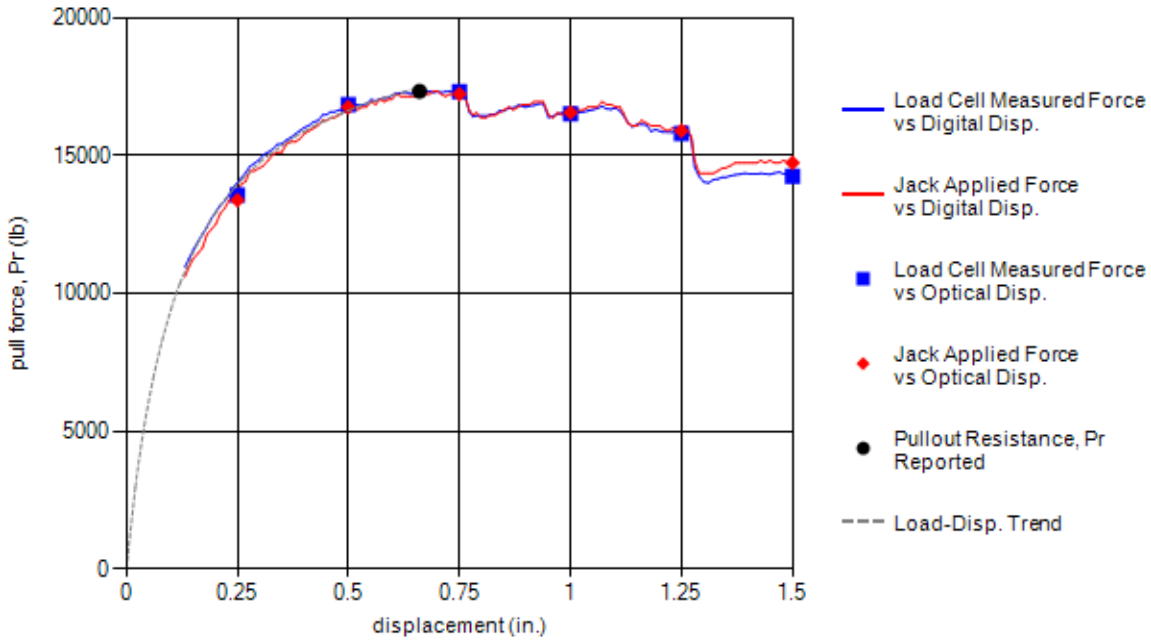
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	116.7 ±2.8
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	5.6 ±0.6%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	93.8 ±2.2%

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	627	17322	5.1	**1.54**

Load-Displacement Curve



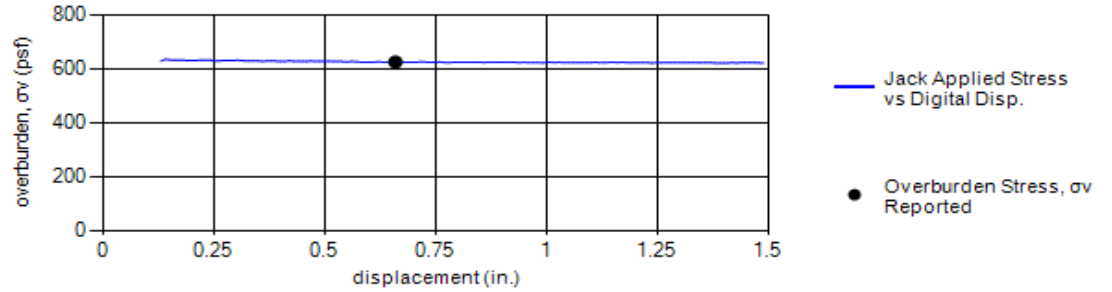
Comments

No earth pressure cell data.

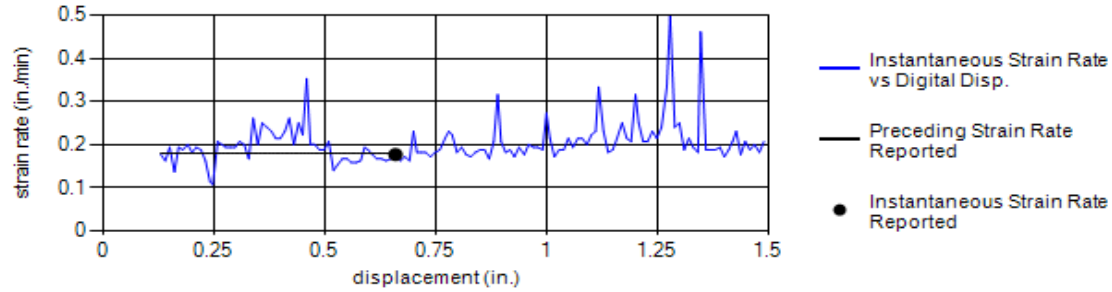
Personnel

Tested:	JL YW DH
Prepared:	SB TW
Checked:	WL PJ

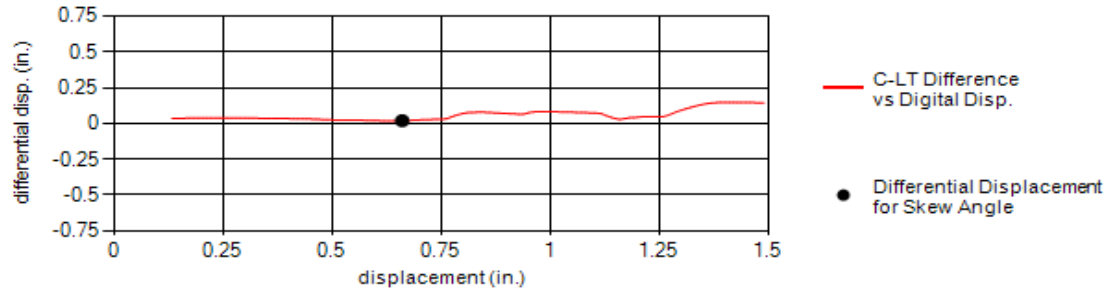
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	1.02	627



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.18	0.18	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	0.02	No Data	0.03	CCW



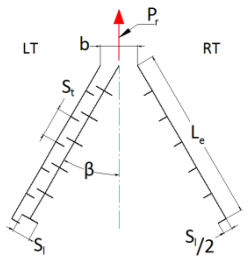
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	2/2/2011 3:42:00 PM
Test Identification:	TS22.02-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

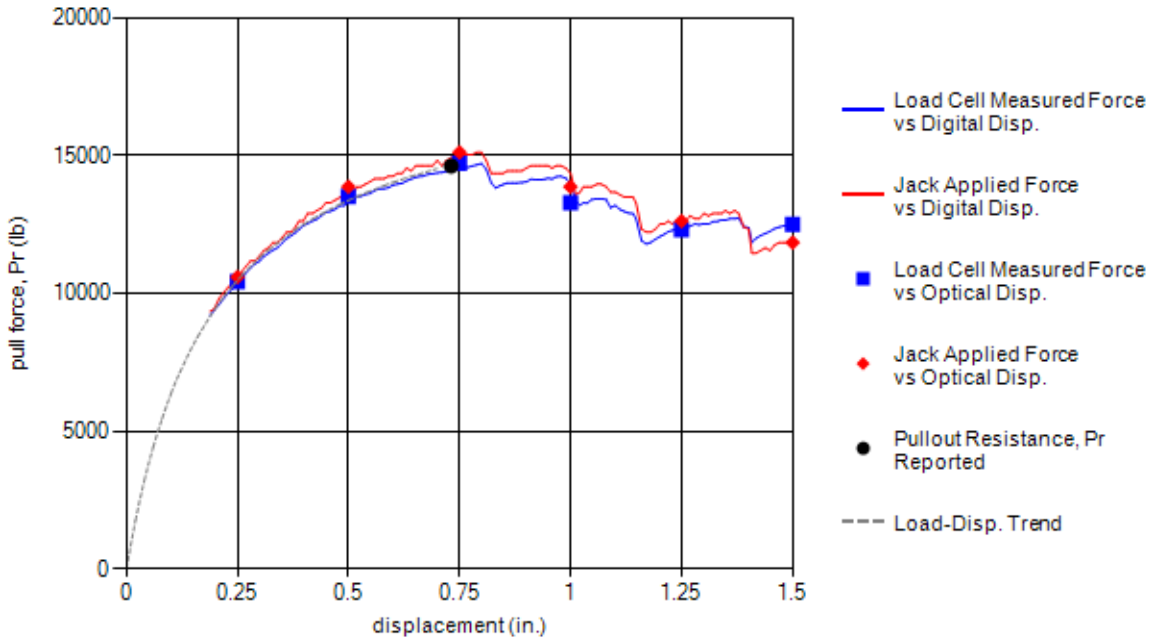
Specification:	TxDOT Item 423 - Type B

Moisture Density Relationship (TEX-114-E)		In-Place Density (TEX-115-E)		
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Dry Unit Weight, γ_d (pcf):*	116.7	±2.8
Optimum Moisture Content, OMC (%):	7.8%	*Moisture Content, w (%):*	5.6	±0.6%
		Relative Compaction, C_R (%):	93.8	±2.2%

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	639	14612	5.2	**1.27**

Load-Displacement Curve



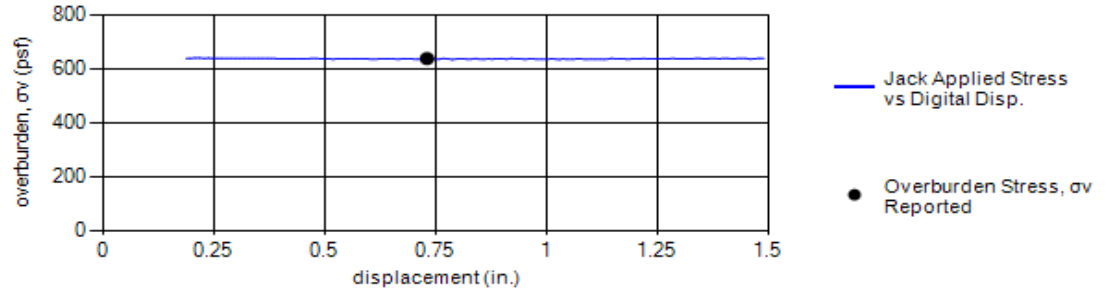
Comments

No earth pressure cell data.

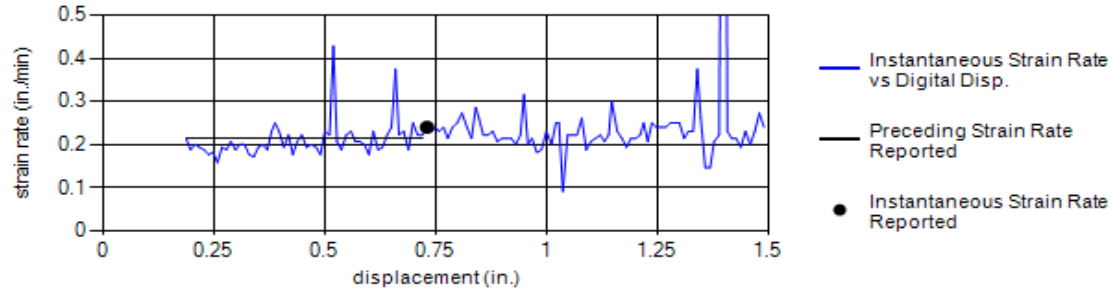
Personnel

Tested:	JL YW DH
Prepared:	SB TW
Checked:	WL PJ

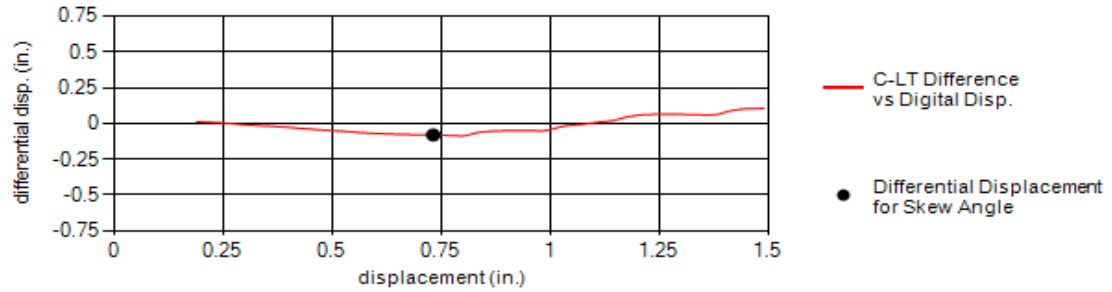
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	1.00	639



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.24	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	-0.08	No Data	-0.13	CW



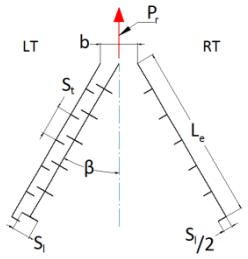
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	2/2/2011 4:44:00 PM
Test Identification:	TS22.03-G-9x12-W20xW11-L6-ß15°-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 (°):	15	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

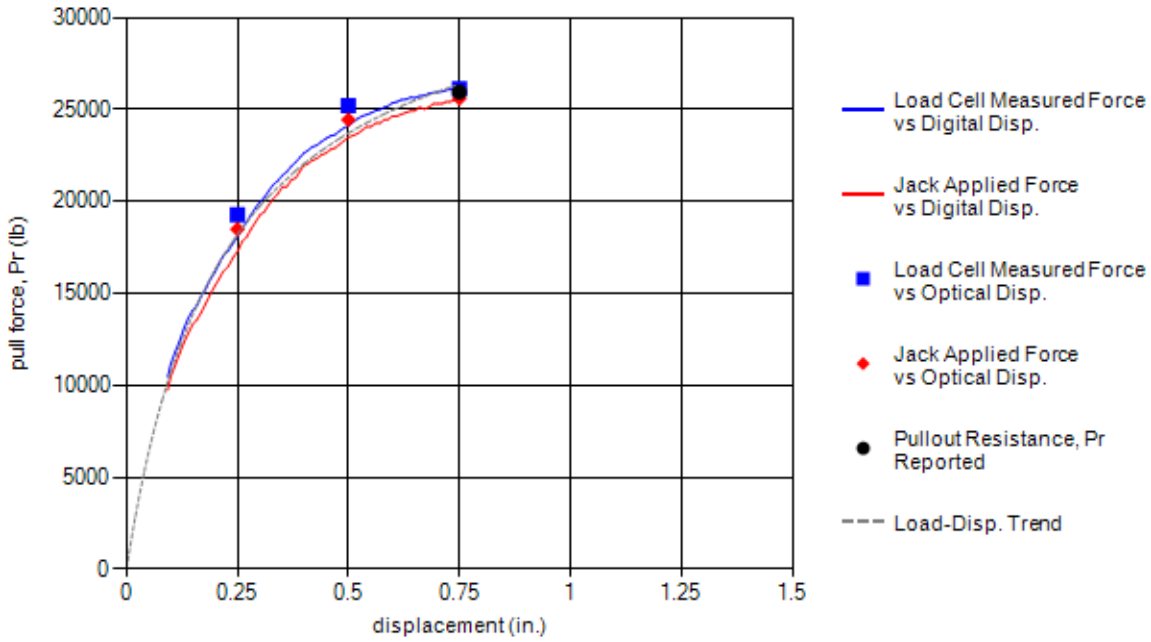
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	116.7 ±2.8
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	5.6 ±0.6%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	93.8 ±2.2%

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	630	25942	5.1	**2.29**

Load-Displacement Curve



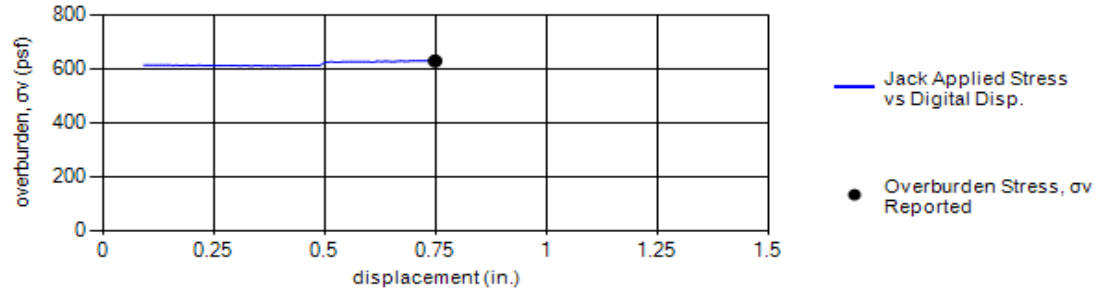
Comments

Displacement gage error ended the test. No earth pressure cell data.

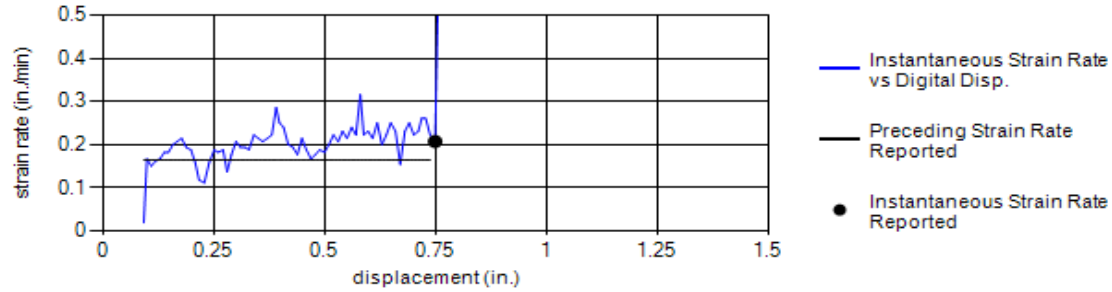
Personnel

Tested:	JL YW DH
Prepared:	SB TW
Checked:	WL PJ

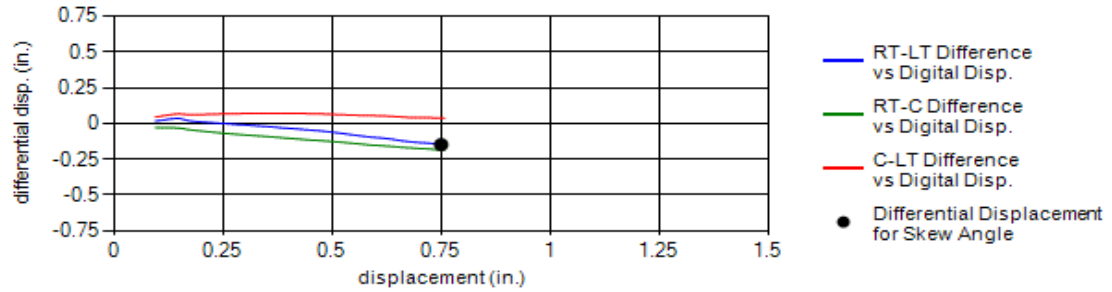
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	1.21	630



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



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
-0.15	-0.19	0.04	No Data	-0.47	CW



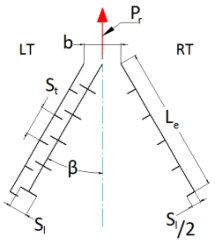
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	2/3/2011 1:35:00 PM
Test Identification:	TS22.04-G-9x12-W20xW11-L5-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):	5.0	*Number, N_t:*	5	*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

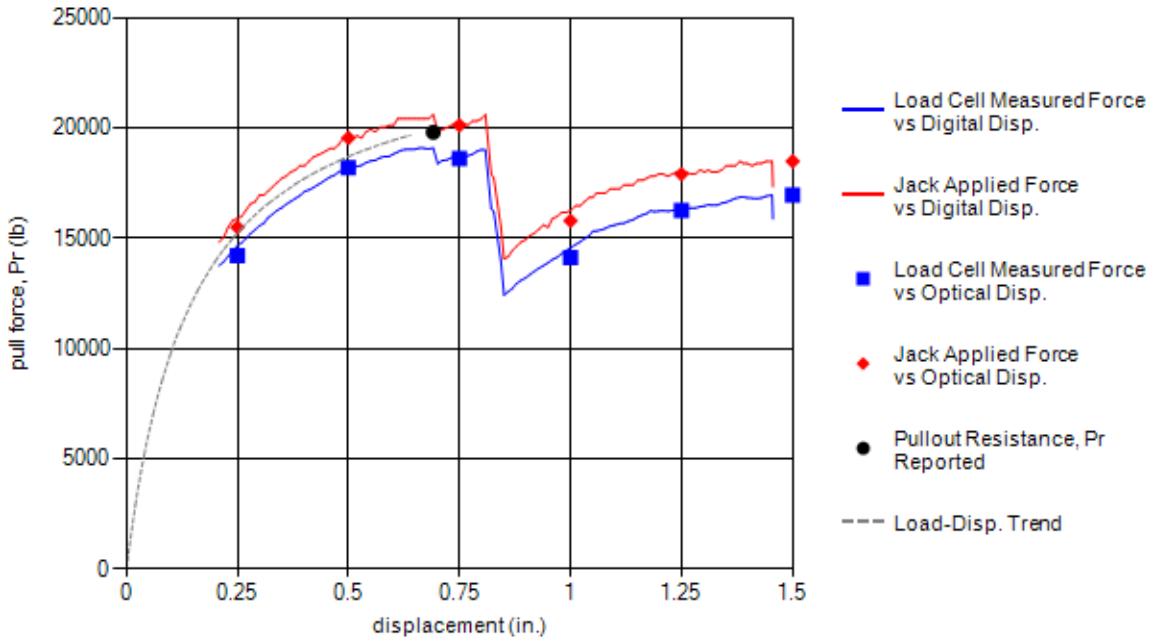
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	116.7 ±2.8
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	5.6 ±0.6%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	93.8 ±2.2%

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	630	19798	5.1	**2.09**

Load-Displacement Curve



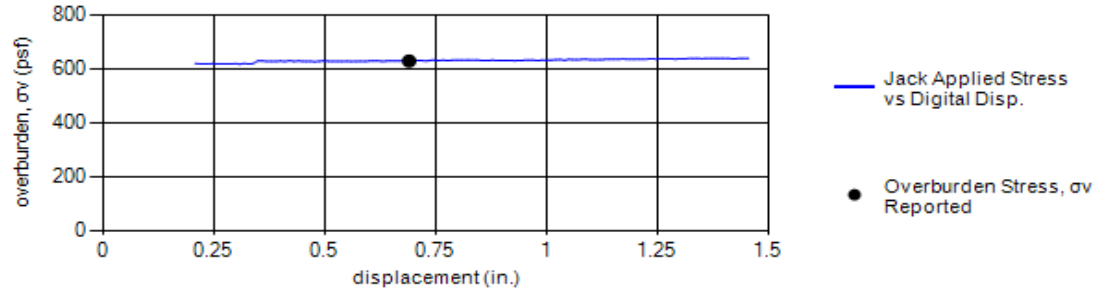
Comments

No earth pressure cell data.

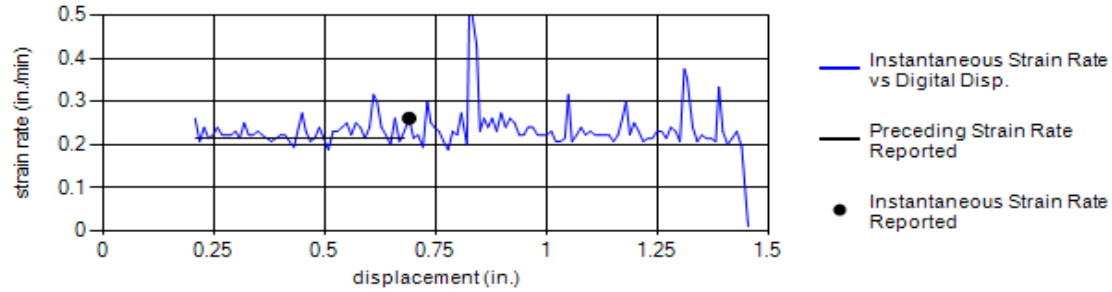
Personnel

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

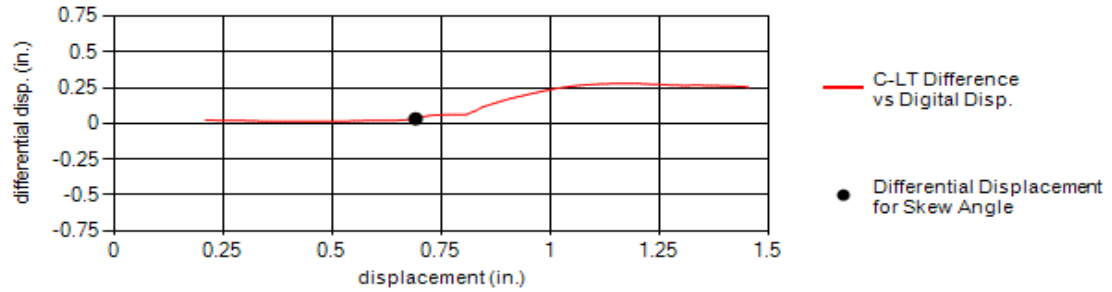
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	1.21	630



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.26	0.21	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	0.03	No Data	0.05	CCW



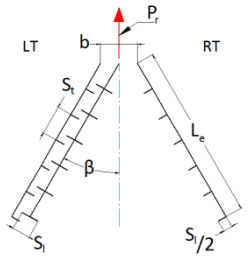
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	2/3/2011 11:49:00 AM
Test Identification:	TS22.05-G-9x12-W20xW11-L6-ß15°-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):	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

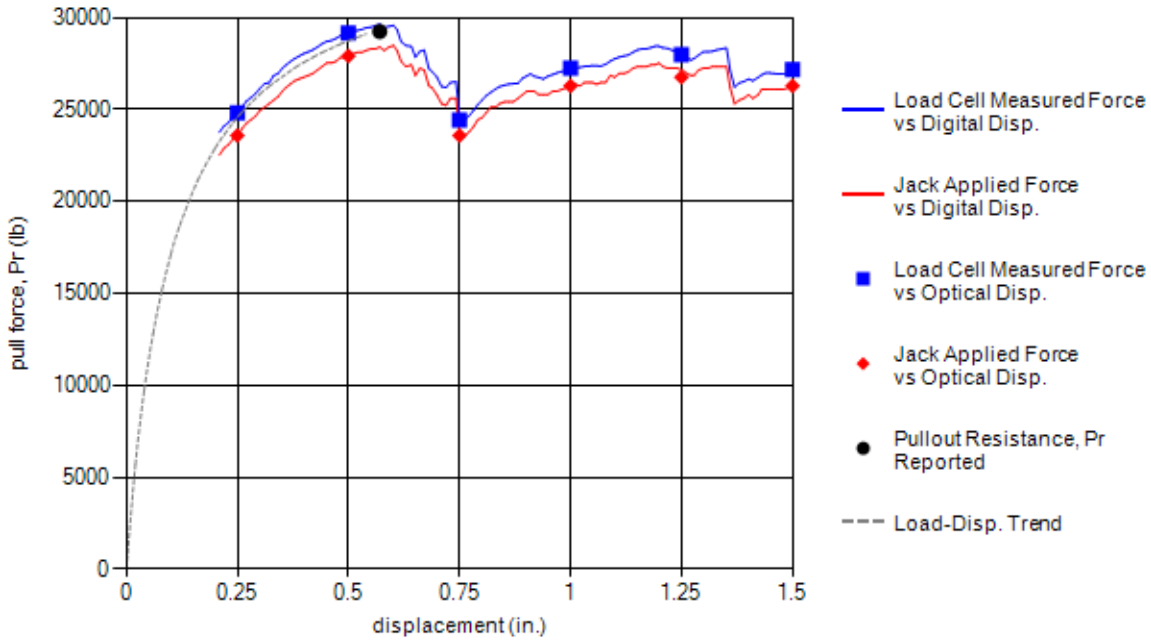
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	116.7 ±2.8
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	5.6 ±0.6%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	93.8 ±2.2%

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	0.57	628	29235	5.1	**2.59**

Load-Displacement Curve



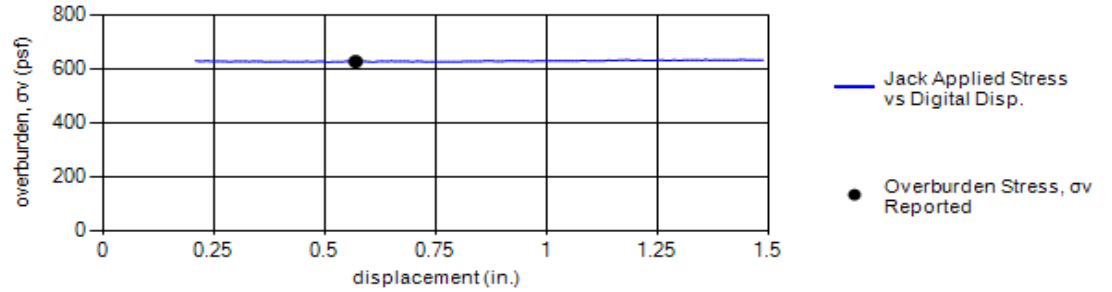
Comments

No earth pressure cell data.

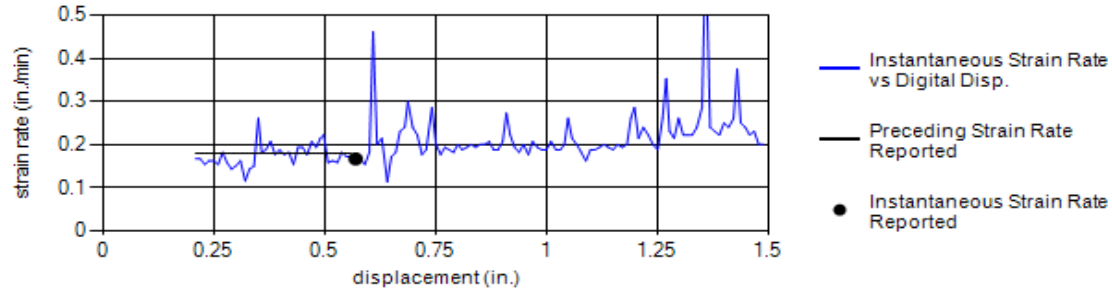
Personnel

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

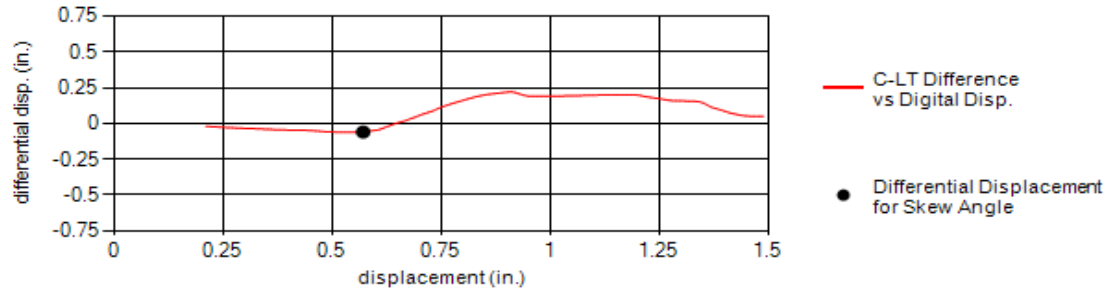
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	1.41	628



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.17	0.18	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	-0.06	No Data	-0.09	CW



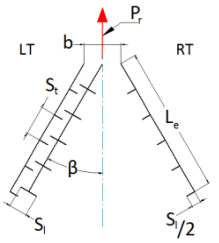
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	2/3/2011 12:26:00 PM
Test Identification:	TS22.06-G-9x12-W20xW11-L5-ß30°-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):	5.0	*Number, N_t:*	5	*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 B

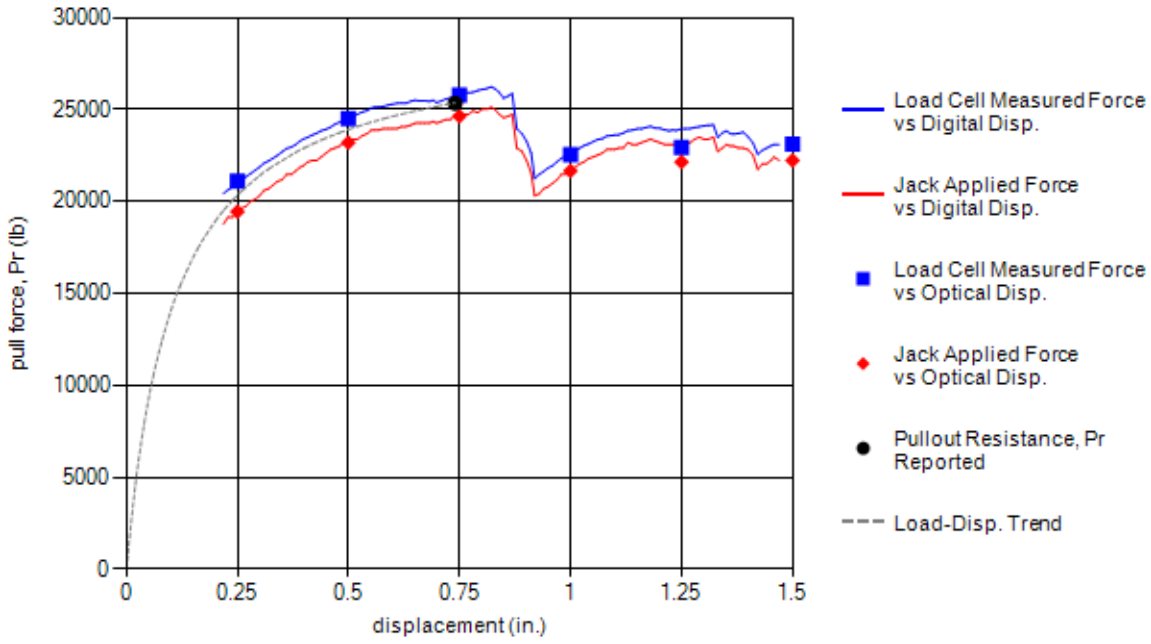
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	116.7	±2.8
Moisture Content, w (%):	5.6	±0.6%
Relative Compaction, C_R (%):	93.8	±2.2%

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	25329	5.1	**2.71**

Load-Displacement Curve



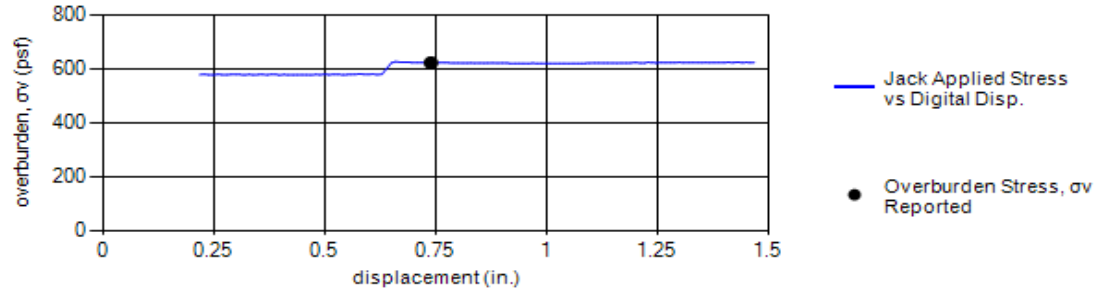
Comments

No earth pressure cell data.

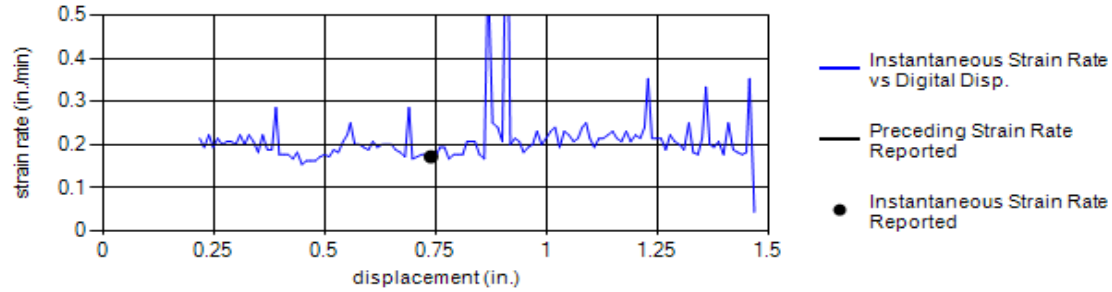
Personnel

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

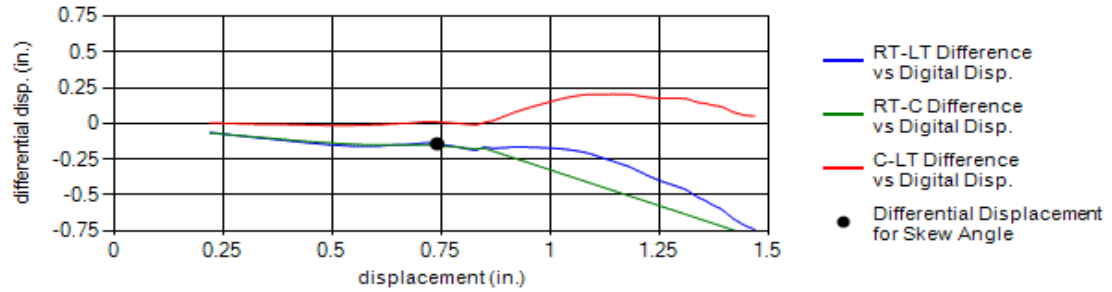
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	1.42	624



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



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
-0.14	-0.15	0.01	No Data	-0.45	CW



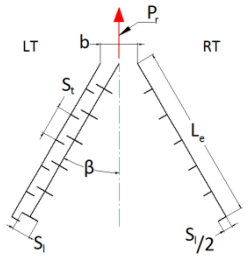
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	2/22/2011 1:29:00 PM
Test Identification:	TS23.01-G-9x12-W20xW11-L6-ß15°-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 (°):	15	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

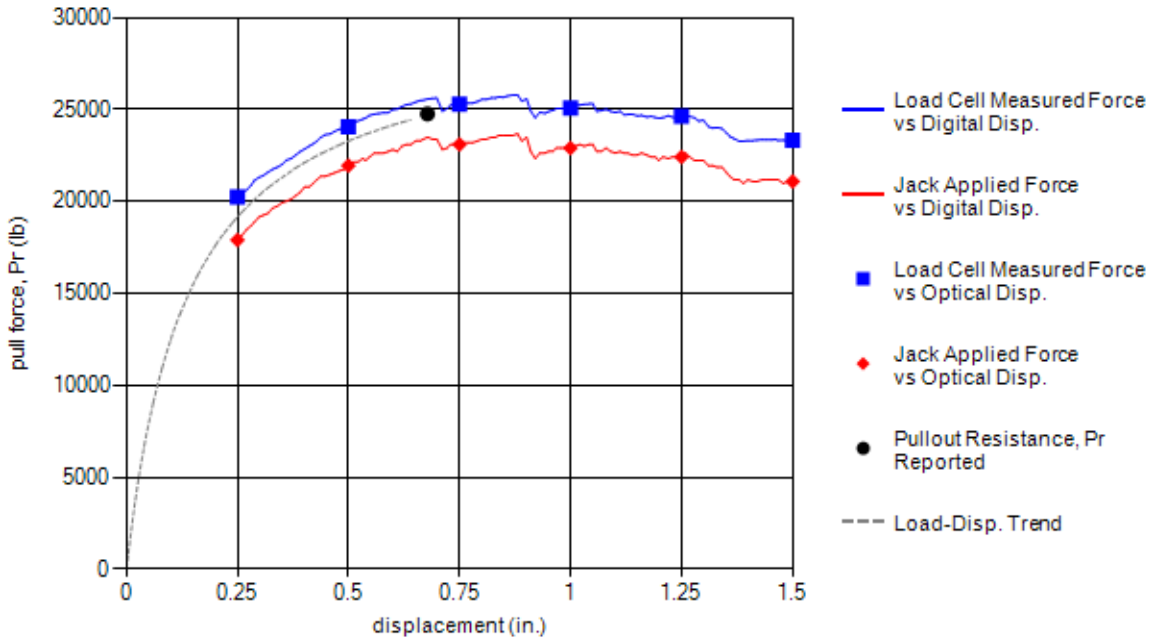
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	119.4 ±1.9
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	5.7 ±0.5%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	96.0 ±1.5%

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	0.68	1532	24754	12.1	**0.90**

Load-Displacement Curve



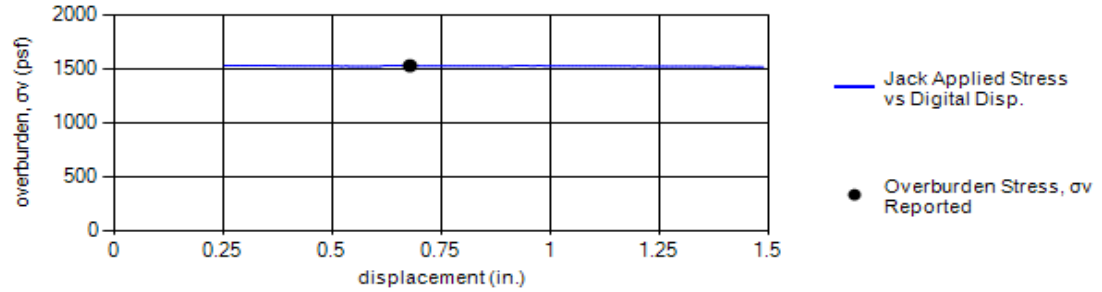
Comments

No earth pressure cell data.

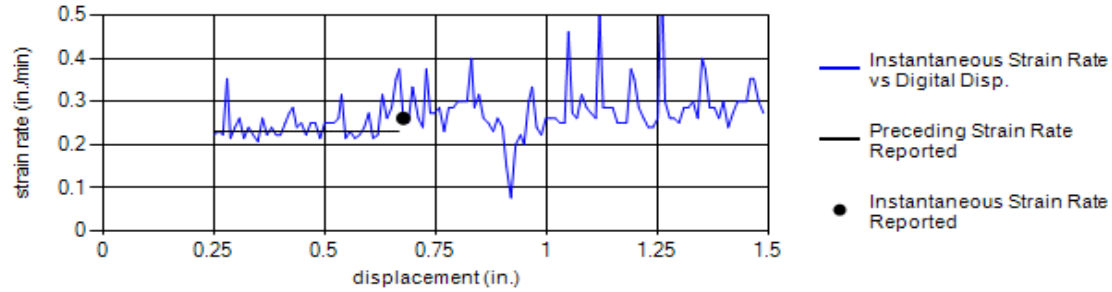
Personnel

Tested:	JL YW DH
Prepared:	SB TW
Checked:	WL PJ

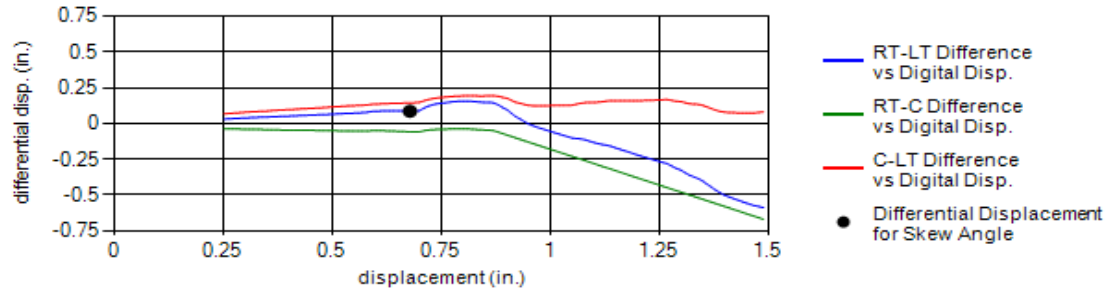
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	1.00	1532



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.26	0.23	0.24



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.09	-0.06	0.14	No Data	0.27	CCW



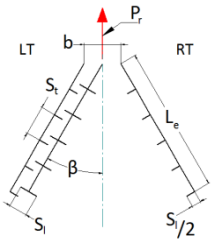
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	2/22/2011 2:00:00 PM
Test Identification:	TS23.02-G-9x12-W20xW11-L5-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):	5.0	*Number, N_t:*	5	*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

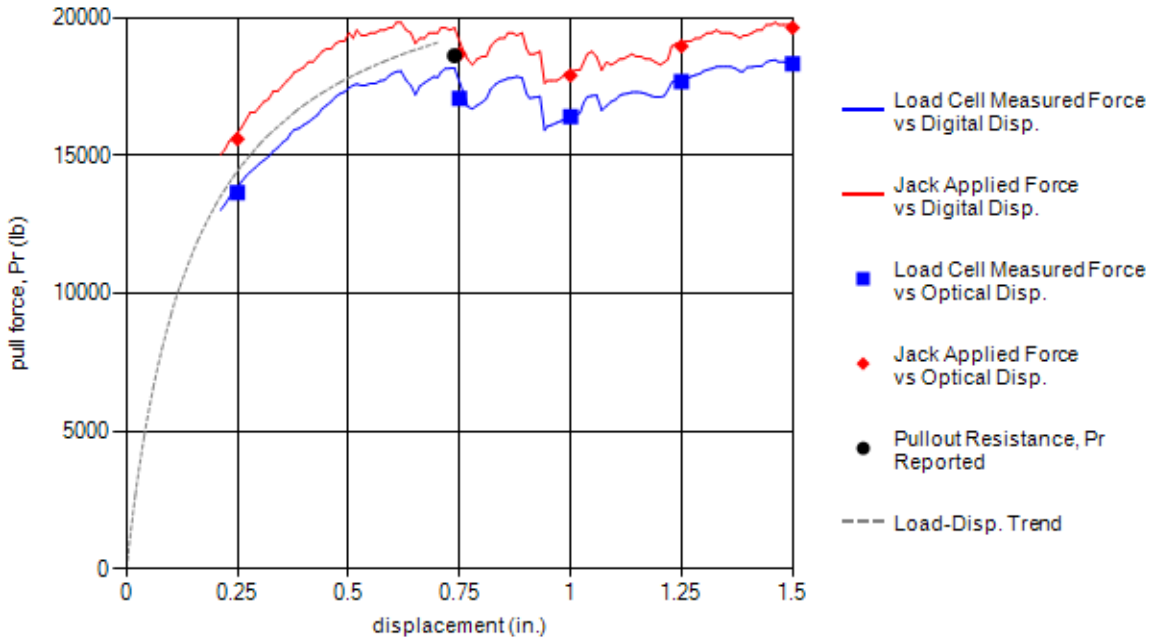
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	119.4 ±1.9
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	5.7 ±0.5%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	96.0 ±1.5%

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	1528	18614	12.1	**0.81**

Load-Displacement Curve

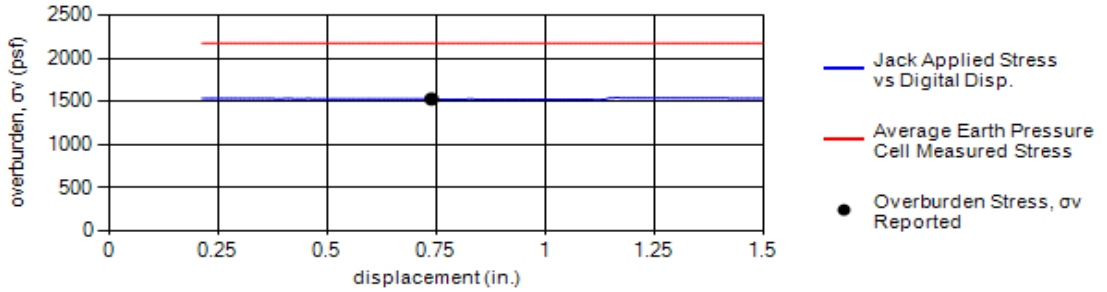


Comments

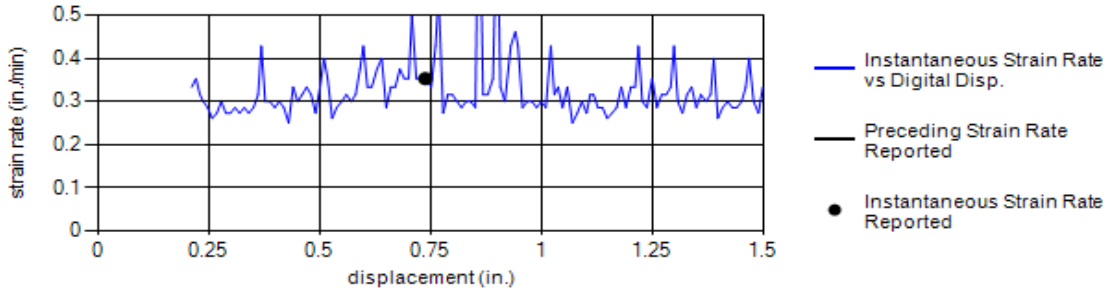
Personnel

Tested:	JL AS DH
Prepared:	SB TW
Checked:	WL PJ

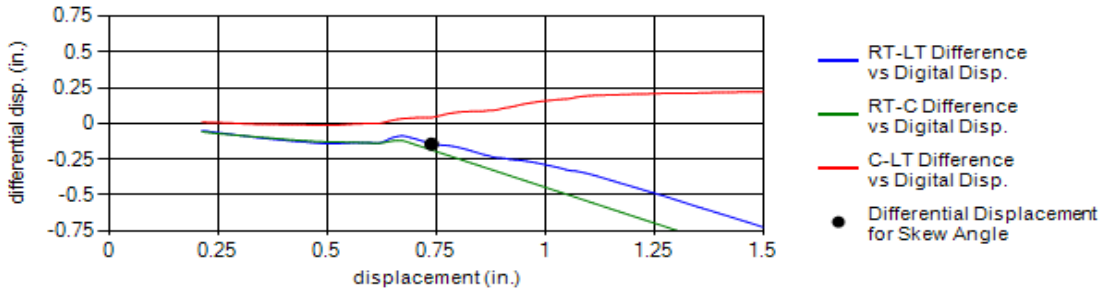
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2296	No Data	2146	2086	No Data	2176	1.04	1527



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.35	0.30	0.29



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
-0.14	-0.18	0.04	No Data	-0.46	CW



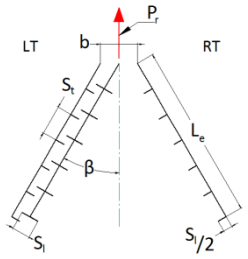
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	2/22/2011 4:37:00 PM
Test Identification:	TS23.03-G-9x12-W20xW11-L6-ß15°-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, ß (°):	15	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

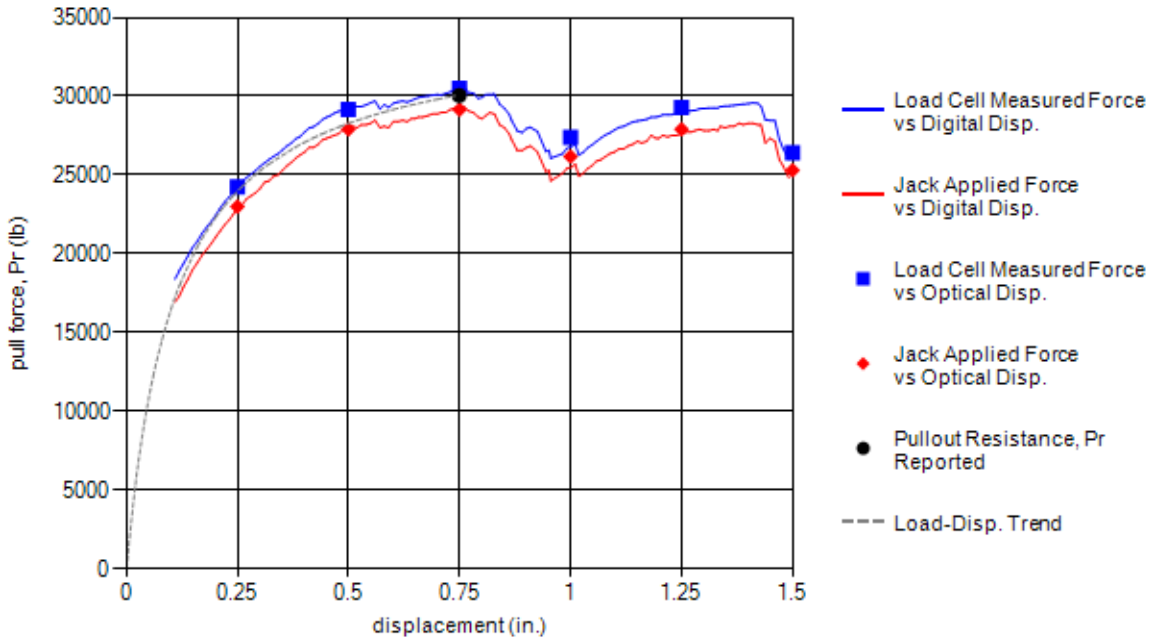
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	119.4	±1.9
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	5.7	±0.5%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	96.0	±1.5%

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	1395	30046	11.0	**1.20**

Load-Displacement Curve

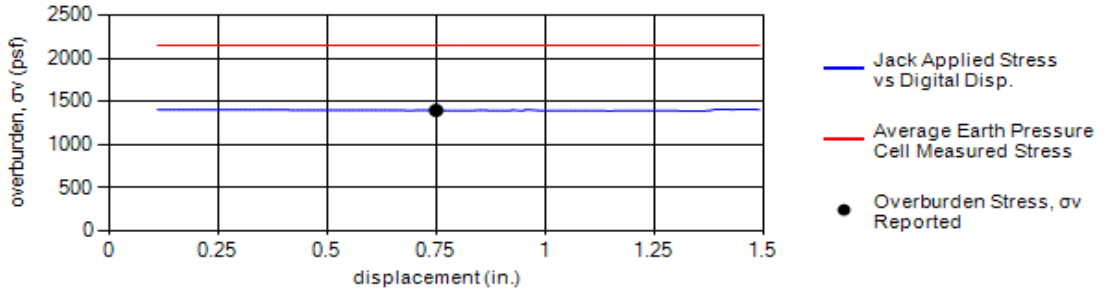


Comments

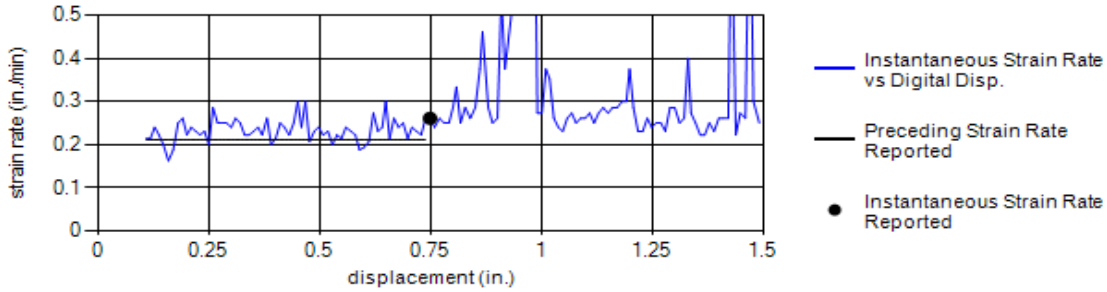
Personnel

Tested:	YW AS DH
Prepared:	SB TW
Checked:	WL PJ

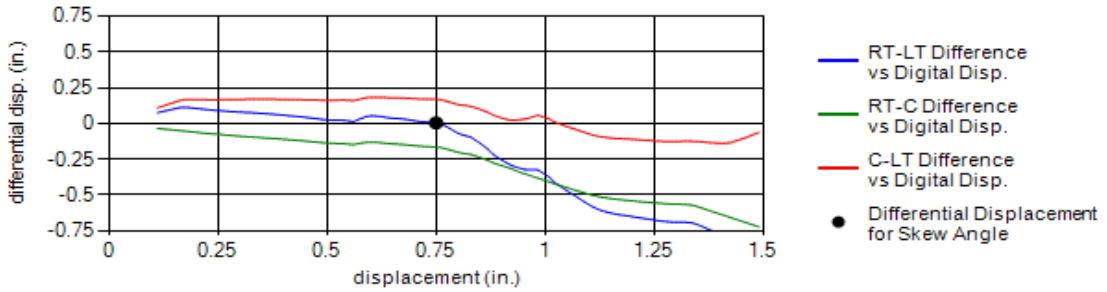
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2412	No Data	1952	2089	No Data	2151	1.19	1395



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.26	0.21	0.24



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.00	-0.16	0.17	No Data	0.01	CCW



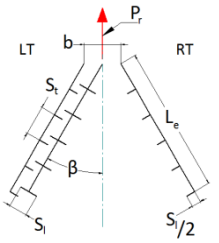
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	2/23/2011 12:25:00 PM
Test Identification:	TS23.04-G-9x12-W20xW11-L5-ß30°-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):	5.0	*Number, N_t:*	5	*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

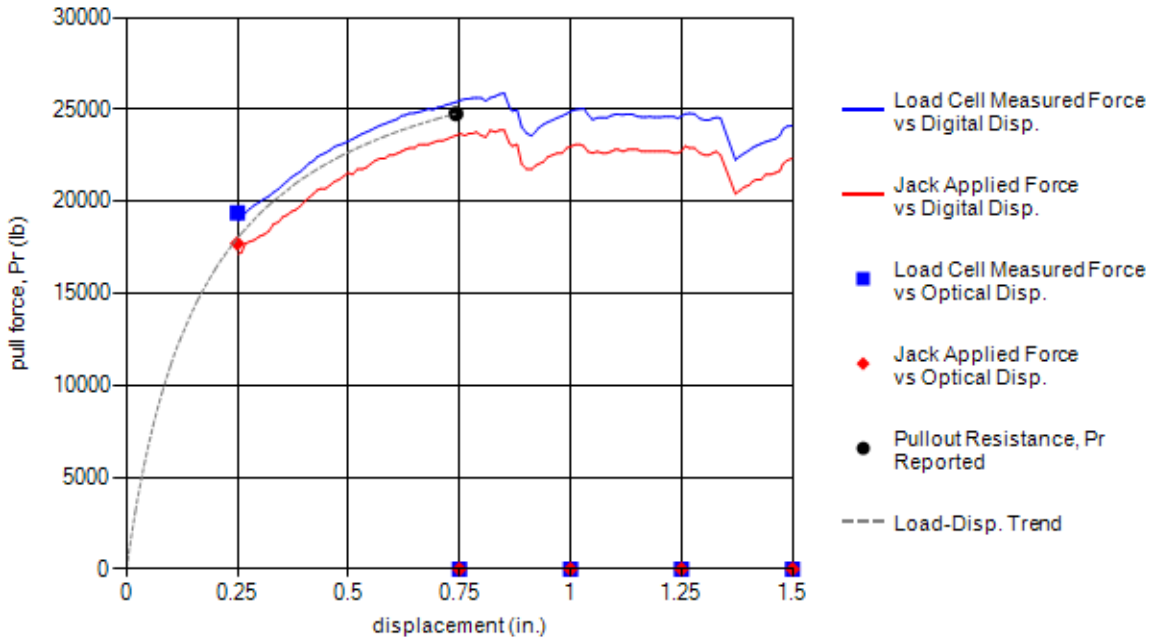
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	119.4 ±1.9
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	5.7 ±0.5%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	96.0 ±1.5%

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	1404	24761	11.1	**1.18**

Load-Displacement Curve

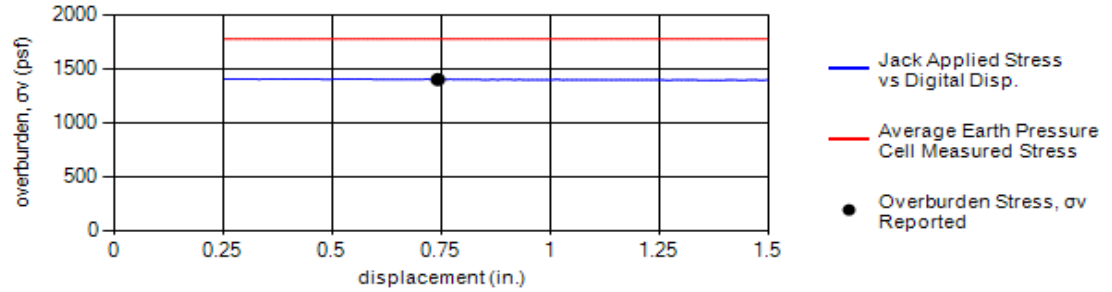


Comments

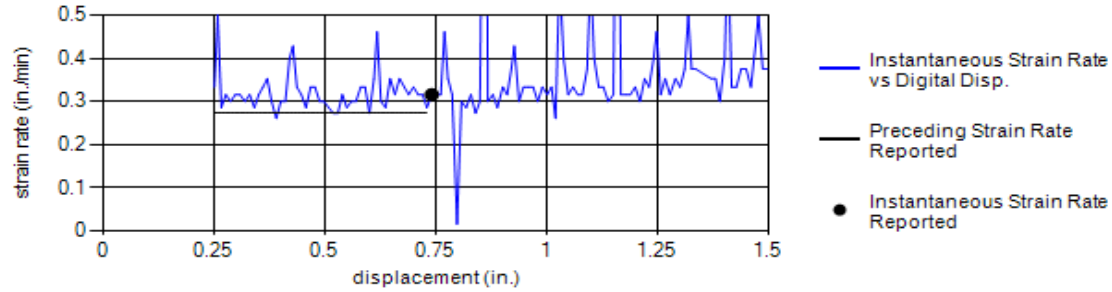
Personnel

Tested:	YW AS DH
Prepared:	SB TW
Checked:	WL PJ

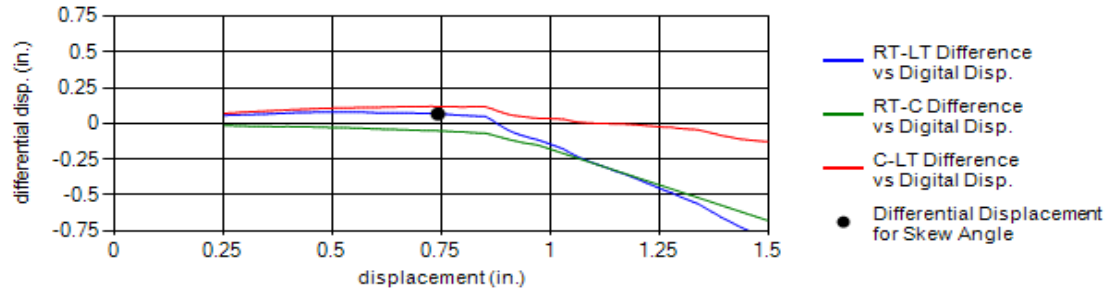
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1954	No Data	1649	1735	No Data	1779	1.35	1403



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.32	0.27	0.26



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	0.21	CCW



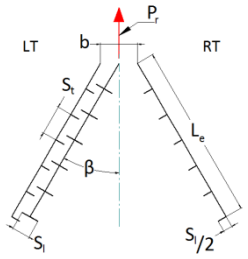
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	2/22/2011 4:00:00 PM
Test Identification:	TS23.05-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

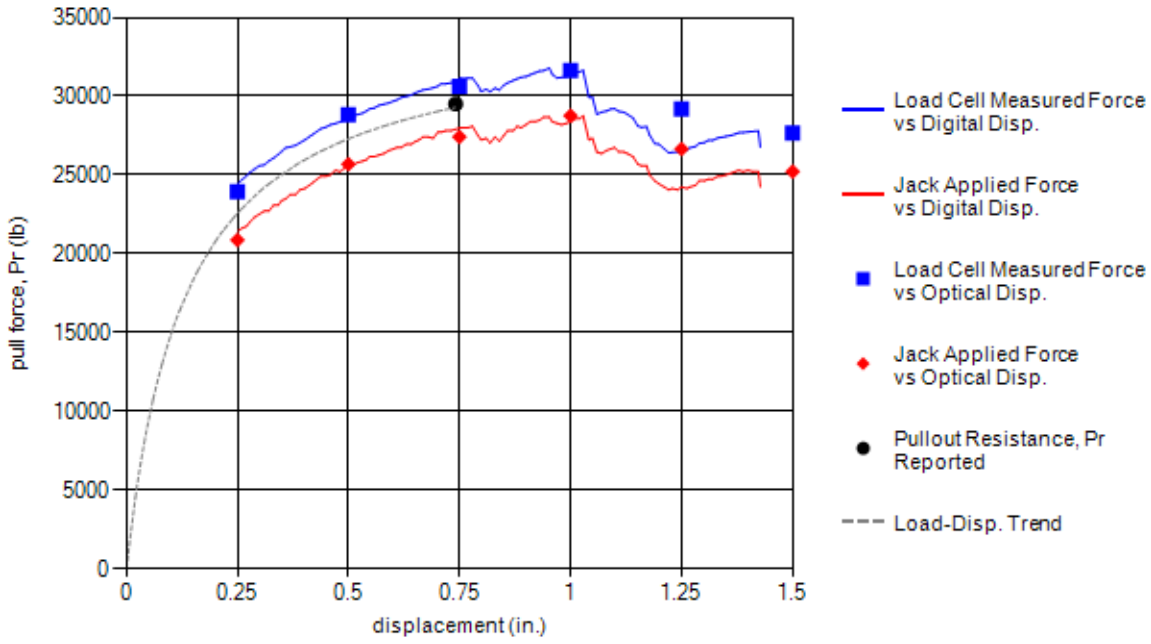
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	119.4	±1.9
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	5.7	±0.5%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	96.0	±1.5%

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	1526	29511	12.1	**1.07**

Load-Displacement Curve

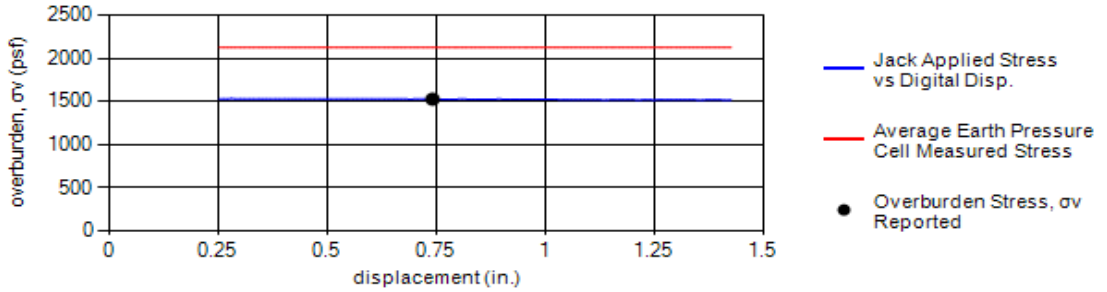


Comments

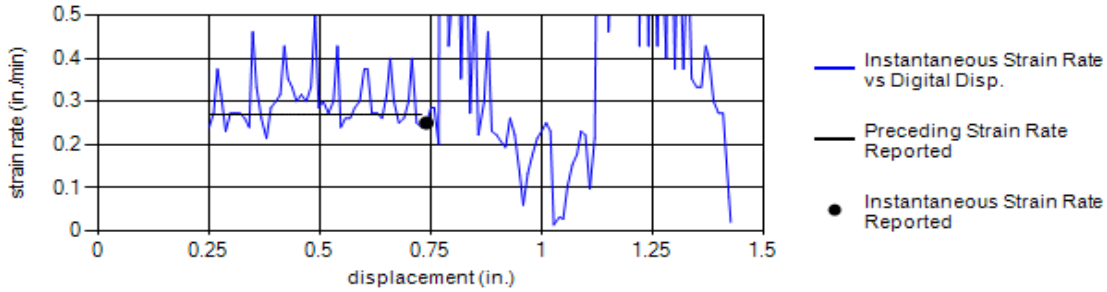
Personnel

Tested:	YW AS DH
Prepared:	SB TW
Checked:	WL PJ

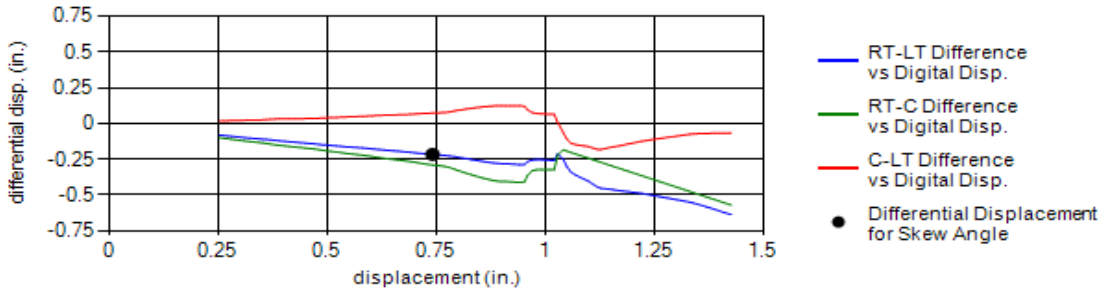
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2313	No Data	1970	2093	No Data	2126	1.17	1526



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.25	0.27	0.21



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
-0.22	-0.29	0.07	No Data	-0.69	CW



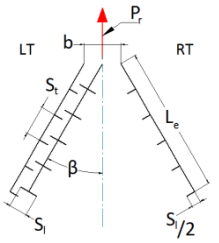
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	2/22/2011 2:48:00 PM
Test Identification:	TS23.06-G-9x12-W20xW11-L5-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):	5.0	*Number, N_t:*	5	*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

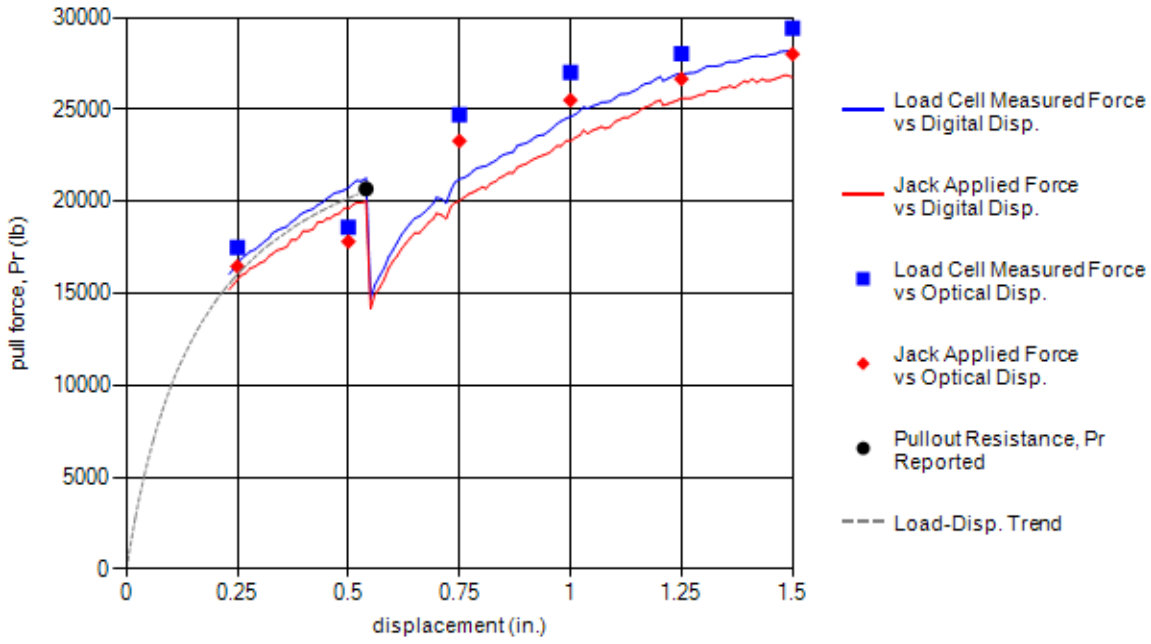
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	119.4 ±1.9
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	5.7 ±0.5%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	96.0 ±1.5%

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	1522	20678	12.1	**0.91**

Load-Displacement Curve

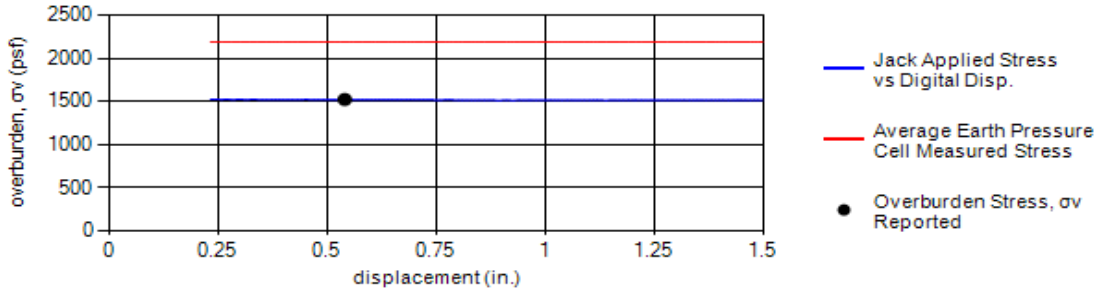


Comments

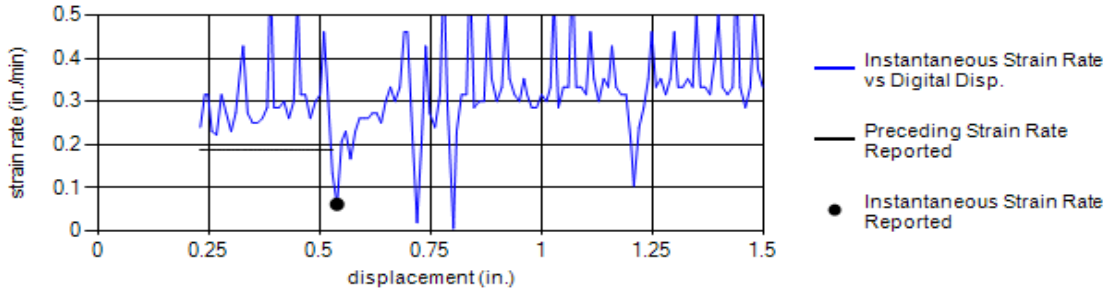
Personnel

Tested:	YW AS DH
Prepared:	SB TW
Checked:	WL PJ

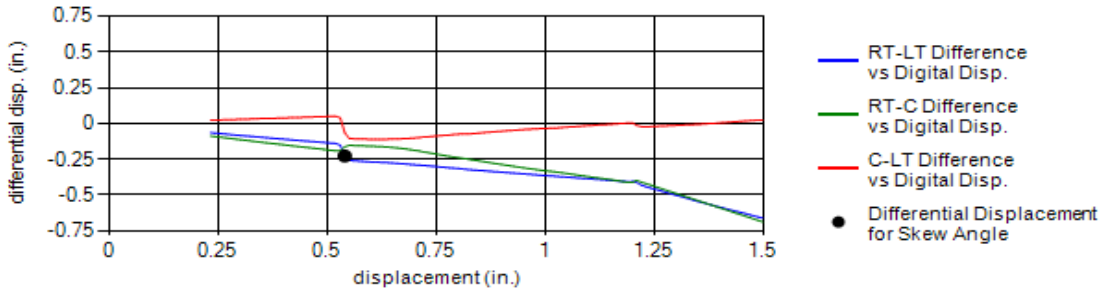
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2356	No Data	2076	2140	No Data	2191	1.17	1521



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.06	0.19	0.20



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
-0.23	-0.16	-0.06	No Data	-0.72	CW



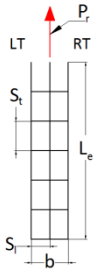
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	4/12/2011 3:52:00 PM
Test Identification:	TS24.01-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

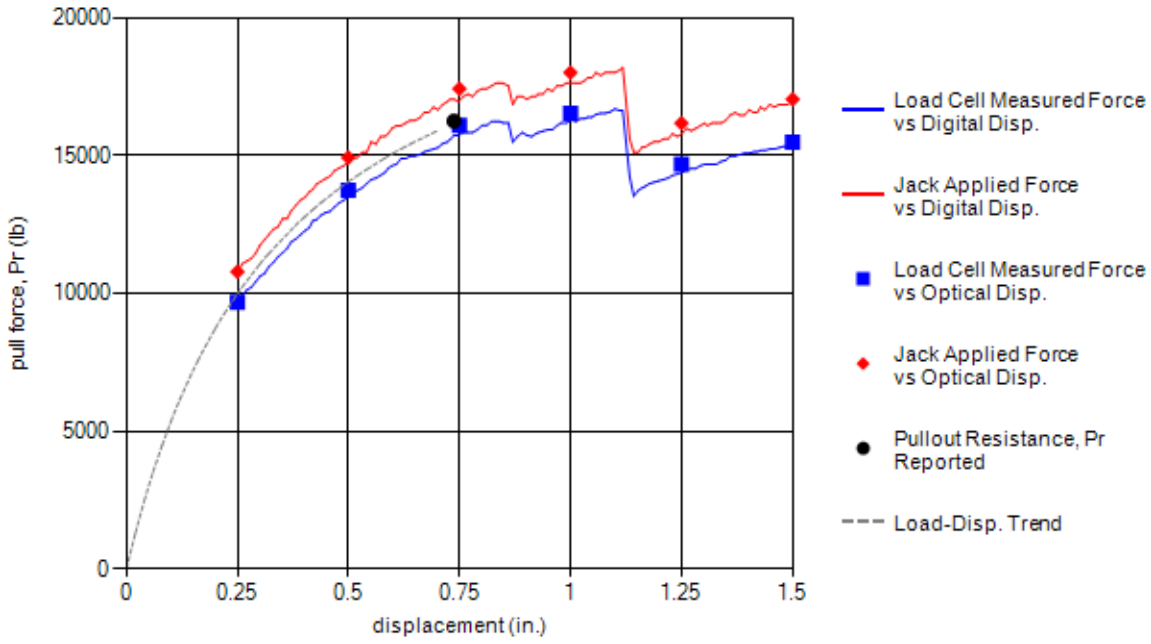
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	117.9 ±1.5
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	7.3 ±1.0%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	94.7 ±1.3%

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	660	16242	5.2	**2.05**

Load-Displacement Curve

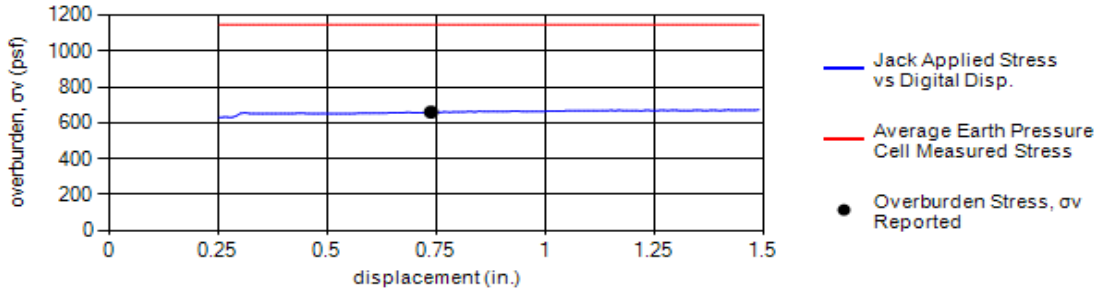


Comments

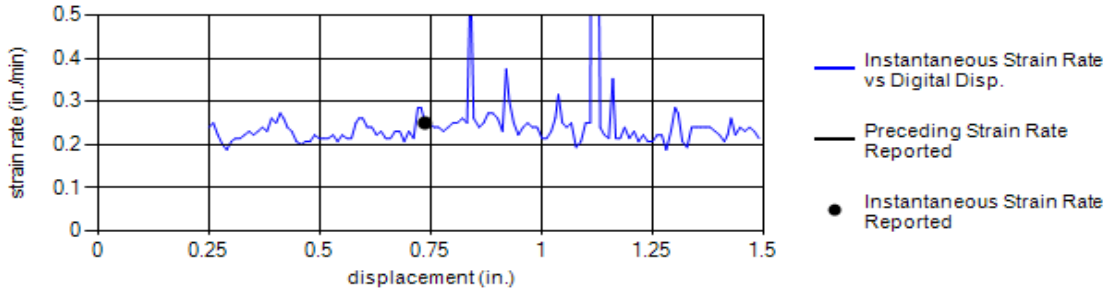
Personnel

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

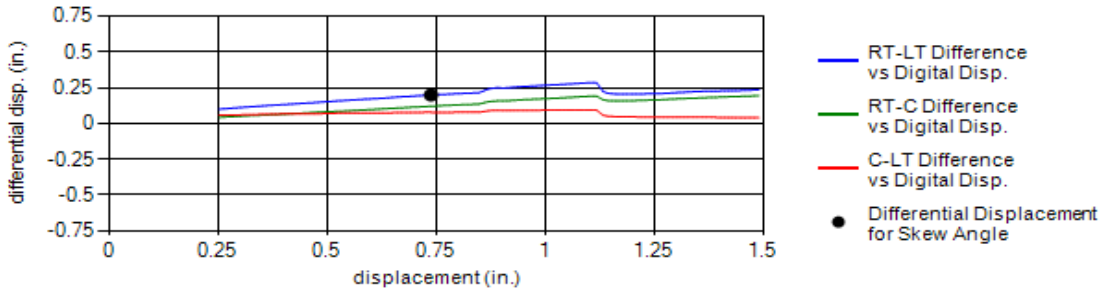
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1530	No Data	989	1086	986	1148	2.32	660



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.25	0.20	0.21



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.20	0.12	0.08	No Data	0.95	CCW



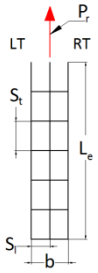
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	4/12/2011 1:39:00 PM
Test Identification:	TS24.02-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

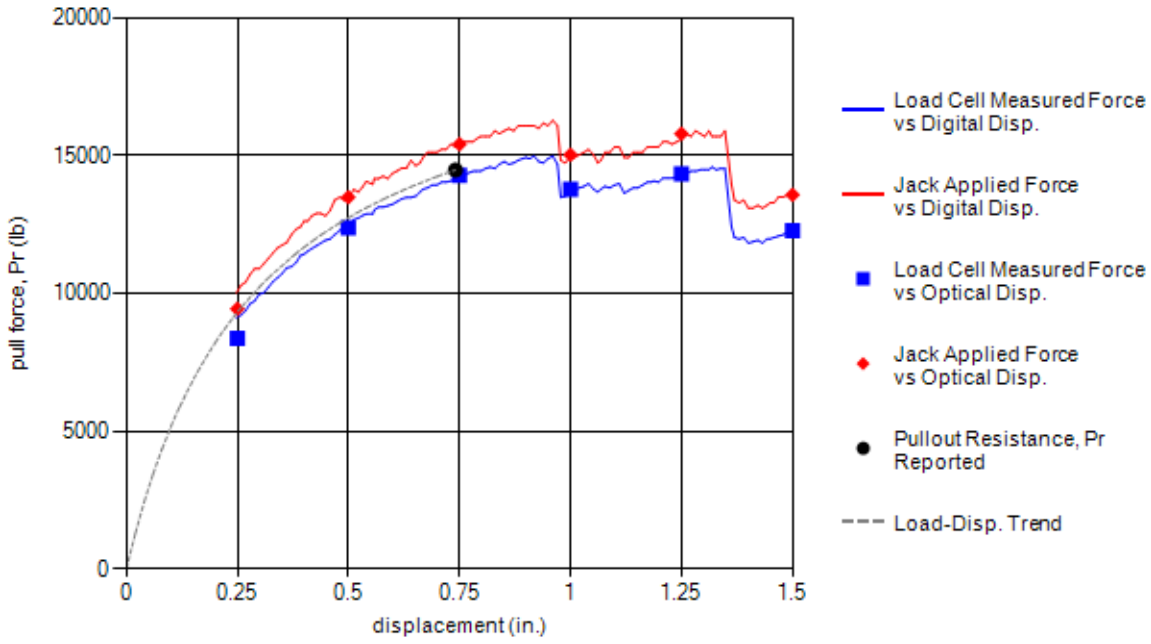
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	117.9 ±1.5
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	7.3 ±1.0%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	94.7 ±1.3%

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	679	14469	5.4	**1.18**

Load-Displacement Curve

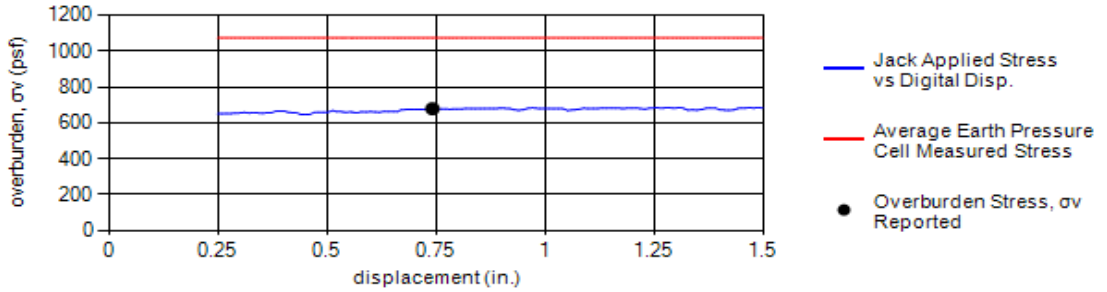


Comments

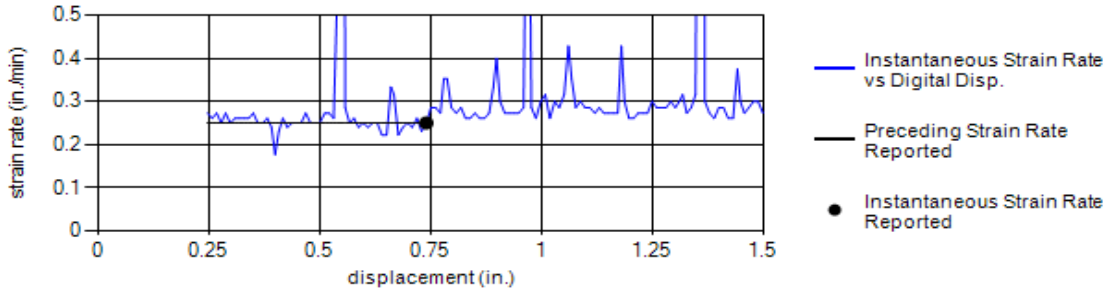
Personnel

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

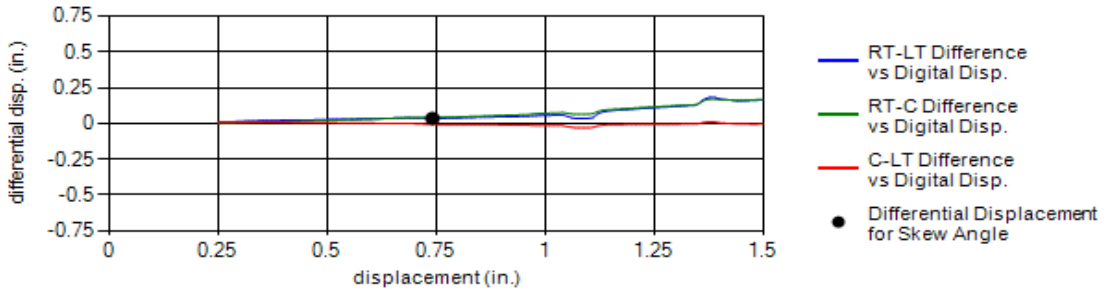
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1250	No Data	958	1099	990	1074	2.26	677



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.25	0.25	0.26



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.04	0.04	-0.01	No Data	0.12	CCW



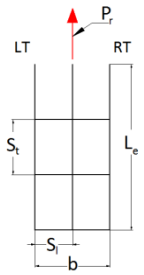
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	4/12/2011 10:07:00 AM
Test Identification:	TS24.03-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

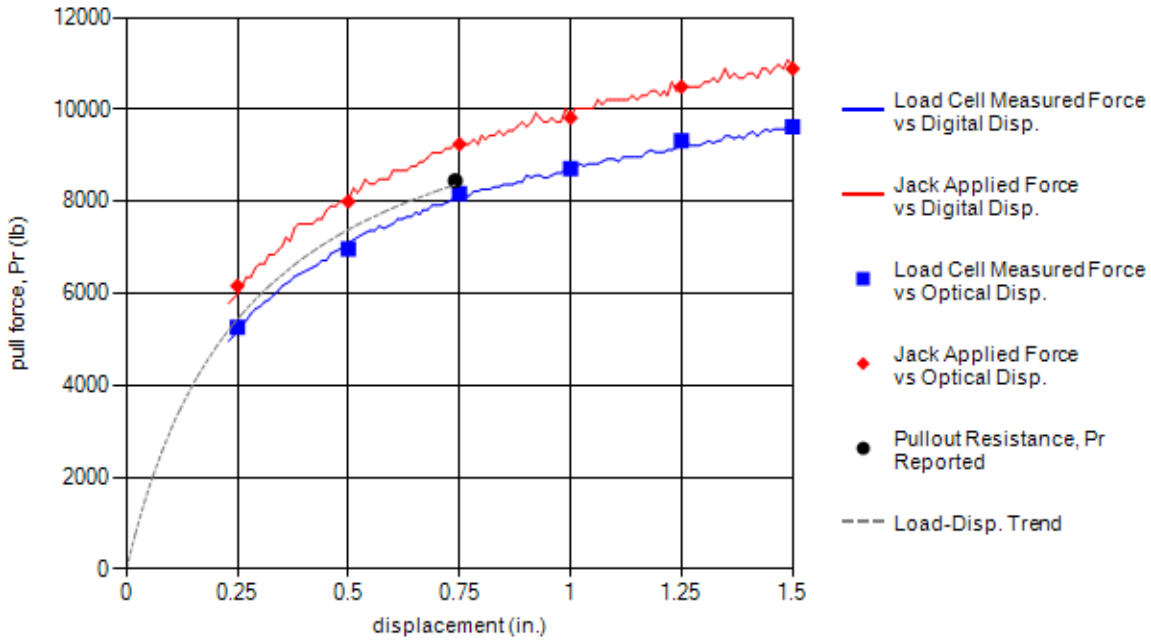
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	117.9 ±1.5
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	7.3 ±1.0%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	94.7 ±1.3%

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	1534	8449	12.1	**0.92**

Load-Displacement Curve

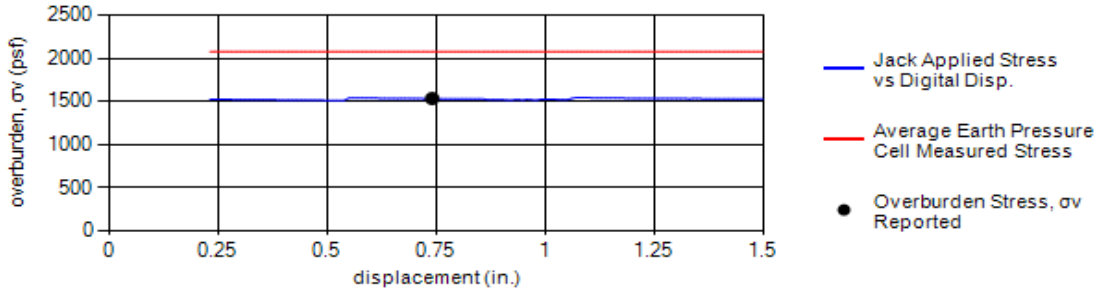


Comments

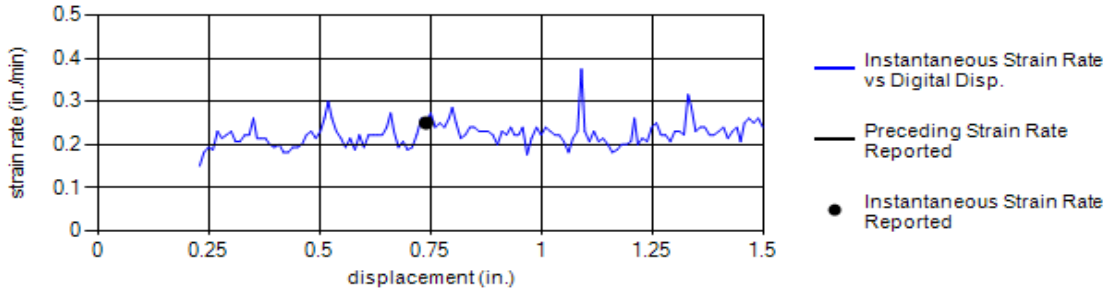
Personnel

Tested:	TW YW JL
Prepared:	SB TW
Checked:	WL PJ

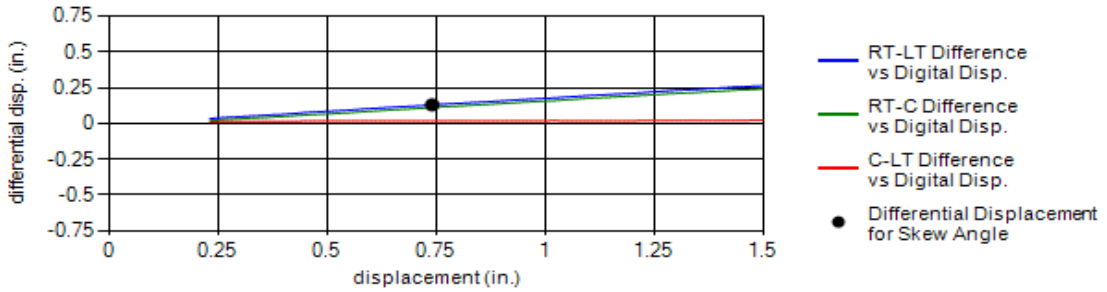
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2253	No Data	2153	2060	1855	2080	1.02	1533



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.25	0.20	0.20



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.13	0.11	0.02	No Data	0.62	CCW



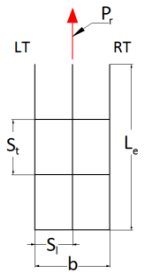
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	4/11/2011 1:10:00 PM
Test Identification:	TS24.04-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

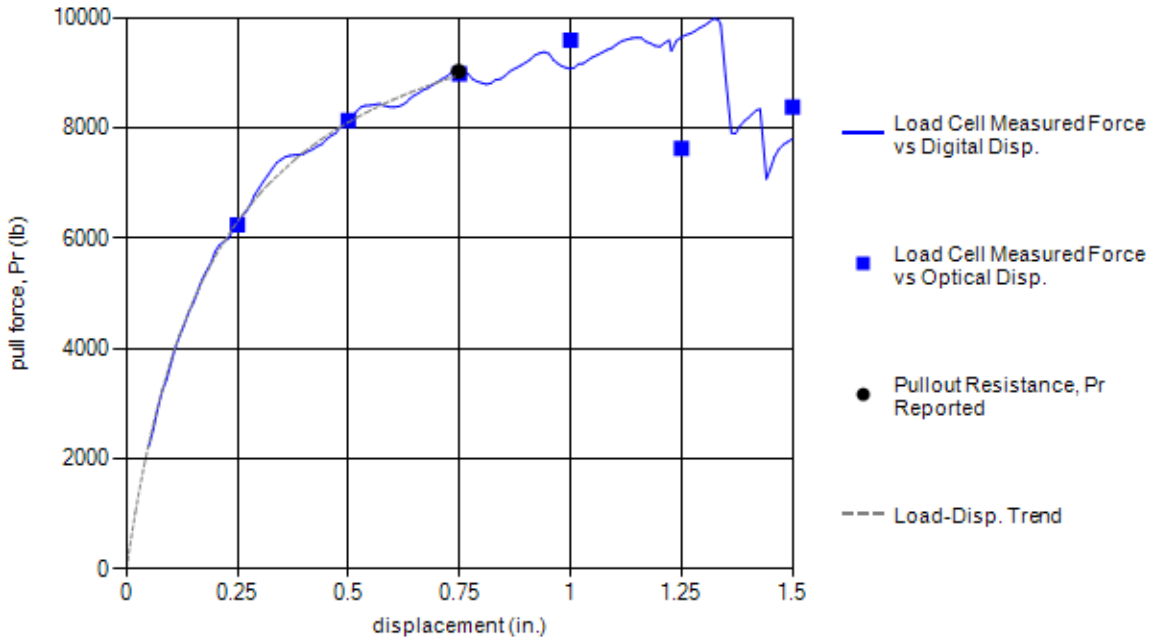
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	117.9	±1.5
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	7.3	±1.0%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	94.7	±1.3%

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	1489	9021	11.8	**0.67**

Load-Displacement Curve



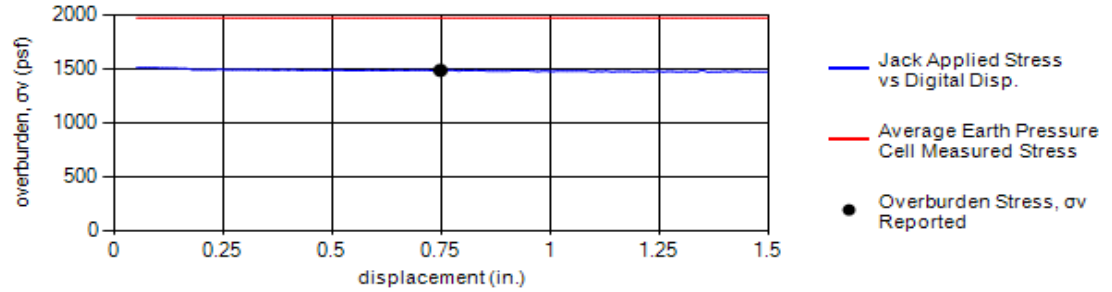
Comments

Hydraulic pullout jack transducer error; no hydraulic pullout jack data.

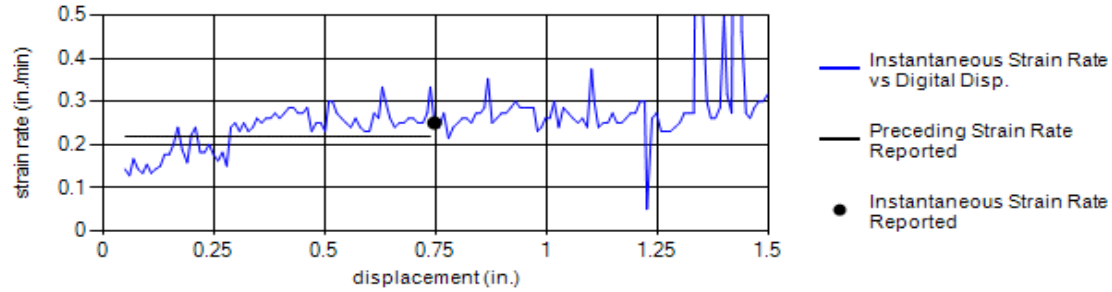
Personnel

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

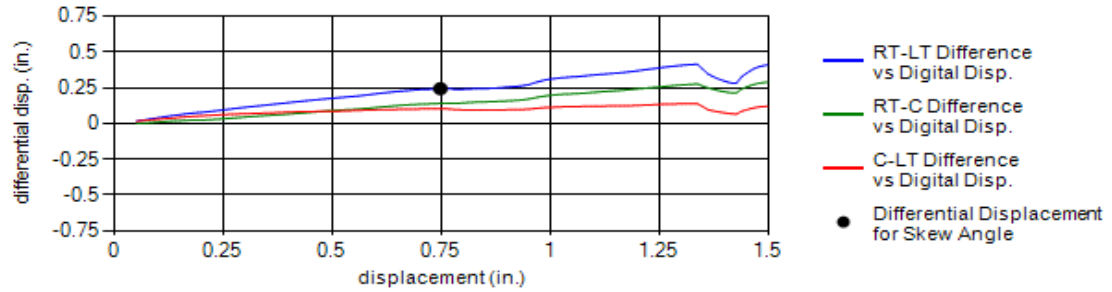
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2168	No Data	2018	1970	1745	1975	1.04	1487



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.25	0.22	0.23



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.24	0.14	0.10	No Data	0.78	CCW



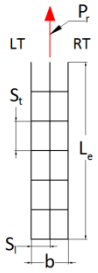
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	4/8/2011 1:54:00 PM
Test Identification:	TS24.05-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

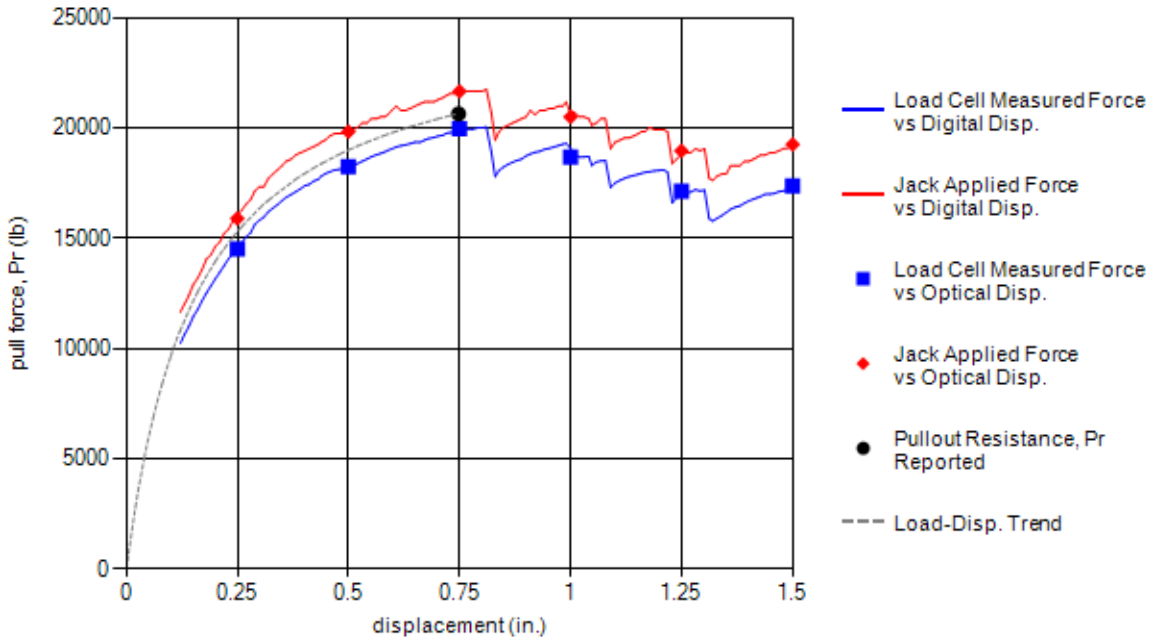
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	117.9	±1.5
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	7.3	±1.0%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	94.7	±1.3%

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	787	20628	6.2	**2.19**

Load-Displacement Curve

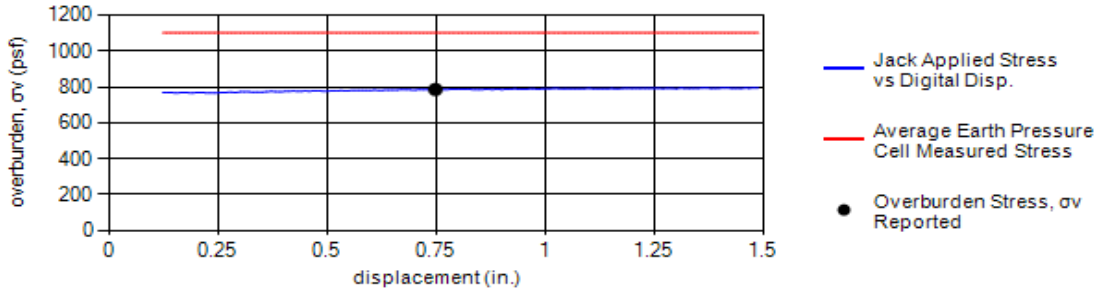


Comments

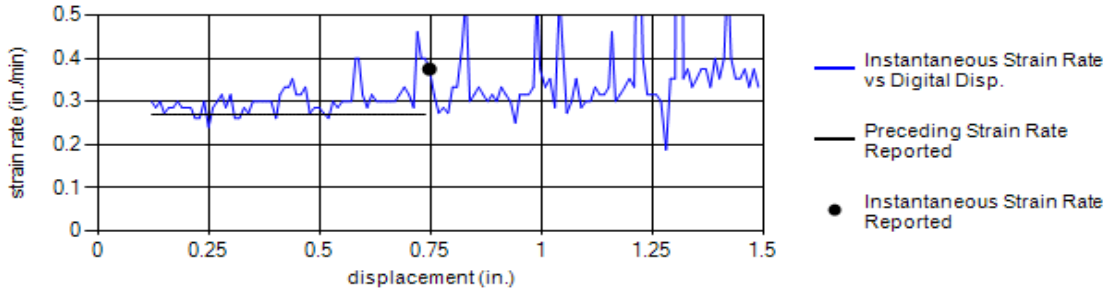
Personnel

Tested:	AS YW DH
Prepared:	SB TW
Checked:	WL PJ

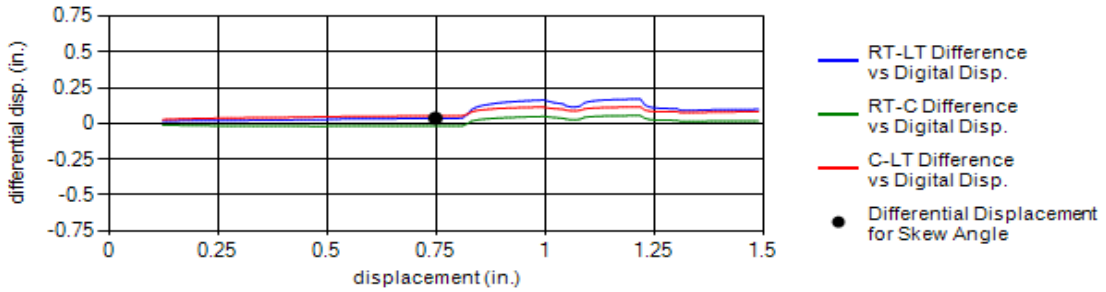
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1920	No Data	784	889	815	1102	2.07	787



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.38	0.27	0.29



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.04	-0.02	0.05	No Data	0.17	CCW



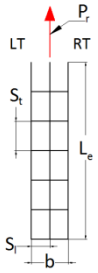
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	4/8/2011 1:26:00 PM
Test Identification:	TS24.06-G-9x12-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.):	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

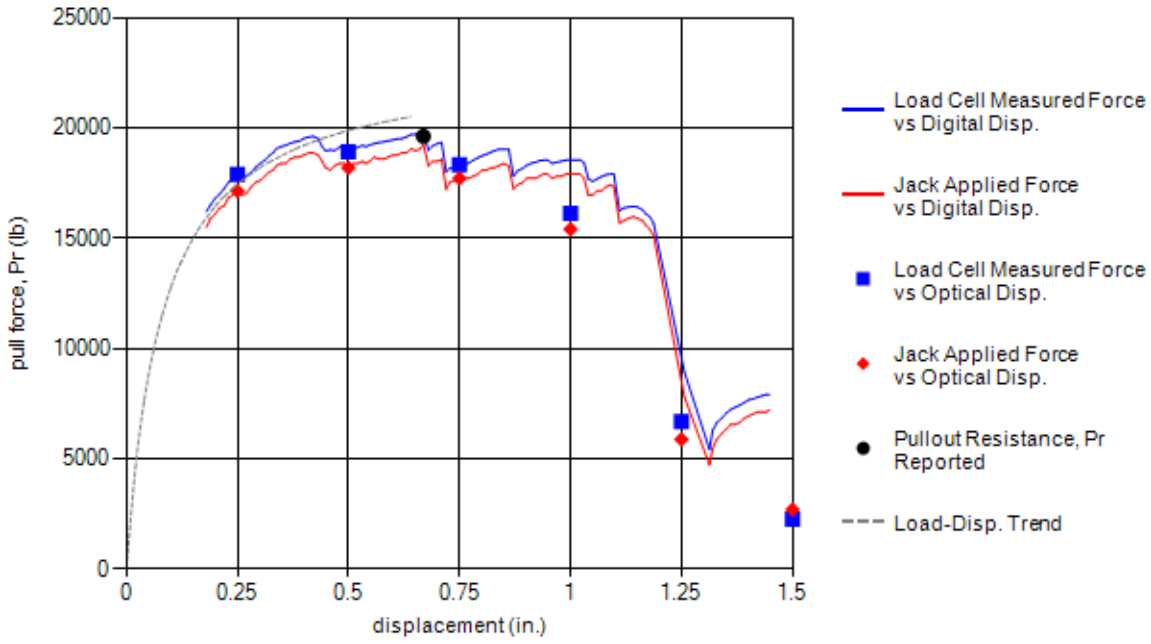
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	117.9 ±1.5
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	7.3 ±1.0%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	94.7 ±1.3%

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	687	19614	5.4	**1.58**

Load-Displacement Curve

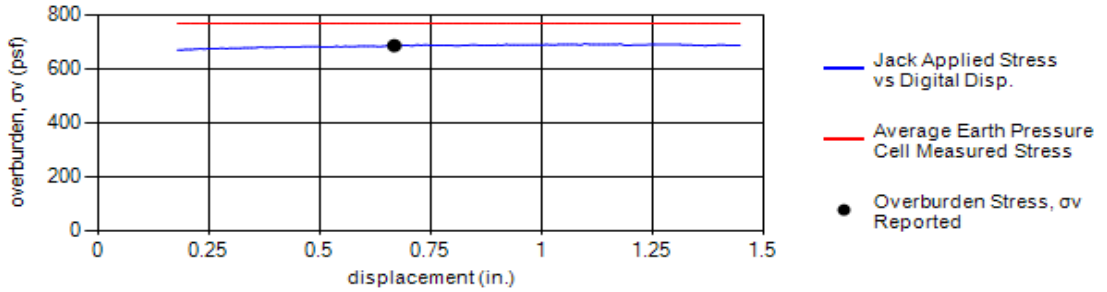


Comments

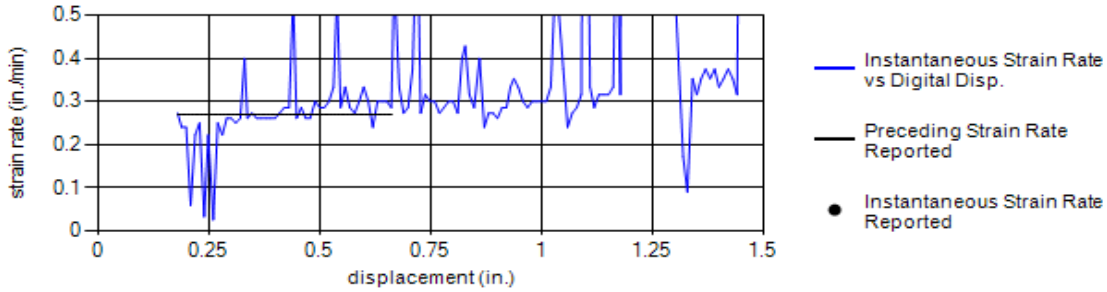
Personnel

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

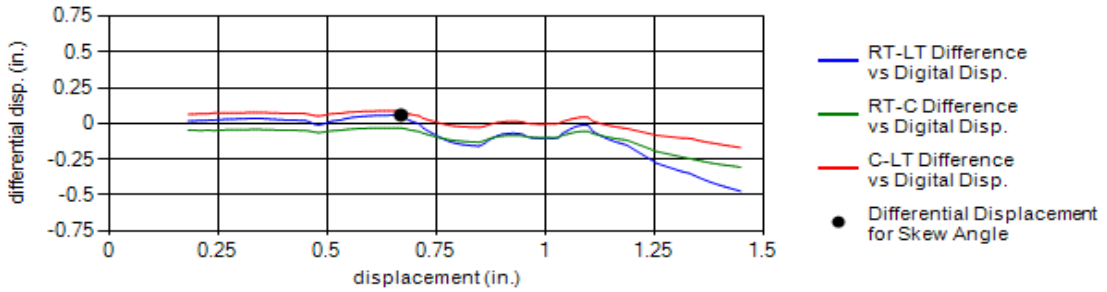
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
909	No Data	610	816	743	770	2.28	687



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.60	0.27	0.32



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.06	-0.03	0.09	No Data	0.19	CCW



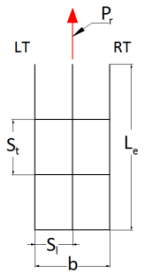
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	4/8/2011 12:59:00 PM
Test Identification:	TS24.07-G-6x12-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.):	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

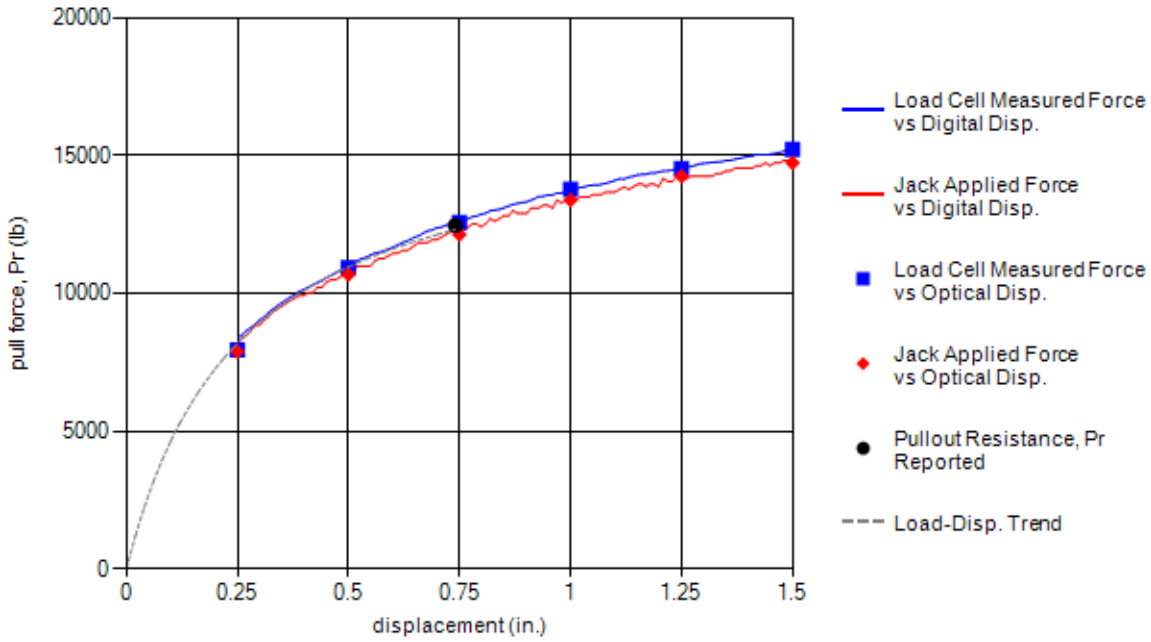
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	117.9 ±1.5
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	7.3 ±1.0%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	94.7 ±1.3%

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	1505	12458	11.9	**1.38**

Load-Displacement Curve

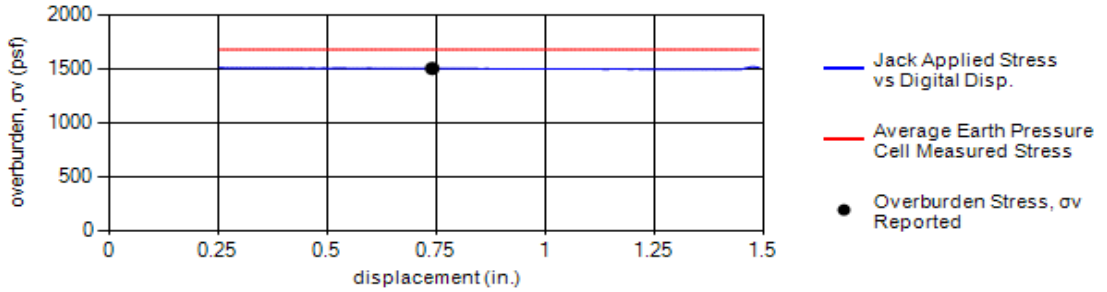


Comments

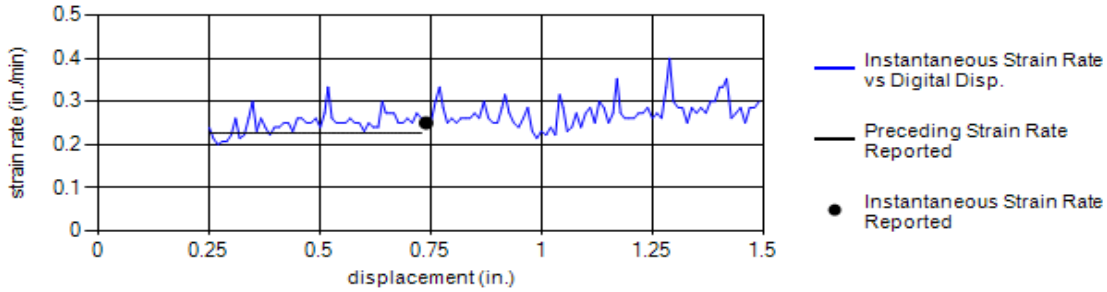
Personnel

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

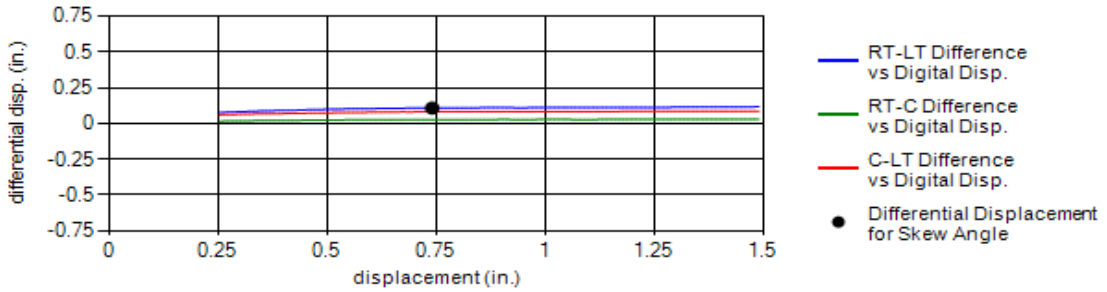
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1905	No Data	1724	1620	1477	1682	1.04	1505



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.25	0.23	0.24



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.11	0.03	0.08	No Data	0.51	CCW



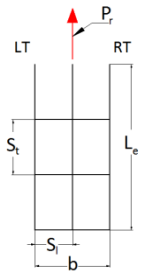
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	4/8/2011 12:21:00 PM
Test Identification:	TS24.08-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

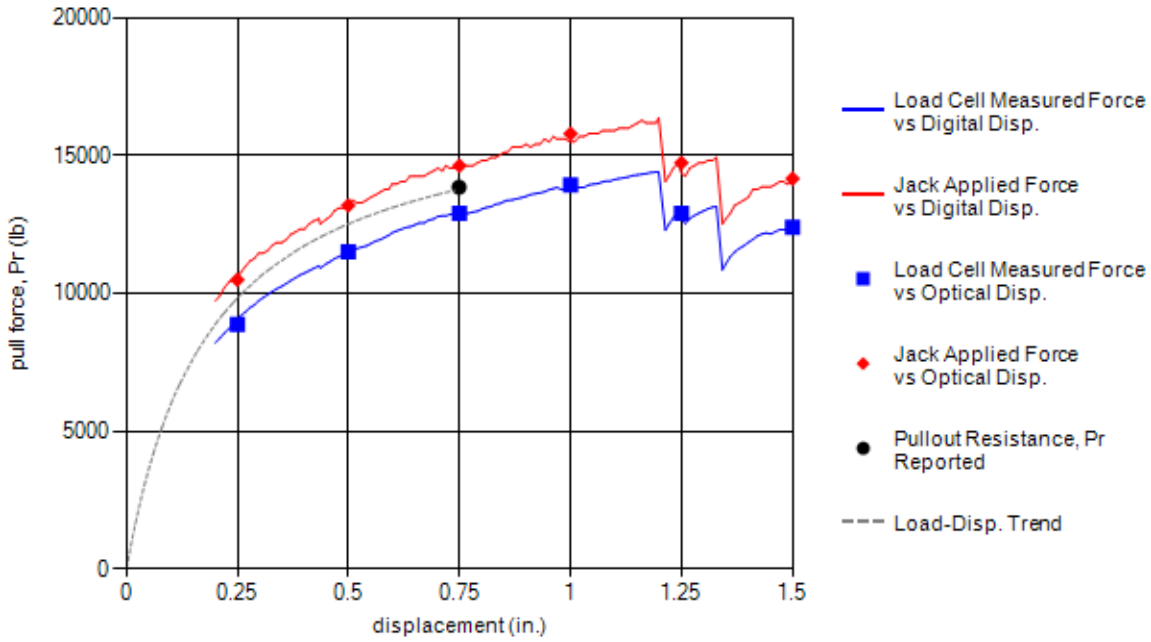
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	117.9	±1.5
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	7.3	±1.0%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	94.7	±1.3%

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	1389	13844	11.0	**1.11**

Load-Displacement Curve

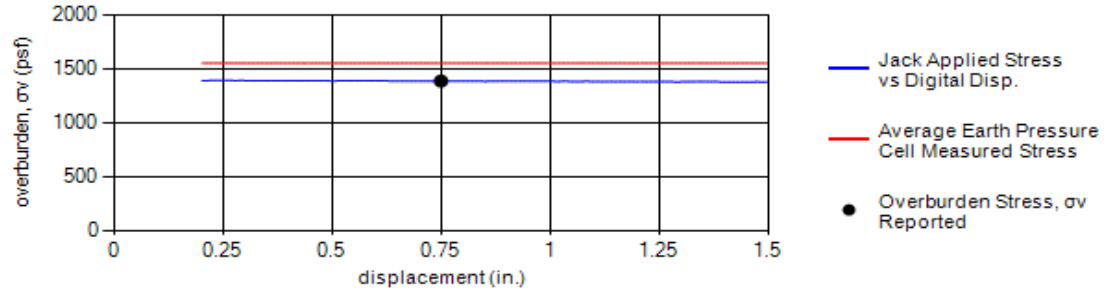


Comments

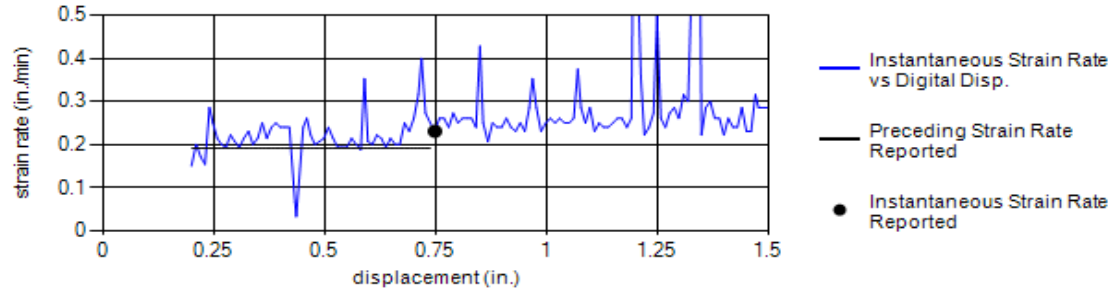
Personnel

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

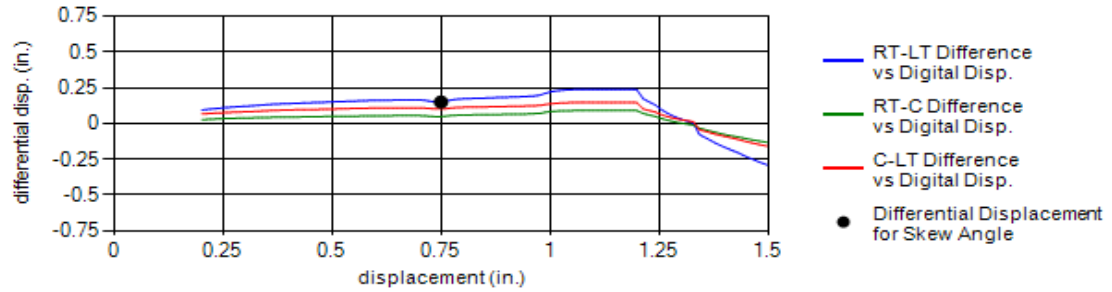
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1760	No Data	1580	1508	1370	1555	1.08	1389



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.23	0.19	0.22



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.15	0.05	0.10	No Data	0.48	CCW



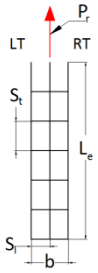
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	4/7/2011 3:07:00 PM
Test Identification:	TS24.10-G-9x12-W9.5xW11-L6-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):	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

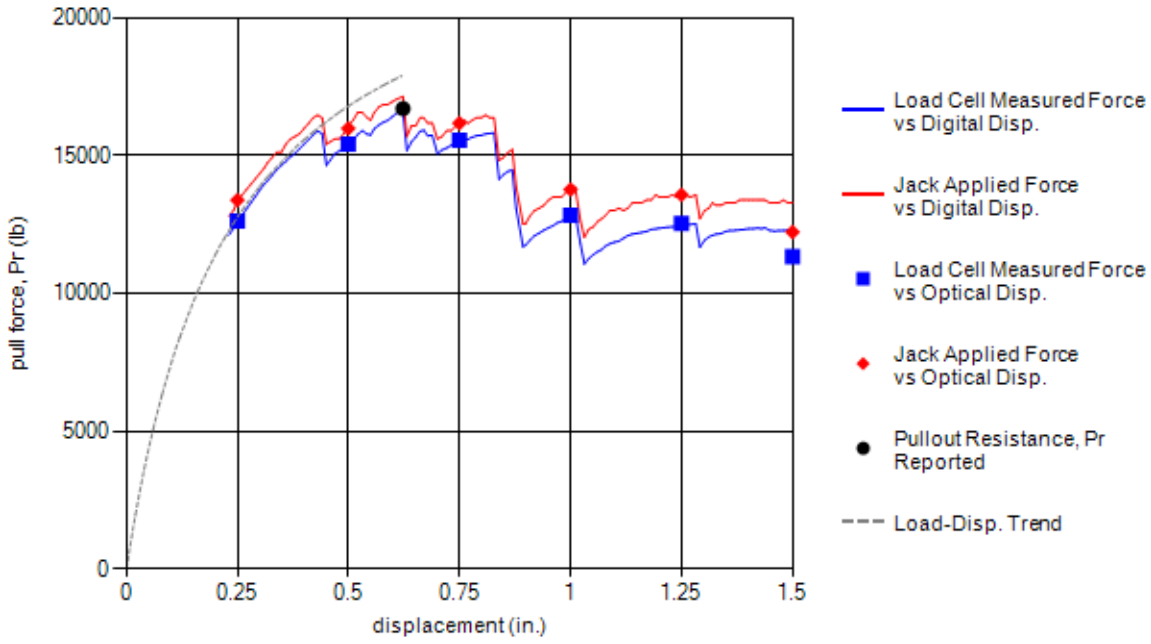
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	117.9 ±1.5
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	7.3 ±1.0%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	94.7 ±1.3%

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	655	16693	5.2	**1.42**

Load-Displacement Curve

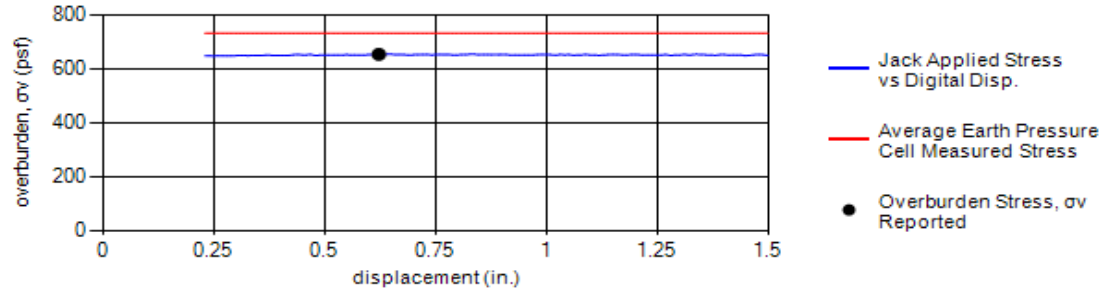


Comments

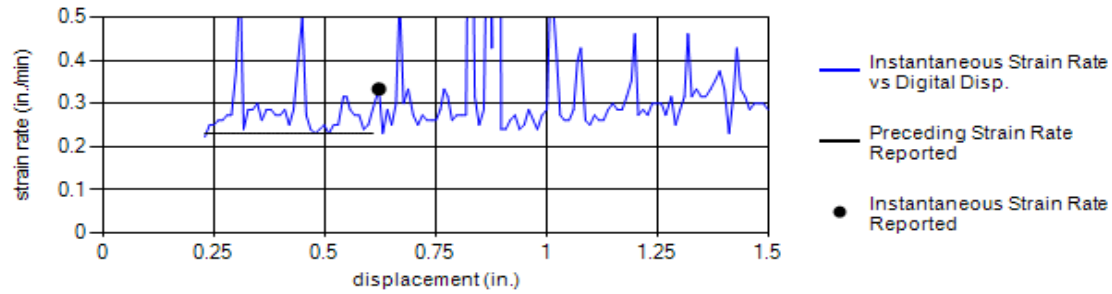
Personnel

Tested:	AS YW DH
Prepared:	SB TW
Checked:	WL PJ

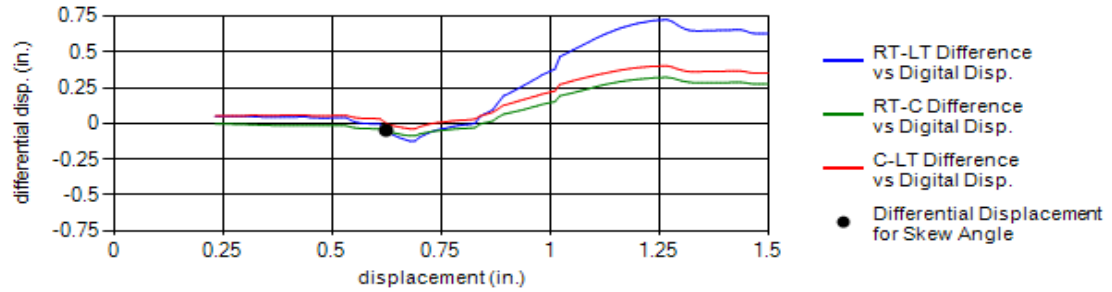
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
945	No Data	620	733	633	733	1.56	655



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.33	0.23	0.25



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	-0.15	CW



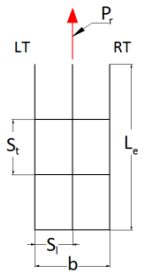
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	4/8/2011 8:34:00 AM
Test Identification:	TS24.11-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

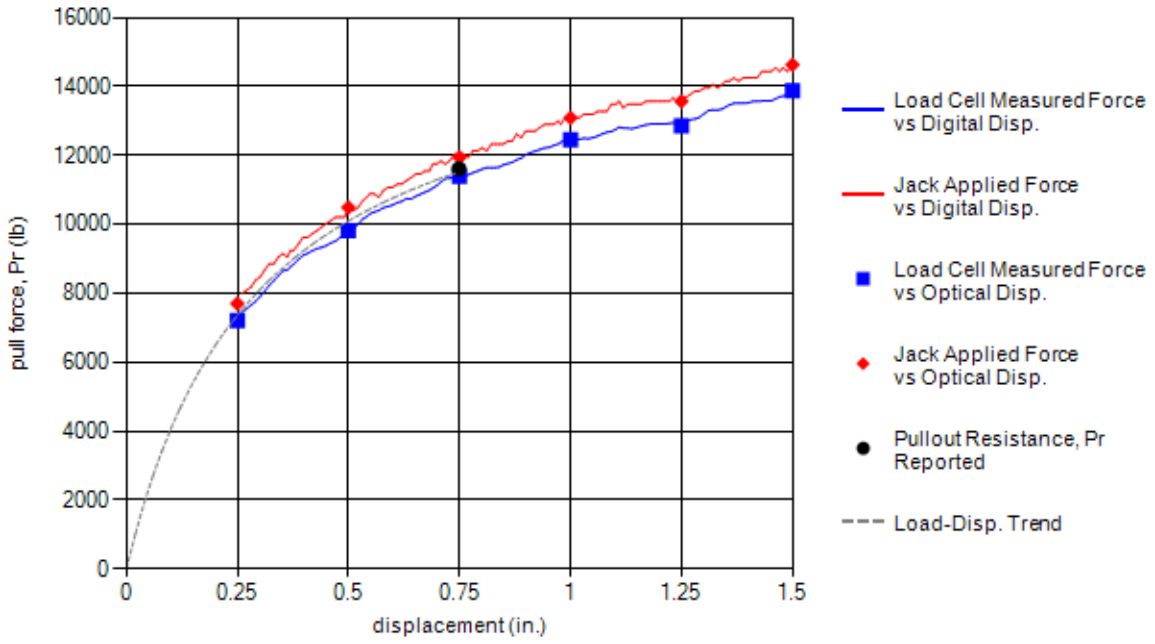
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	117.9 ±1.5
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	7.3 ±1.0%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	94.7 ±1.3%

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	1489	11614	11.8	**1.30**

Load-Displacement Curve

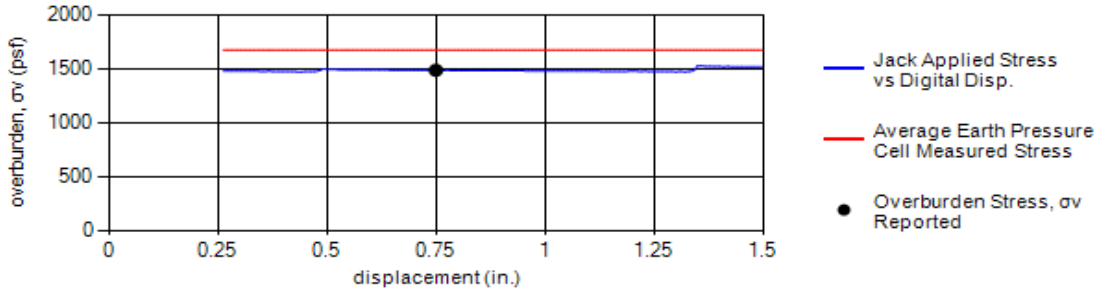


Comments

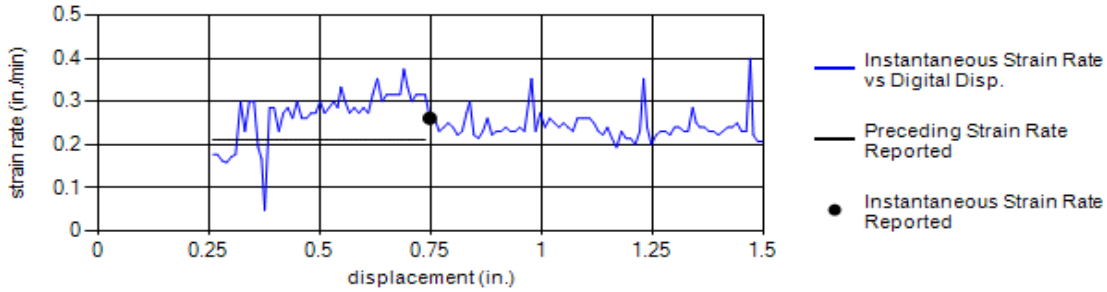
Personnel

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

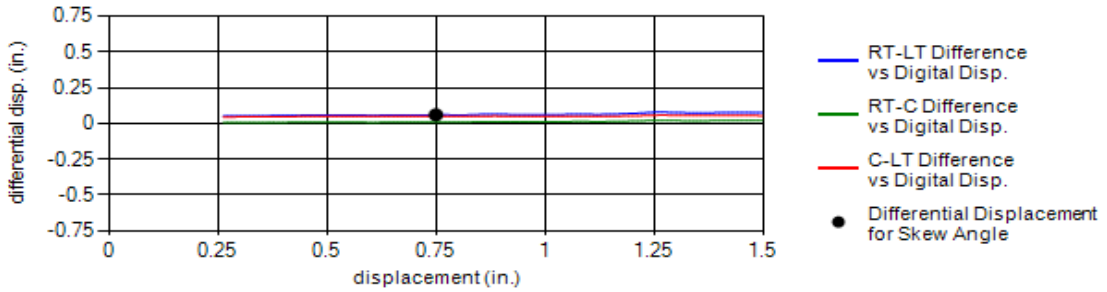
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1923	No Data	1719	1628	1445	1679	1.10	1489



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.26	0.21	0.21



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.06	0.01	0.05	No Data	0.29	CCW



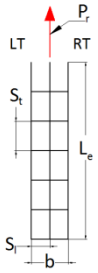
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/9/2011 10:02:00 AM
Test Identification:	TS25.01-G-6x12-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.):	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

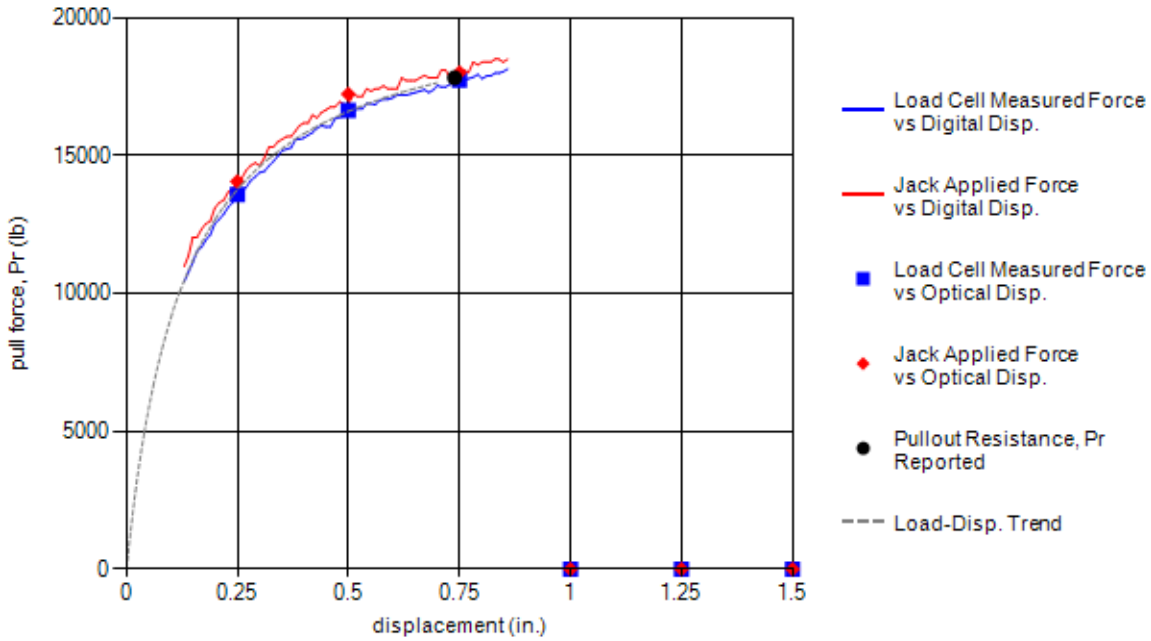
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	120.3	±3.7
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	5.6	±0.5%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	96.6	±2.9%

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****
Pullout	0.74	647	17811	5.1	**2.29**

Load-Displacement Curve

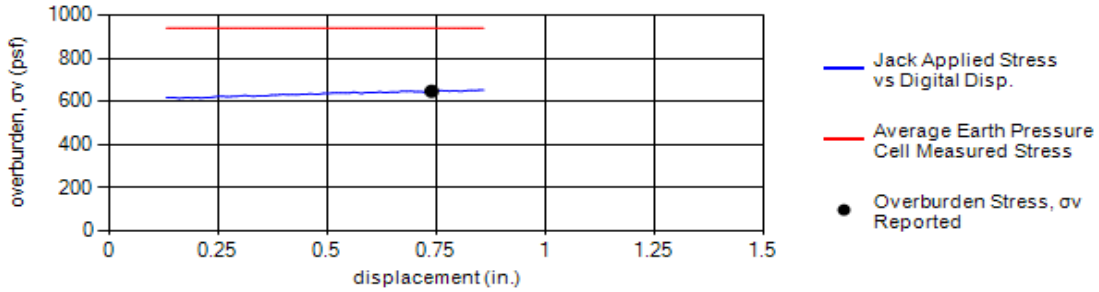


Comments

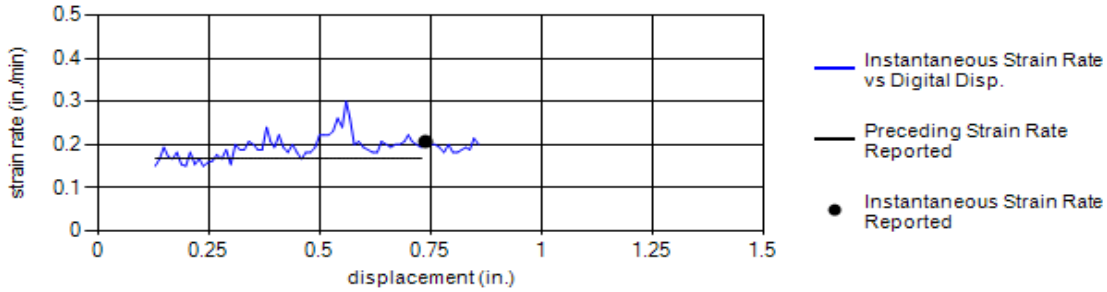
Personnel

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

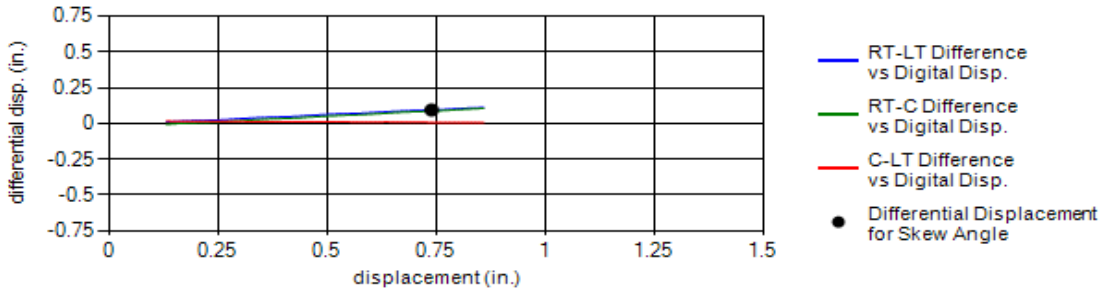
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1198	No Data	745	878	No Data	940	2.35	647



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.21	0.17	0.16



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.09	0.09	0.01	No Data	0.45	CCW



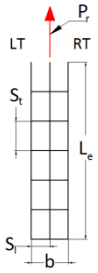
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/6/2011 2:00:00 PM
Test Identification:	TS25.02-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

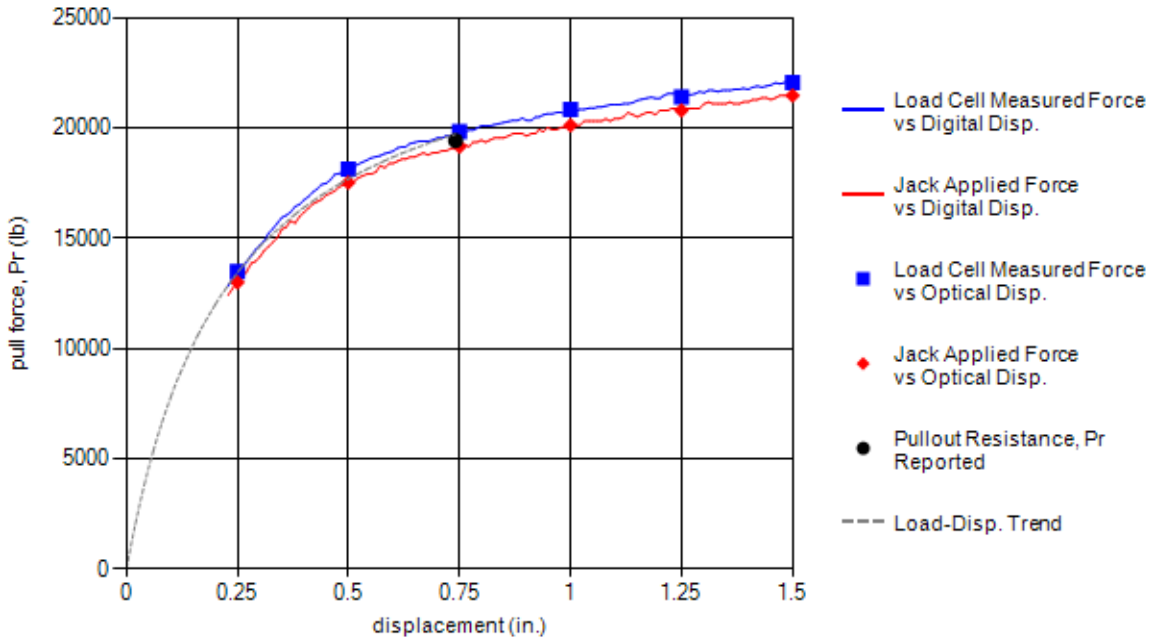
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	120.3	±3.7
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	5.6	±0.5%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	96.6	±2.9%

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****
Pullout	0.74	687	19417	5.4	**1.57**

Load-Displacement Curve

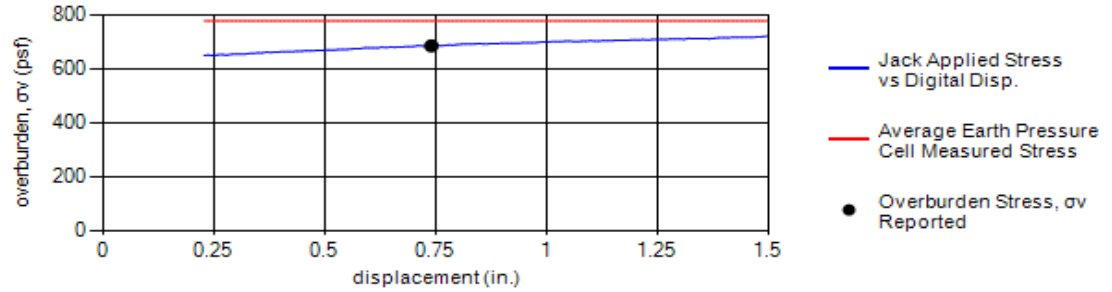


Comments

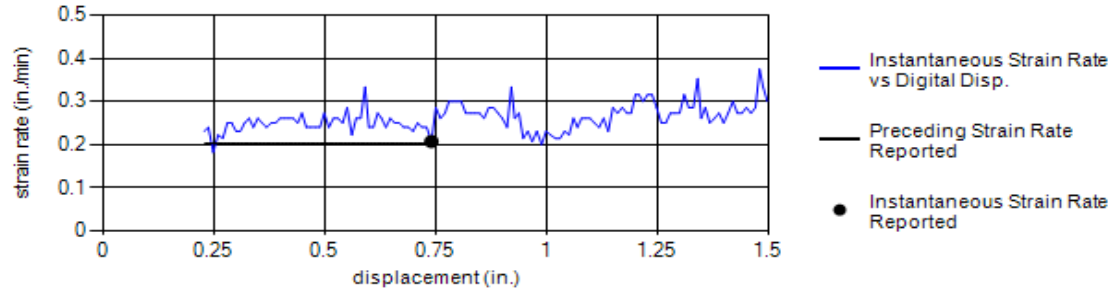
Personnel

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

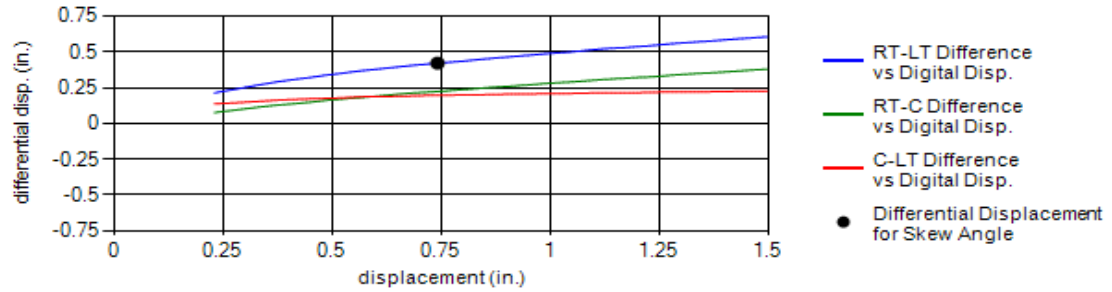
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
980	No Data	603	755	No Data	779	2.45	686



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.21	0.20	0.21



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.42	0.22	0.20	No Data	1.34	CCW



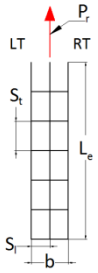
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/6/2011 10:55:00 AM
Test Identification:	TS25.03-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

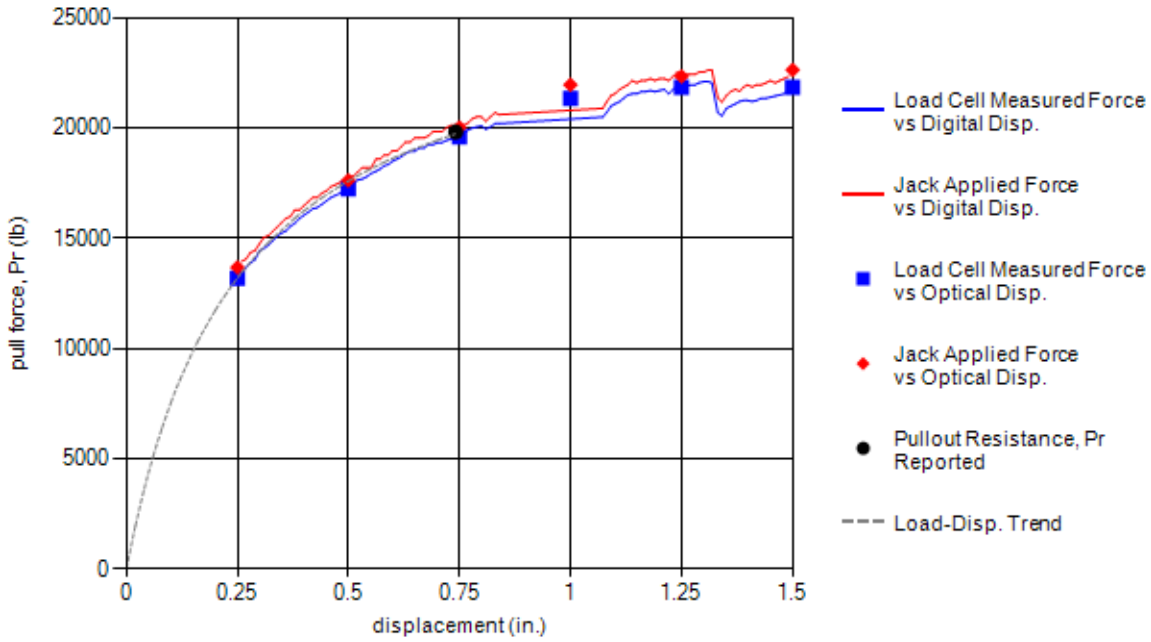
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	120.3	±3.7
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	5.6	±0.5%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	96.6	±2.9%

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	1523	19804	12.0	**1.08**

Load-Displacement Curve

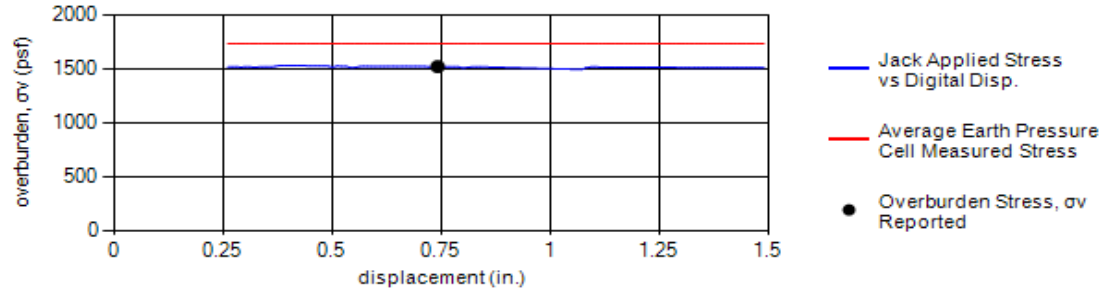


Comments

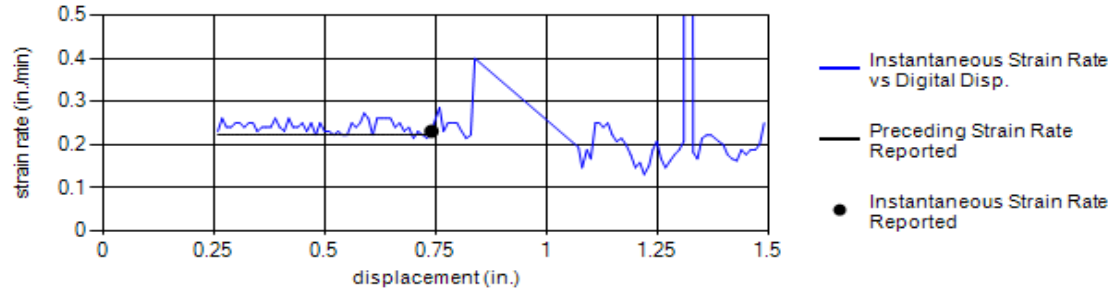
Personnel

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

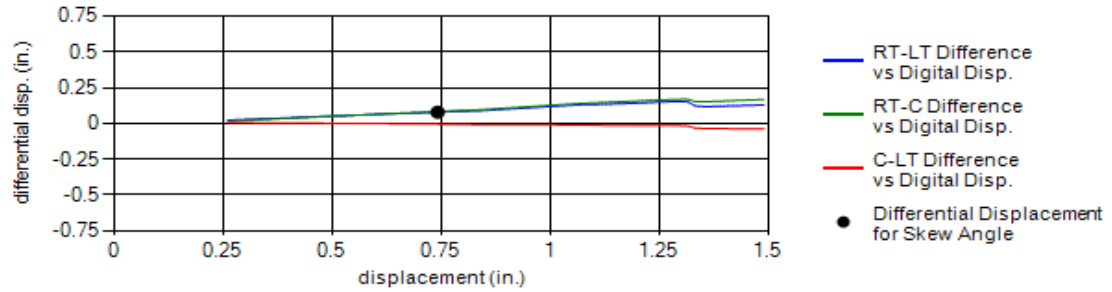
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2044	No Data	1552	1610	No Data	1735	1.10	1523



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.23	0.22	0.13



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.08	0.08	0.00	No Data	0.38	CCW



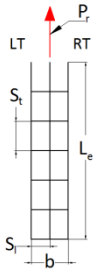
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/6/2011 9:12:00 AM
Test Identification:	TS25.04-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

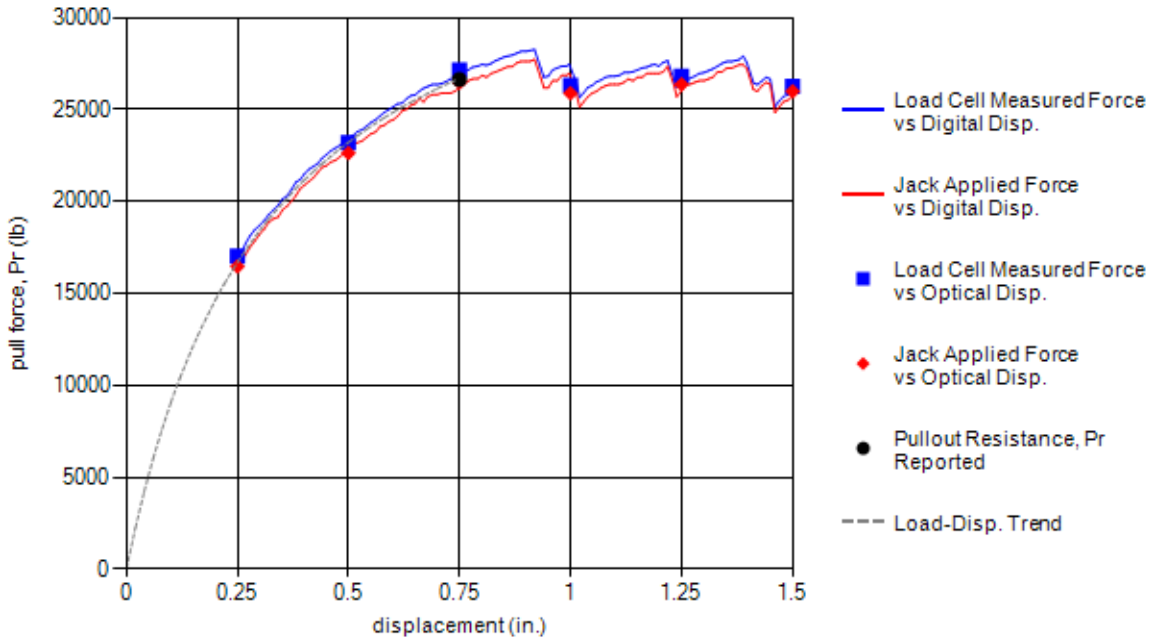
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	120.3	±3.7
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	5.6	±0.5%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	96.6	±2.9%

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	1489	26622	11.7	**0.99**

Load-Displacement Curve

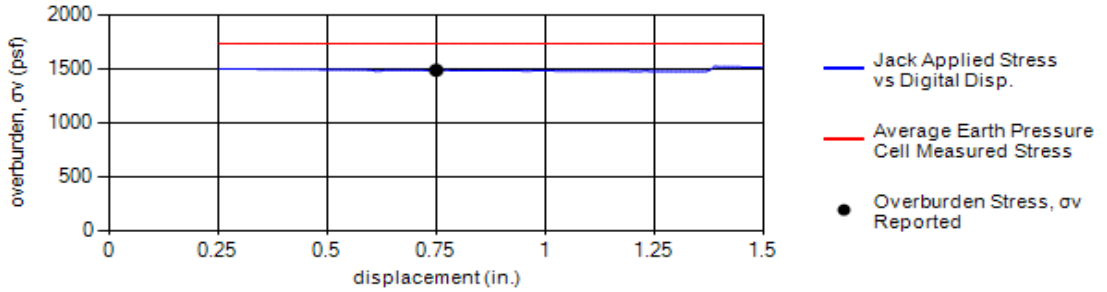


Comments

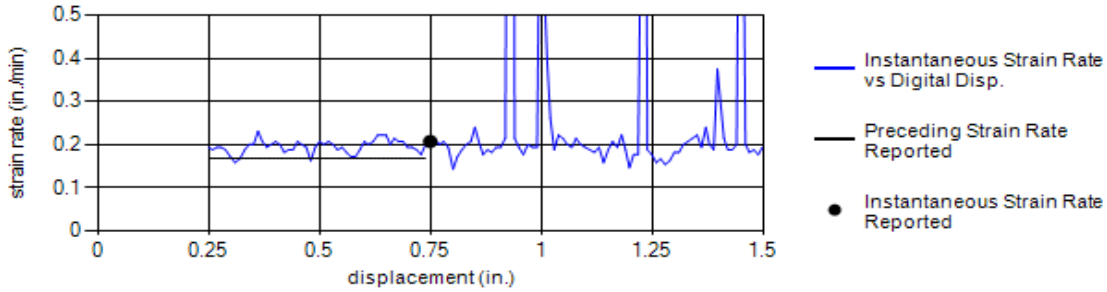
Personnel

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

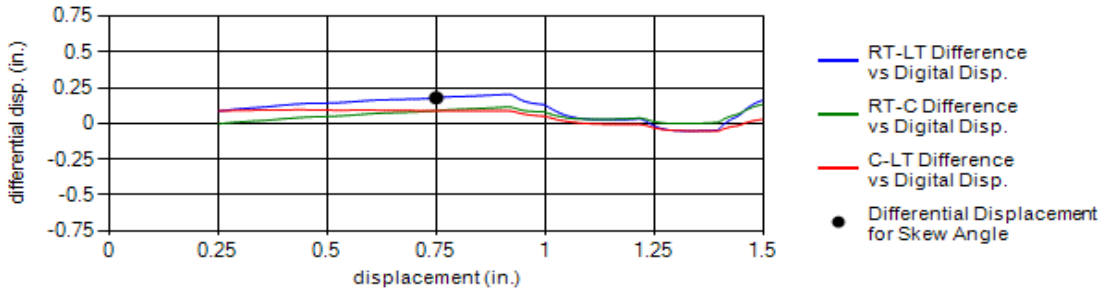
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1986	No Data	1620	1608	No Data	1738	1.10	1489



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.21	0.17	0.18



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.18	0.09	0.09	No Data	0.57	CCW



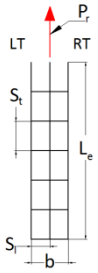
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/5/2011 1:55:00 PM
Test Identification:	TS25.05-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

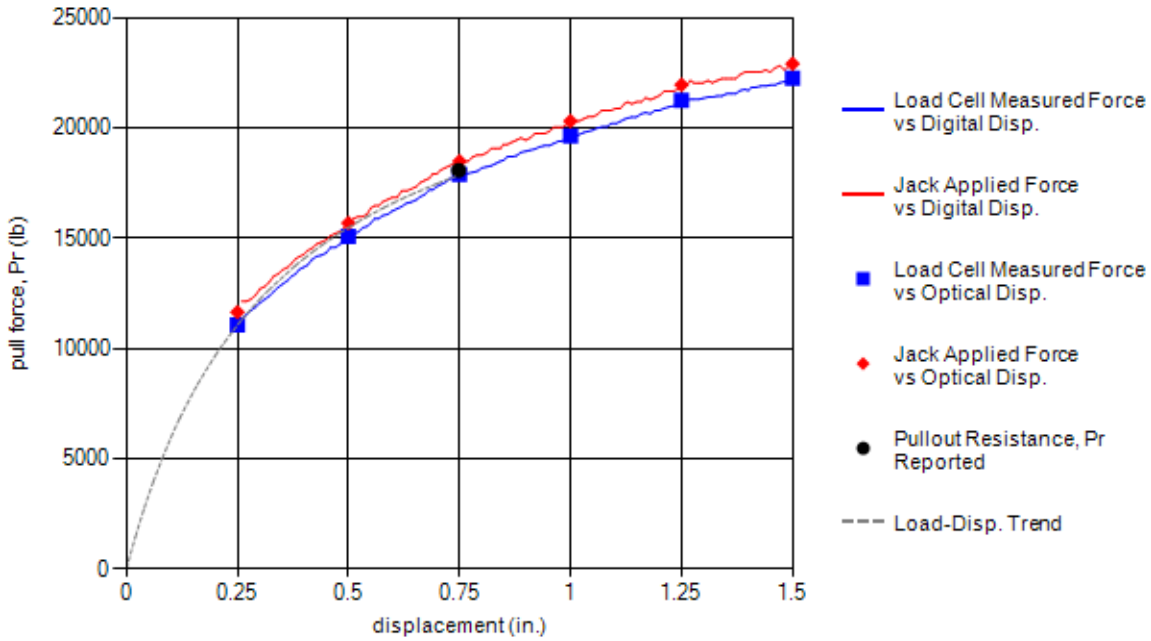
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	120.3	±3.7
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	5.6	±0.5%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	96.6	±2.9%

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****
Pullout	0.75	680	18071	5.4	**2.21**

Load-Displacement Curve

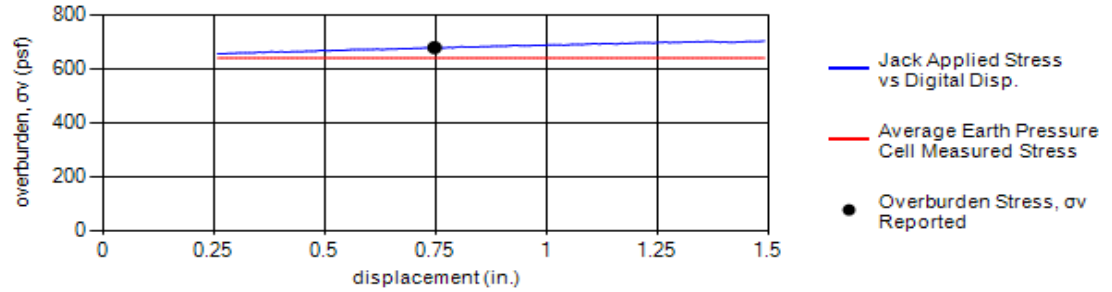


Comments

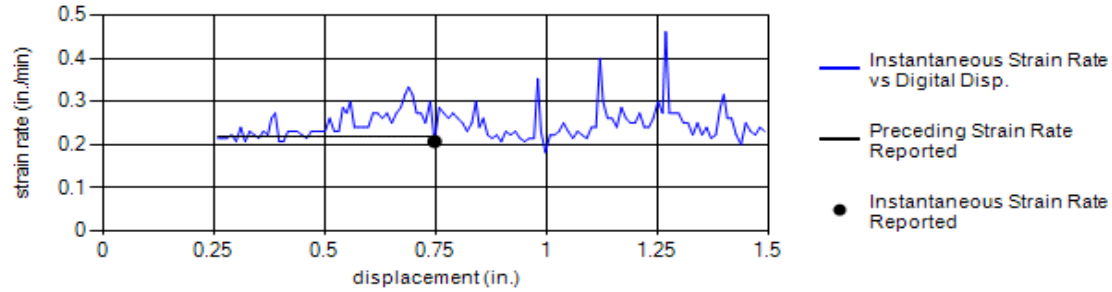
Personnel

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

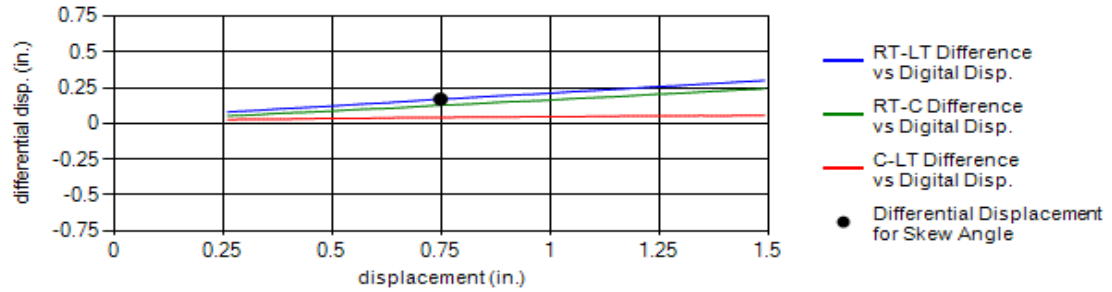
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1061	No Data	371	491	No Data	641	2.66	680



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.21	0.22	0.22



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.17	0.13	0.04	No Data	0.81	CCW



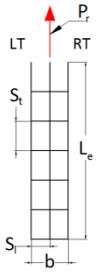
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/5/2011 12:44:00 PM
Test Identification:	TS25.06-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

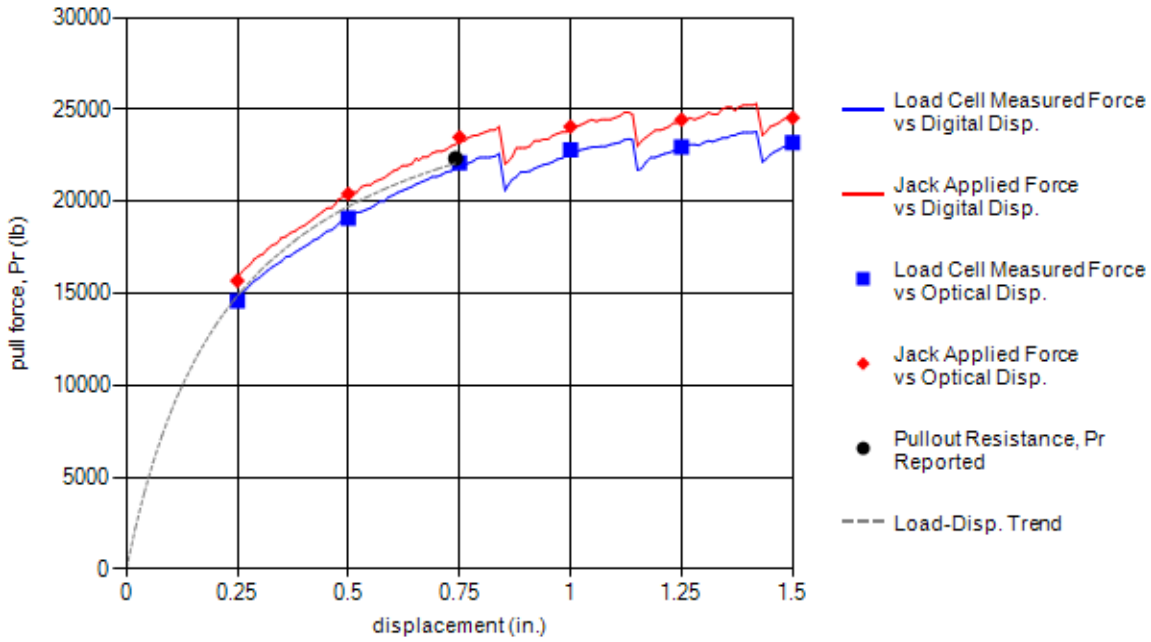
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	120.3	±3.7
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	5.6	±0.5%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	96.6	±2.9%

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	674	22326	5.3	**1.84**

Load-Displacement Curve

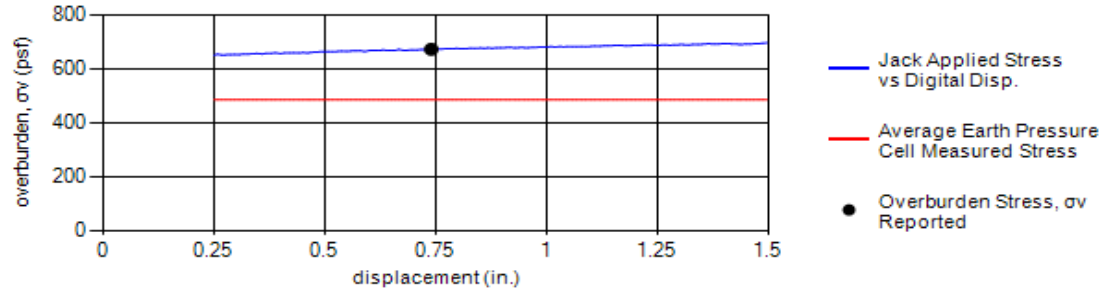


Comments

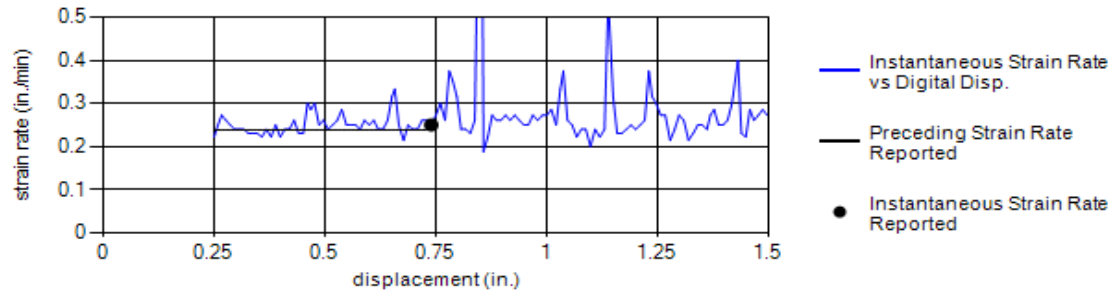
Personnel

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

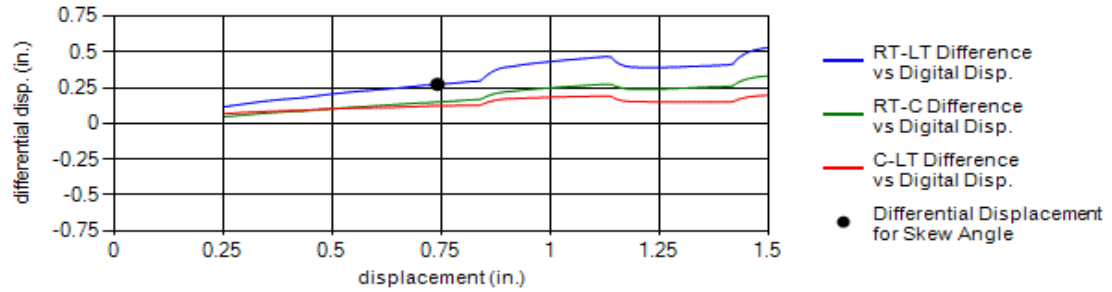
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
639	No Data	343	474	No Data	486	3.51	674



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.25	0.24	0.24



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.27	0.15	0.12	No Data	0.87	CCW



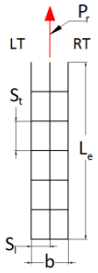
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/5/2011 12:19:00 PM
Test Identification:	TS25.07-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

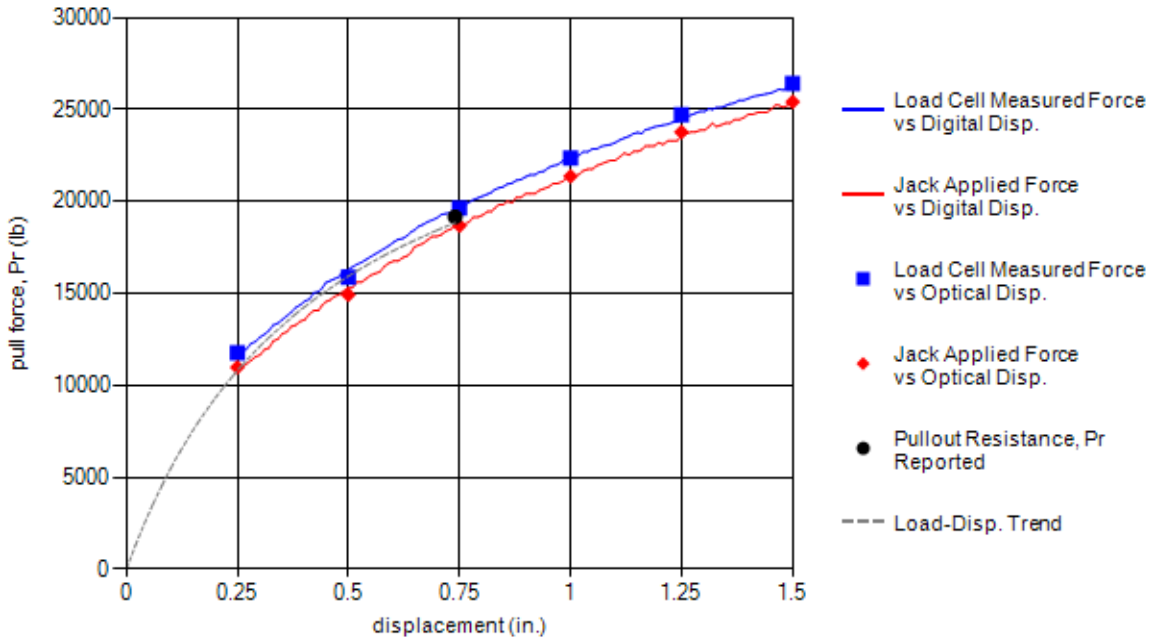
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	120.3	±3.7
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	5.6	±0.5%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	96.6	±2.9%

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	1533	19154	12.1	**1.04**

Load-Displacement Curve

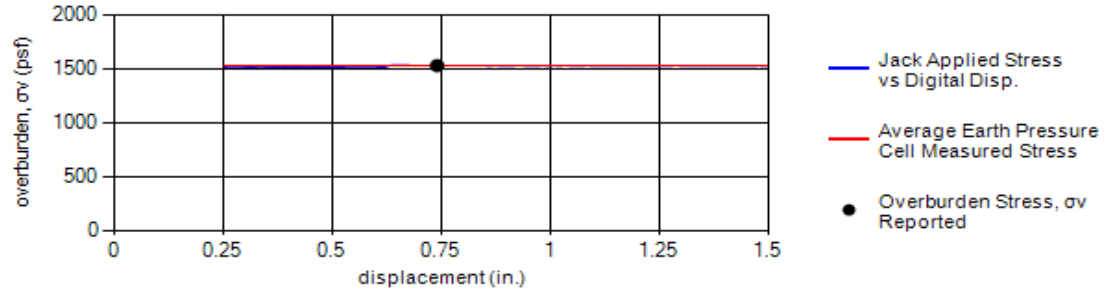


Comments

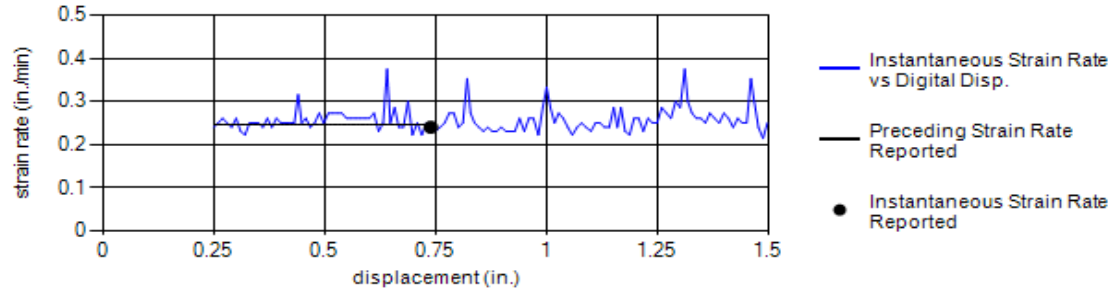
Personnel

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

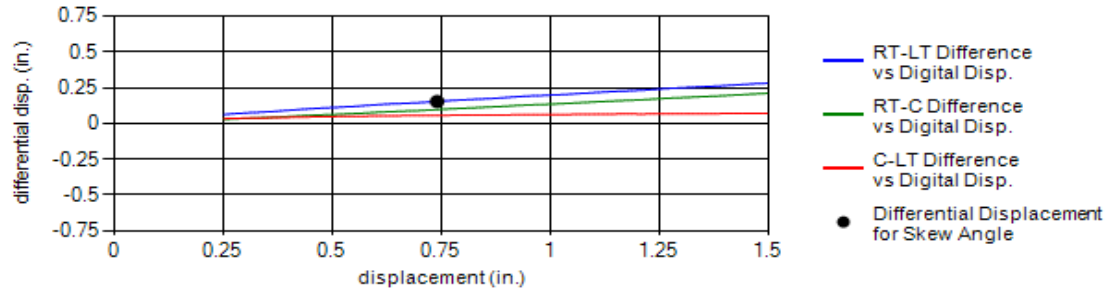
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1950	No Data	1330	1314	No Data	1531	1.12	1533



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



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.15	0.10	0.06	No Data	0.74	CCW



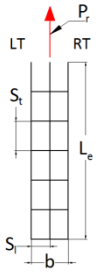
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/5/2011 10:49:00 AM
Test Identification:	TS25.08-G-9x12-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.):	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

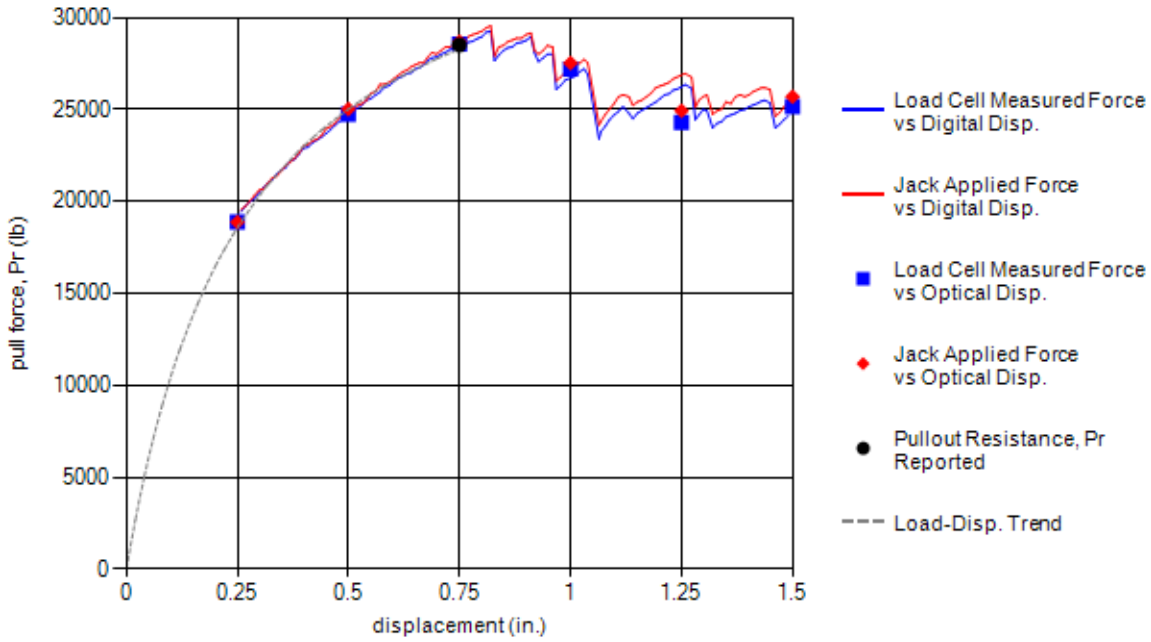
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	120.3	±3.7
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	5.6	±0.5%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	96.6	±2.9%

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	1525	28502	12.0	**1.04**

Load-Displacement Curve

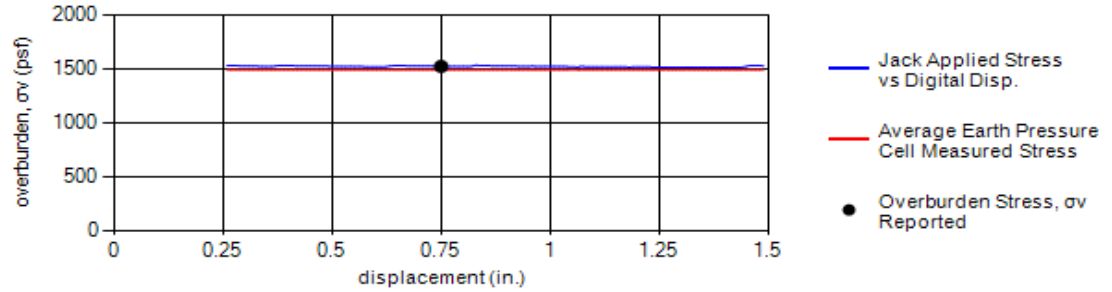


Comments

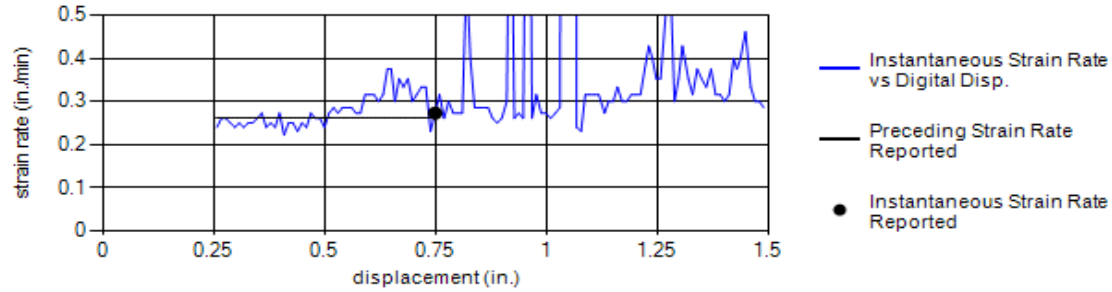
Personnel

Tested:	JL YW DH
Prepared:	SB TW
Checked:	WL PJ

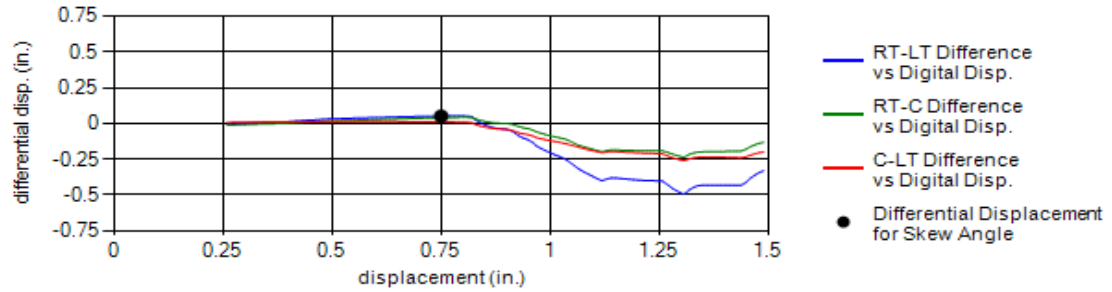
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1888	No Data	1320	1267	No Data	1492	1.15	1525



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.27	0.26	0.28



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	0.17	CCW



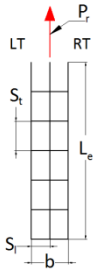
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/5/2011 9:00:00 AM
Test Identification:	TS25.09-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

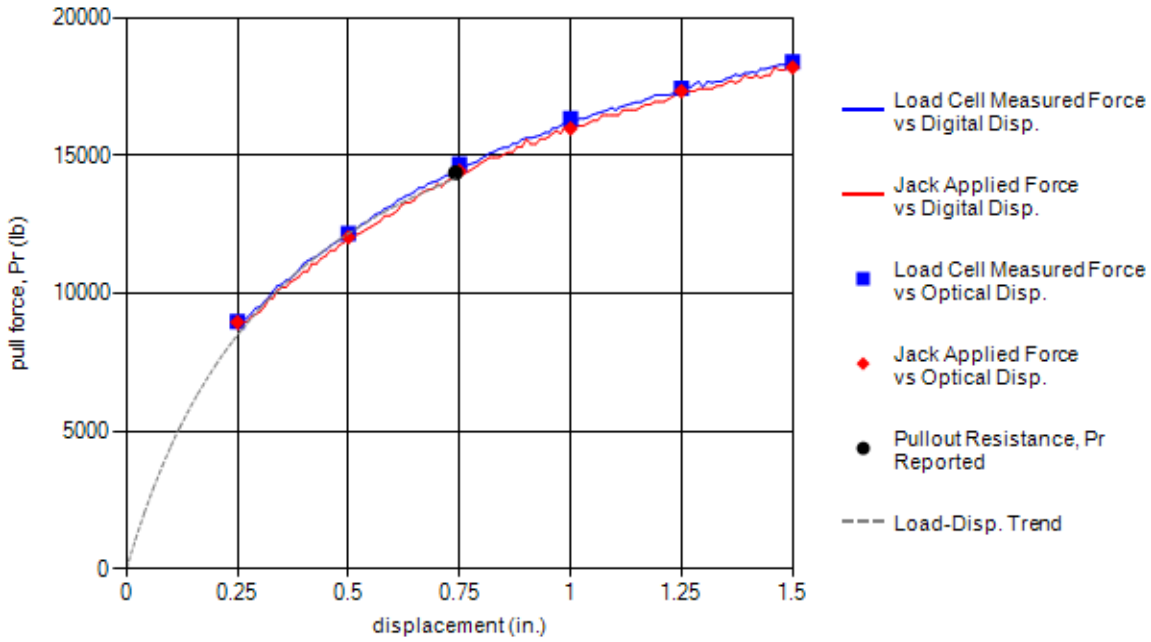
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	120.3	±3.7
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	5.6	±0.5%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	96.6	±2.9%

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	636	14367	5.0	**1.88**

Load-Displacement Curve

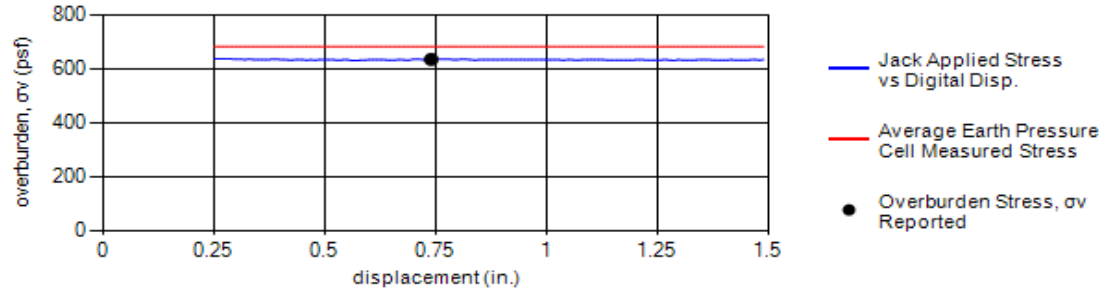


Comments

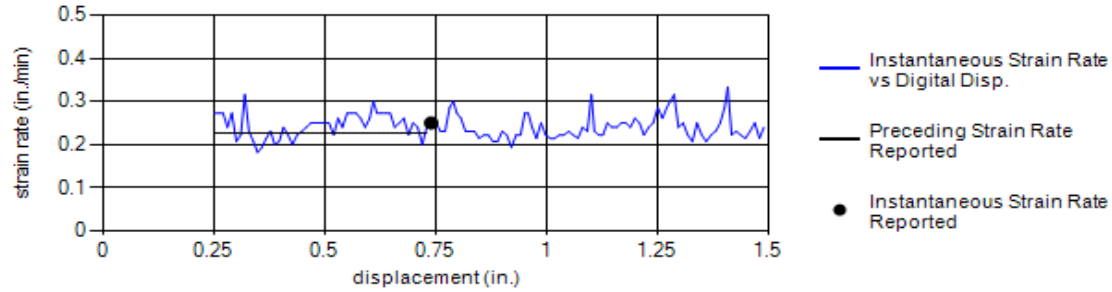
Personnel

Tested:	JL YW DH
Prepared:	SB TW
Checked:	WL PJ

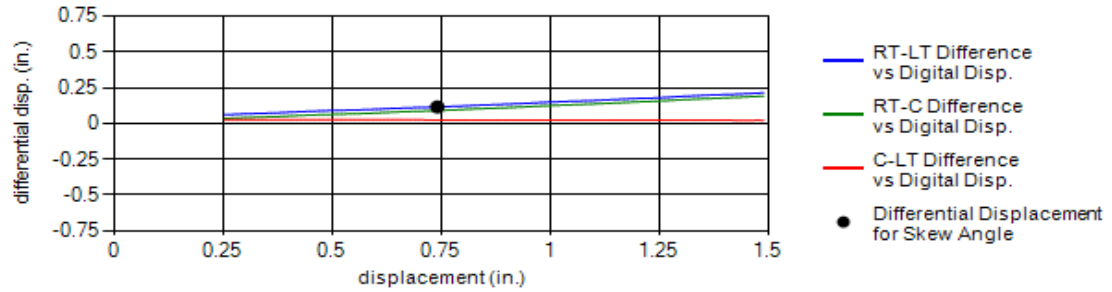
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1275	No Data	384	393	No Data	684	1.62	636



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.25	0.23	0.22



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.12	0.09	0.03	No Data	0.55	CCW



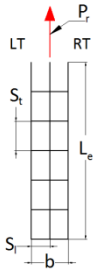
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/5/2011 9:29:00 AM
Test Identification:	TS25.10-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

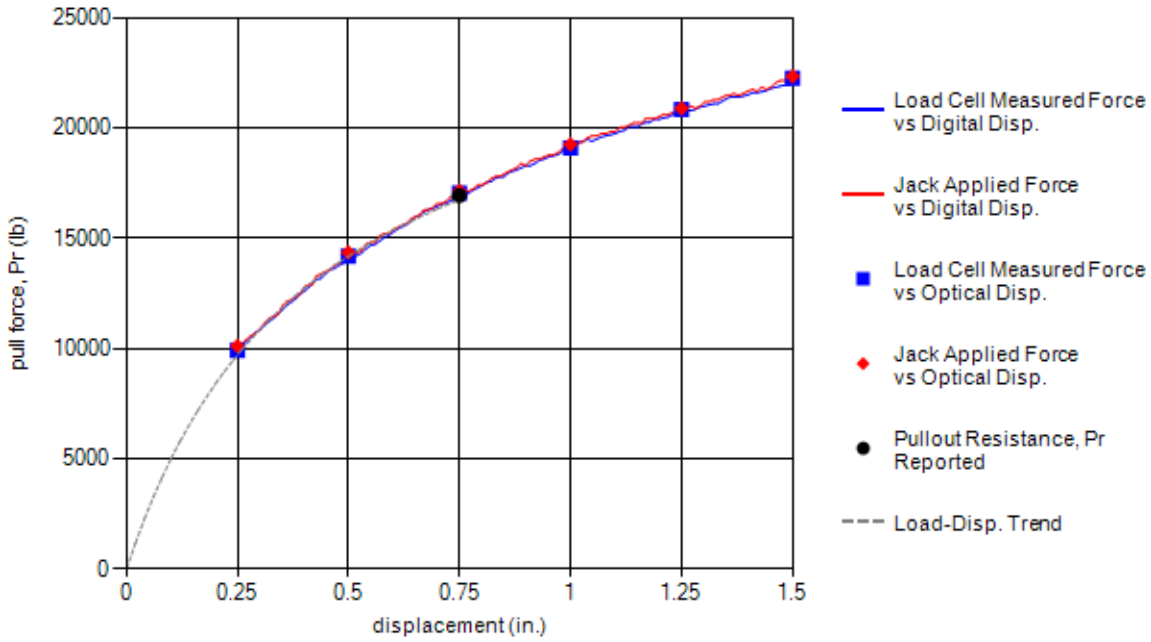
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	120.3	±3.7
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	5.6	±0.5%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	96.6	±2.9%

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****
Pullout	0.75	637	16930	5.0	**1.48**

Load-Displacement Curve

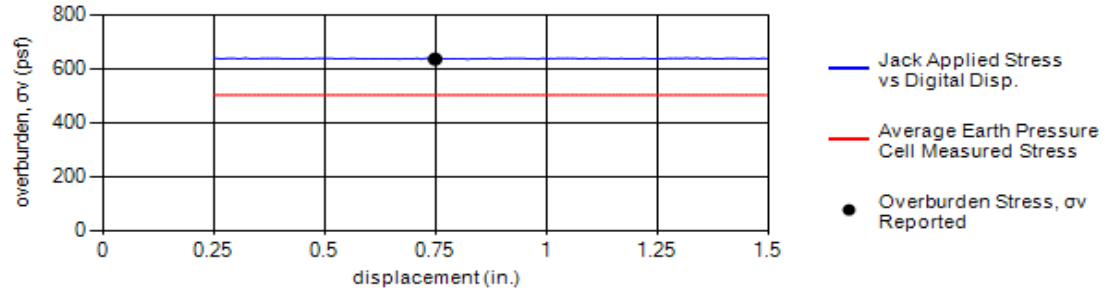


Comments

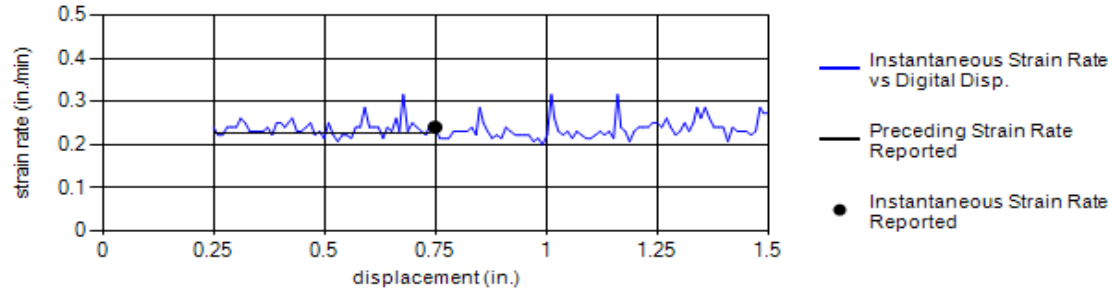
Personnel

Tested:	JL YW DH
Prepared:	SB TW
Checked:	WL PJ

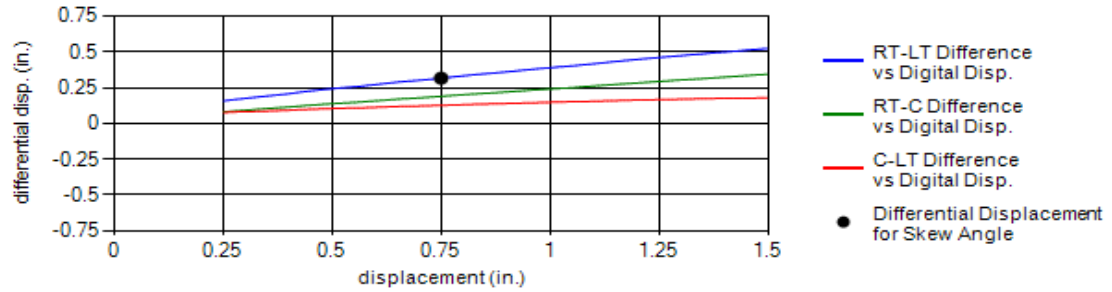
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
838	No Data	274	400	No Data	504	2.20	637



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.24	0.23	0.22



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.32	0.19	0.13	No Data	1.01	CCW



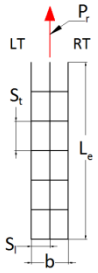
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/5/2011 9:57:00 AM
Test Identification:	TS25.11-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

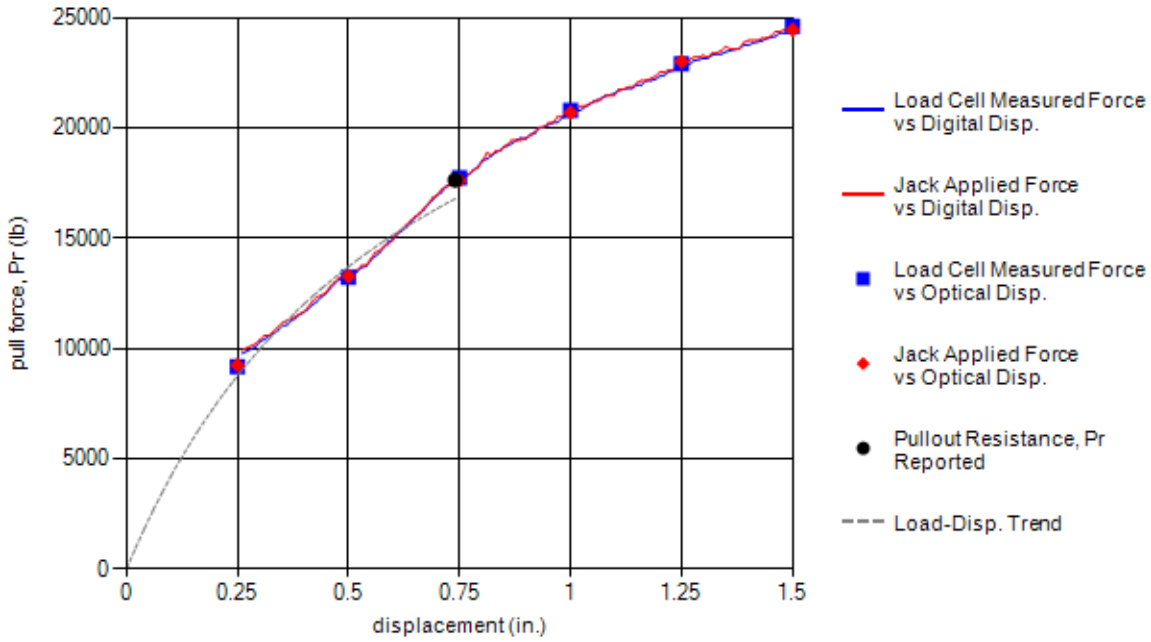
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	120.3	±3.7
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	5.6	±0.5%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	96.6	±2.9%

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****
Pullout	0.74	1439	17627	11.3	**1.02**

Load-Displacement Curve

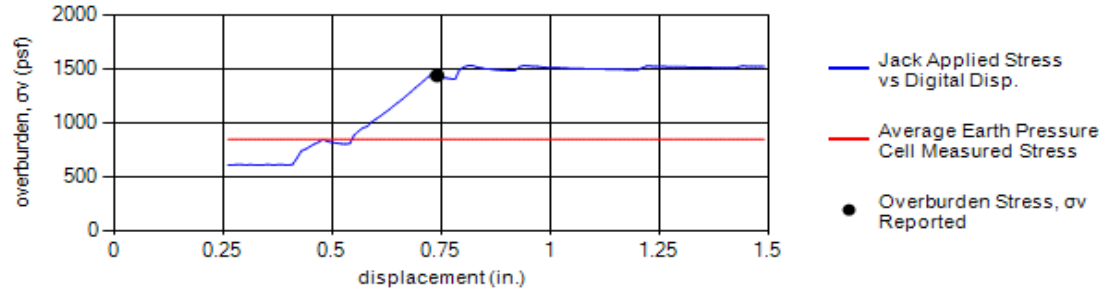


Comments

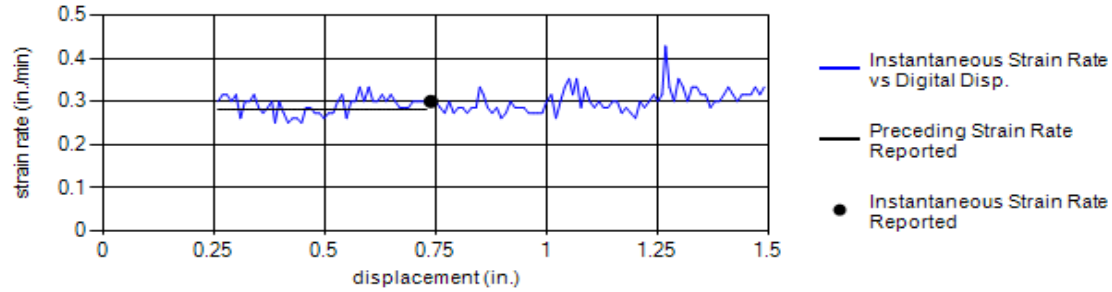
Personnel

Tested:	JL YW DH
Prepared:	SB TW
Checked:	WL PJ

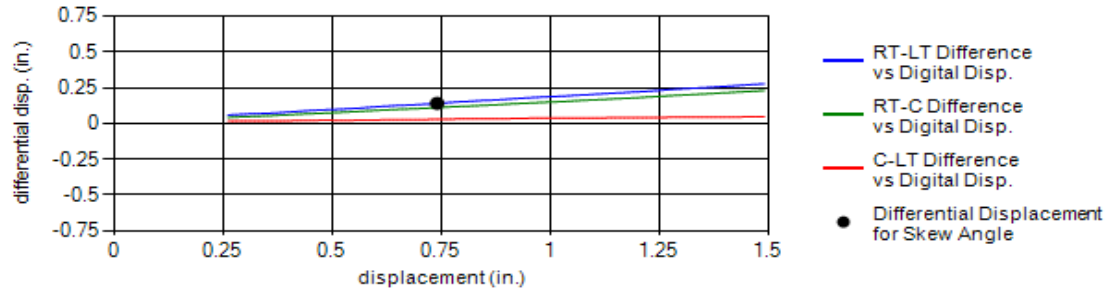
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1219	No Data	611	713	No Data	848	1.93	1440



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.30	0.28	0.28



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.14	0.11	0.03	No Data	0.67	CCW



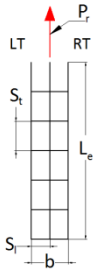
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/5/2011 12:21:00 PM
Test Identification:	TS25.12-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

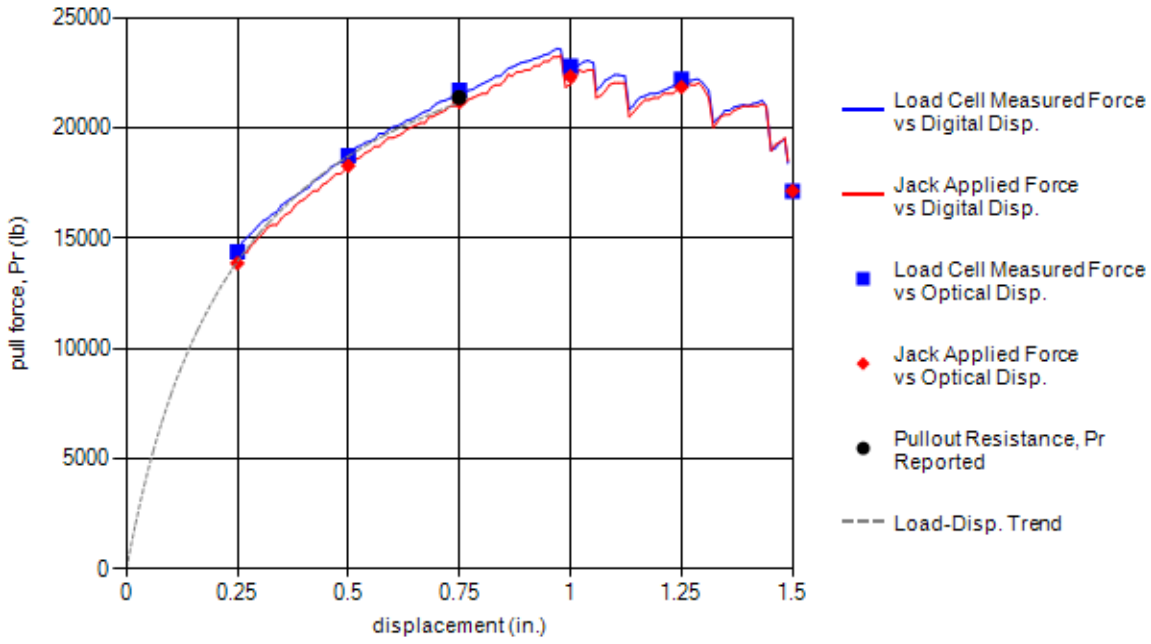
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	120.3	±3.7
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	5.6	±0.5%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	96.6	±2.9%

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****
Pullout	0.75	1522	21370	12.0	**0.78**

Load-Displacement Curve

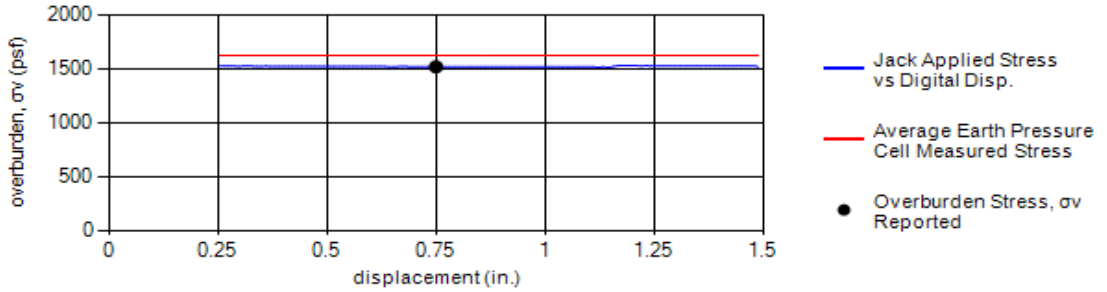


Comments

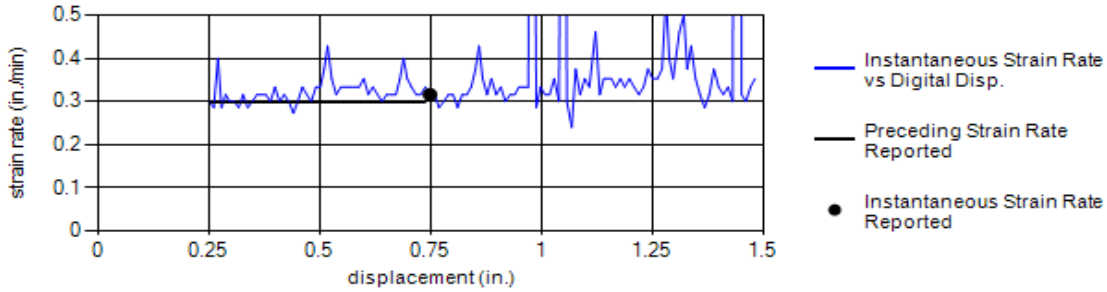
Personnel

Tested:	JL YW DH
Prepared:	SB TW
Checked:	WL PJ

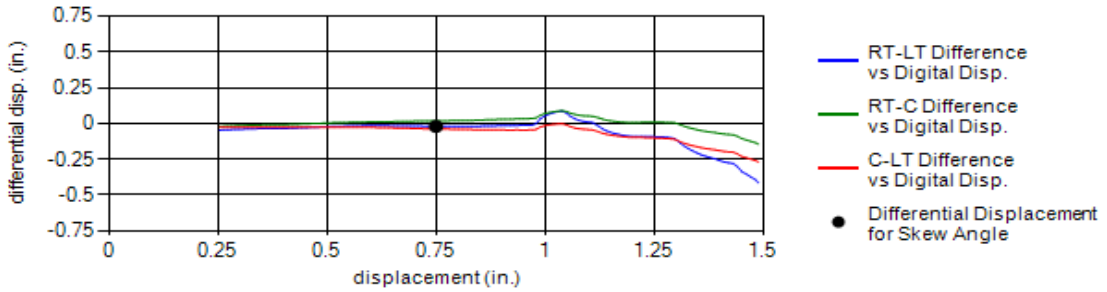
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2054	No Data	1424	1400	No Data	1626	1.11	1522



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.32	0.30	0.31



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	CW



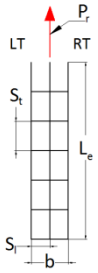
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/17/2011 12:26:00 PM
Test Identification:	TS26.01-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

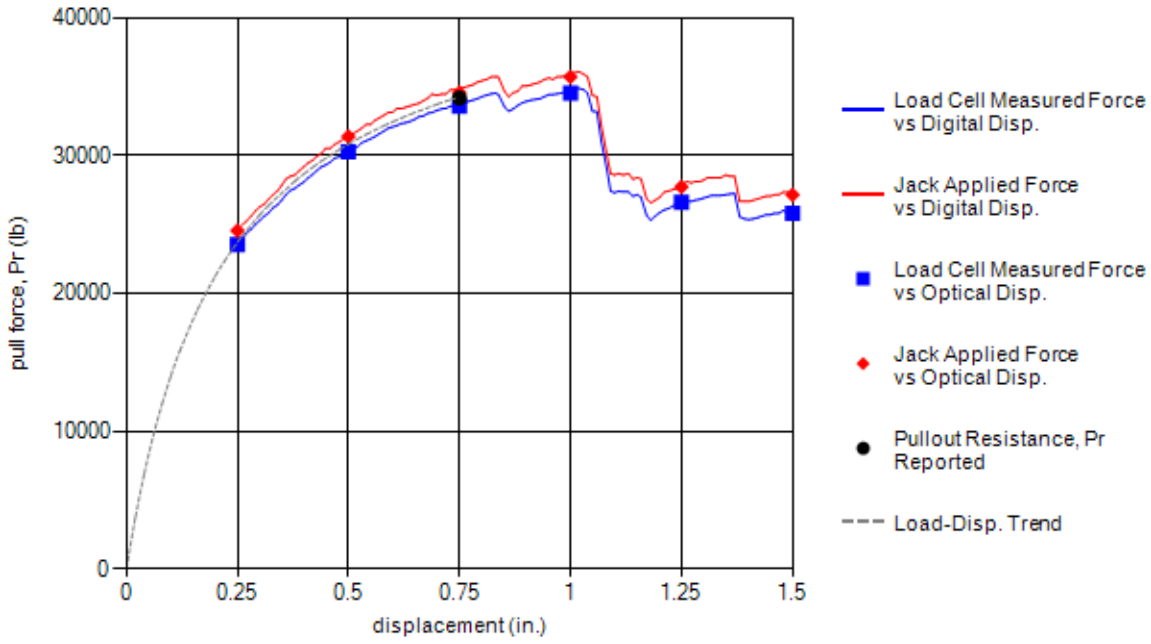
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	122.4	±1.4
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	4.9	±0.5%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	98.4	±1.1%

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	2490	34156	19.4	**1.14**

Load-Displacement Curve

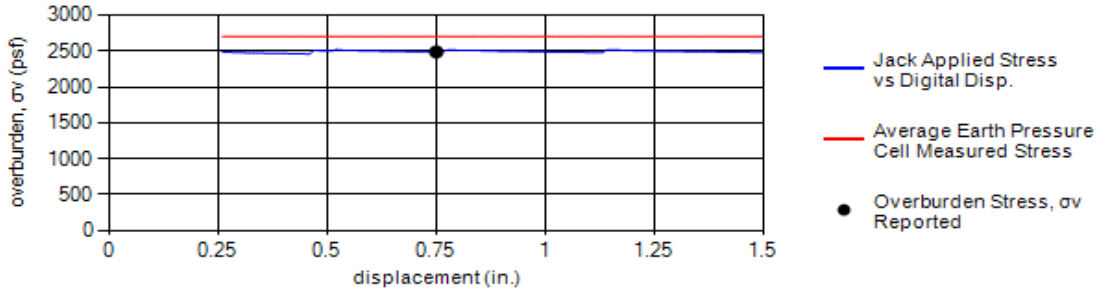


Comments

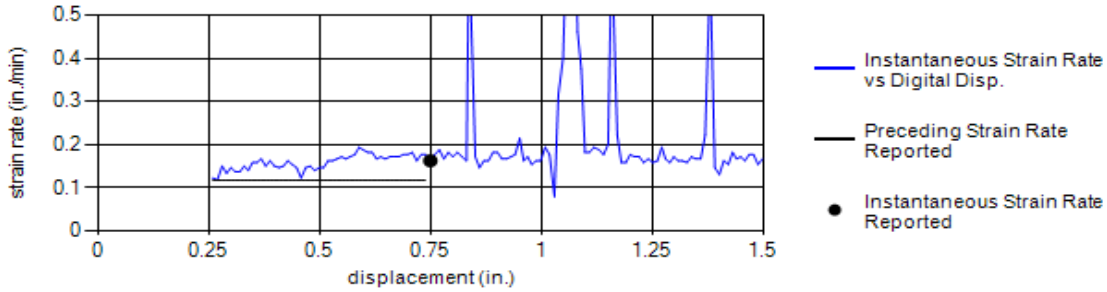
Personnel

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

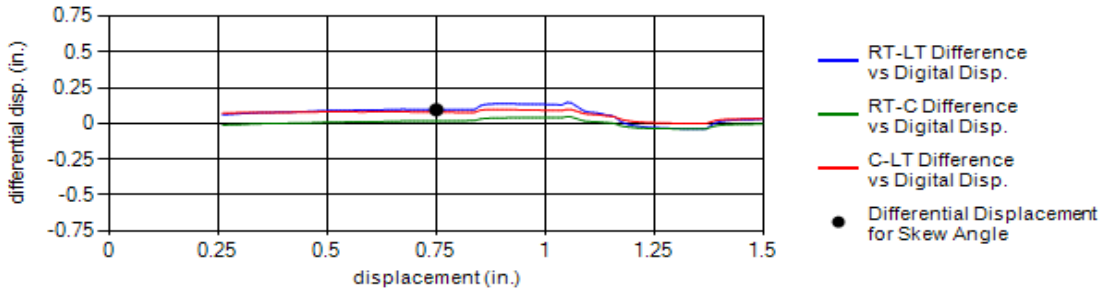
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2822	No Data	2412	2871	No Data	2702	1.03	2489



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.16	0.12	0.14



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.10	0.02	0.08	No Data	0.46	CCW



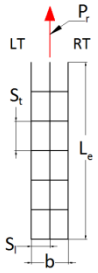
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/17/2011 3:02:00 PM
Test Identification:	TS26.02-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

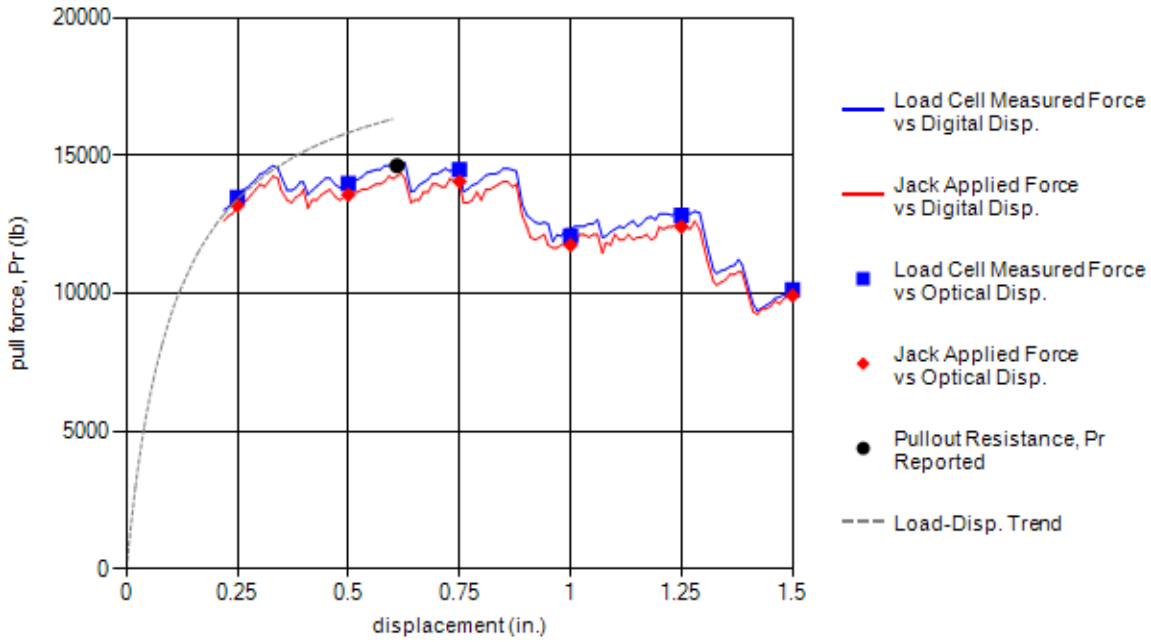
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	122.4	±1.4
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	4.9	±0.5%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	98.4	±1.1%

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	2522	14623	19.6	**0.32**

Load-Displacement Curve

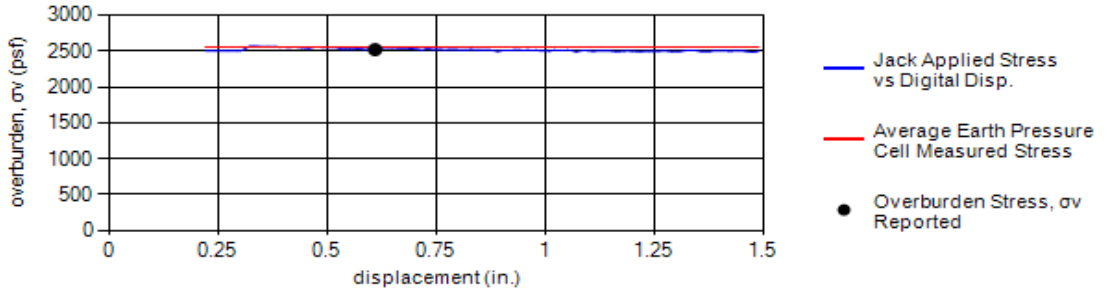


Comments

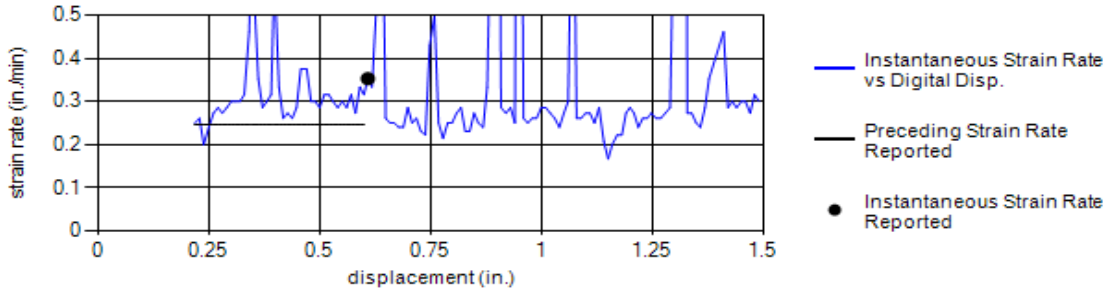
Personnel

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

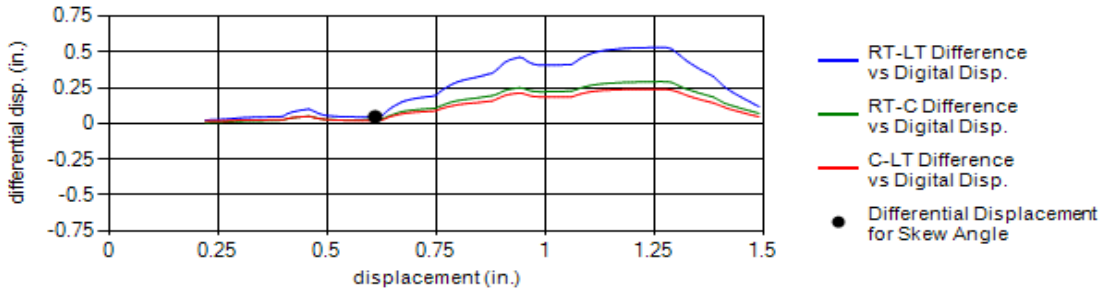
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2658	No Data	2192	2814	No Data	2555	1.09	2522



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.35	0.25	0.26



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	0.15	CCW



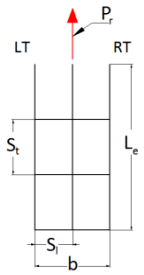
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/19/2011 8:09:00 AM
Test Identification:	TS26.03-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

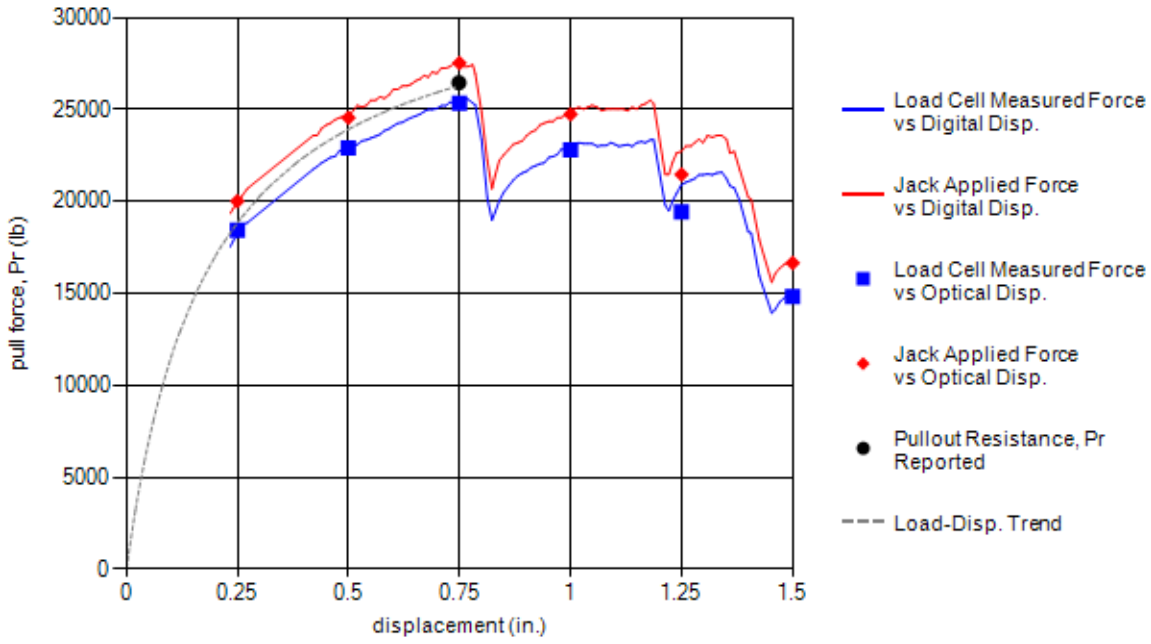
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	122.4	±1.4
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	4.9	±0.5%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	98.4	±1.1%

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	5102	26451	39.7	**0.86**

Load-Displacement Curve

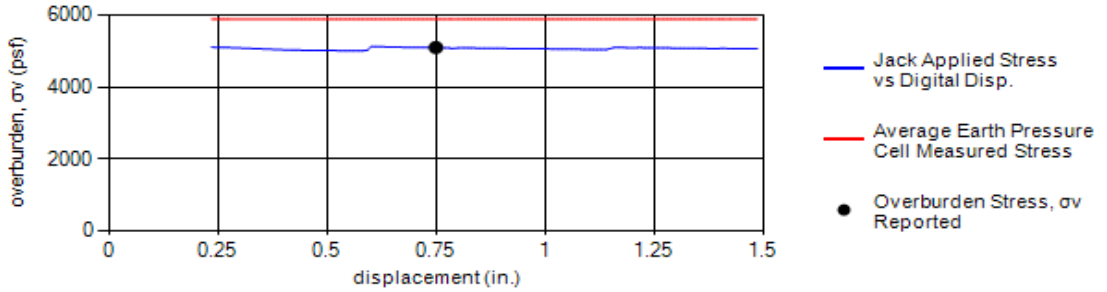


Comments

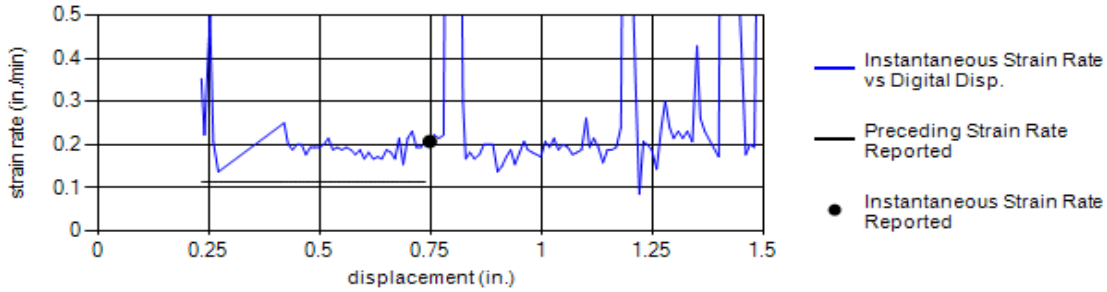
Personnel

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

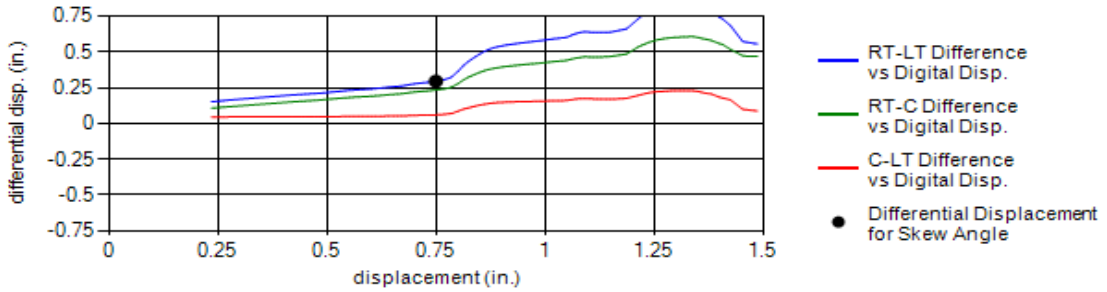
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
6080	No Data	5398	6211	No Data	5896	1.03	5101



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.21	0.11	0.15



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.30	0.24	0.06	No Data	1.41	CCW



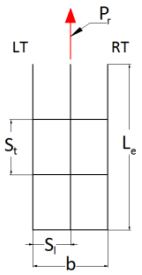
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/19/2011 8:44:00 AM
Test Identification:	TS26.04-G-9x12-W20xW11-L3-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):	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

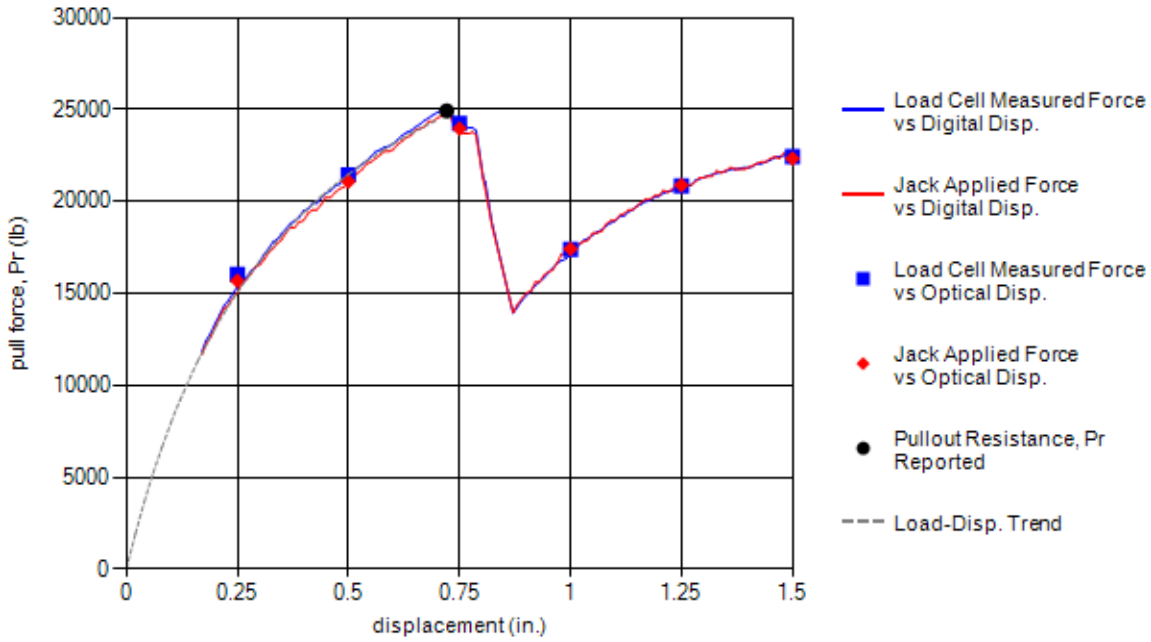
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	122.4 ±1.4
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	4.9 ±0.5%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	98.4 ±1.1%

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	0.72	5108	24919	39.8	**0.54**

Load-Displacement Curve

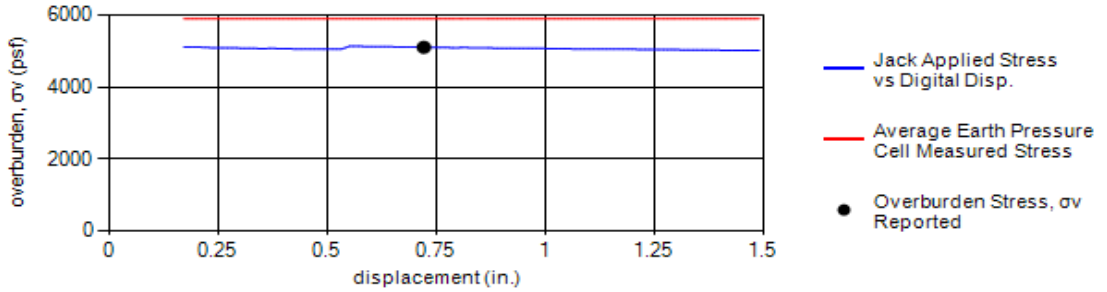


Comments

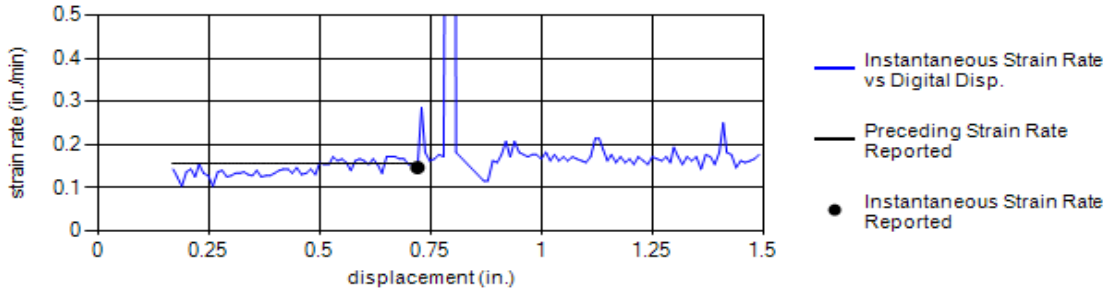
Personnel

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

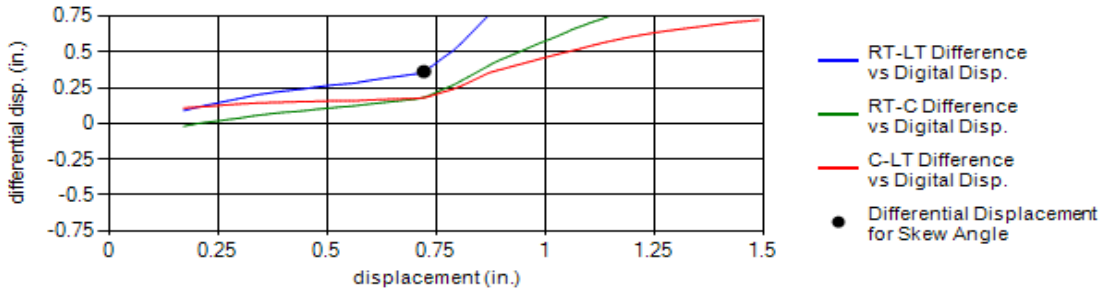
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
6119	No Data	5417	6180	No Data	5905	1.03	5108



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.15	0.16	0.16



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.36	0.18	0.18	No Data	1.16	CCW



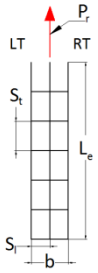
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/18/2011 1:15:00 PM
Test Identification:	TS26.05-G-6x12-W20xW11-L6-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):	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

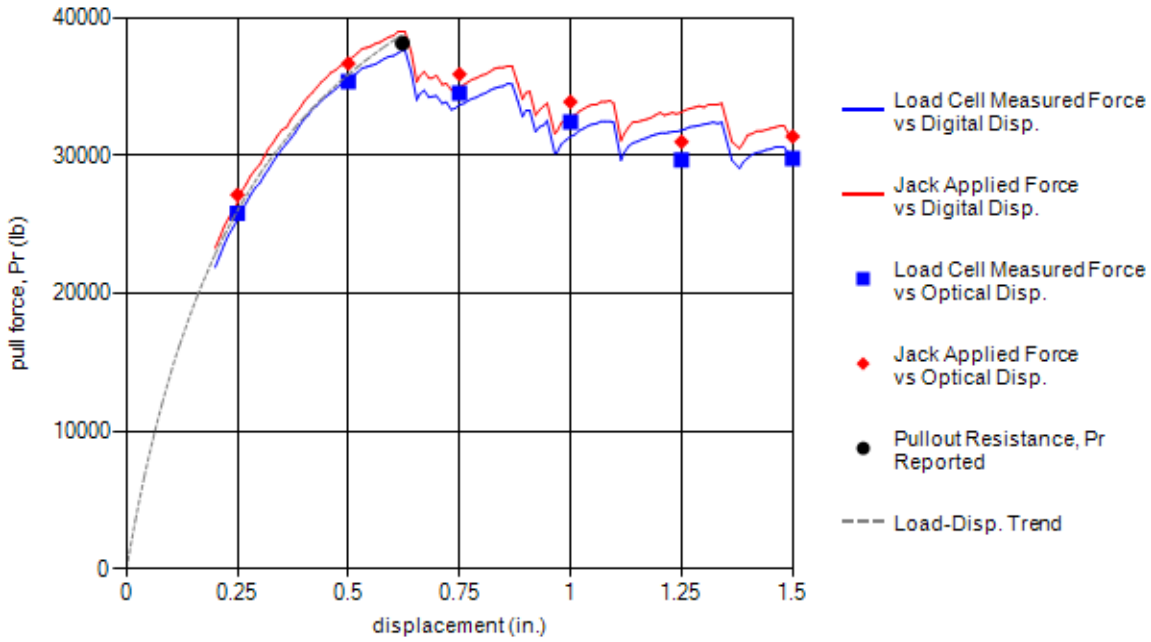
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	122.4 ±1.4
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	4.9 ±0.5%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	98.4 ±1.1%

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	2609	38133	20.3	**1.22**

Load-Displacement Curve

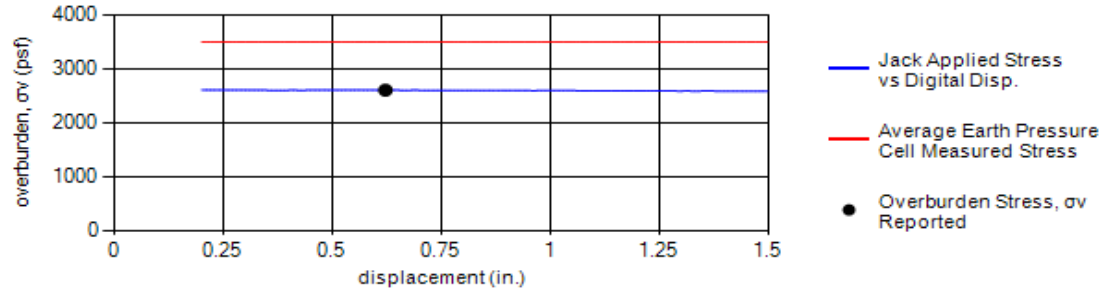


Comments

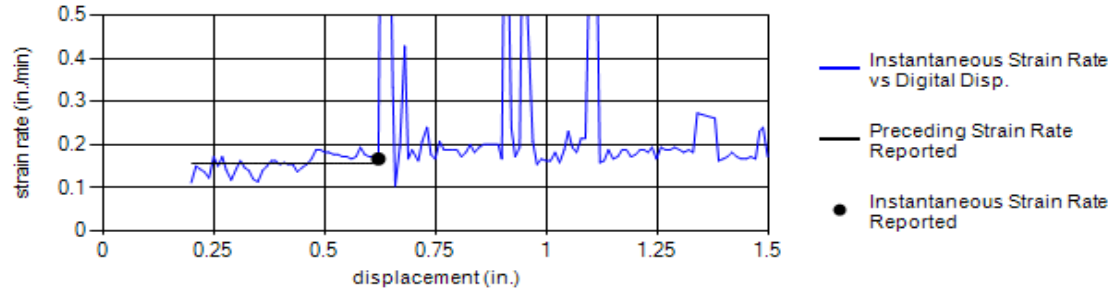
Personnel

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

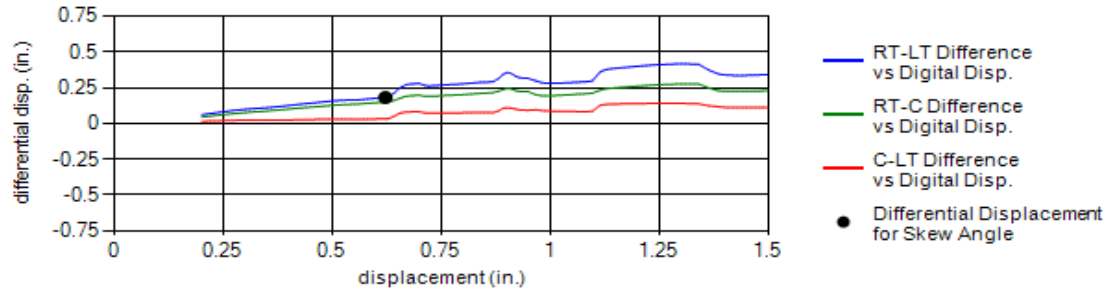
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
4250	No Data	2629	3643	No Data	3507	1.95	2609



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



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.18	0.15	0.03	No Data	0.87	CCW



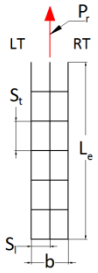
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/18/2011 12:40:00 PM
Test Identification:	TS26.06-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

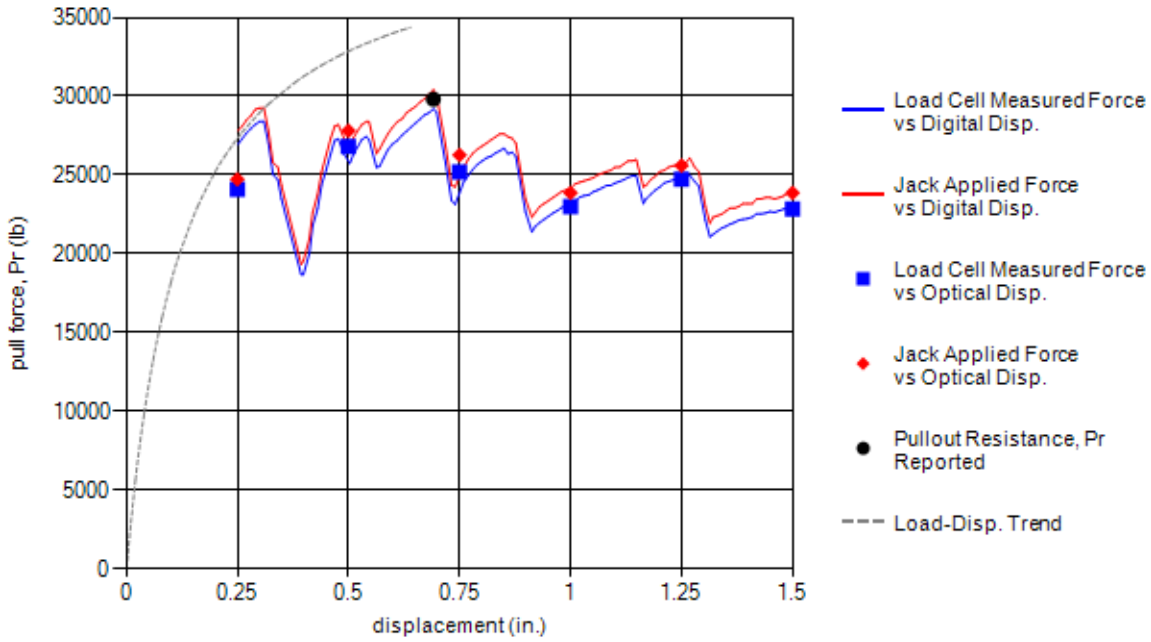
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	122.4	±1.4
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	4.9	±0.5%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	98.4	±1.1%

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	2581	29809	20.1	**0.64**

Load-Displacement Curve

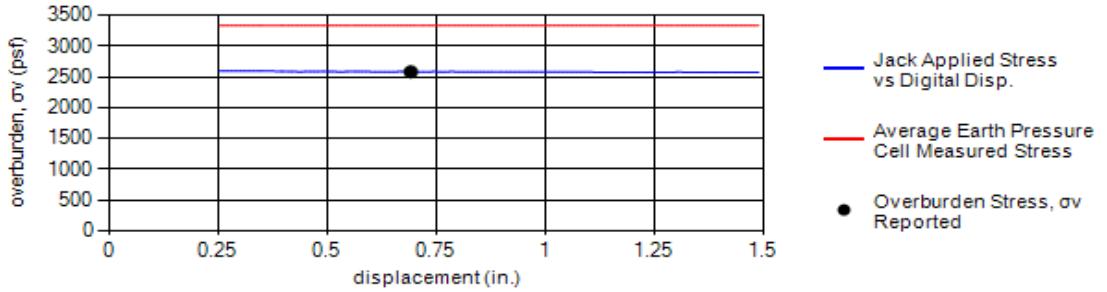


Comments

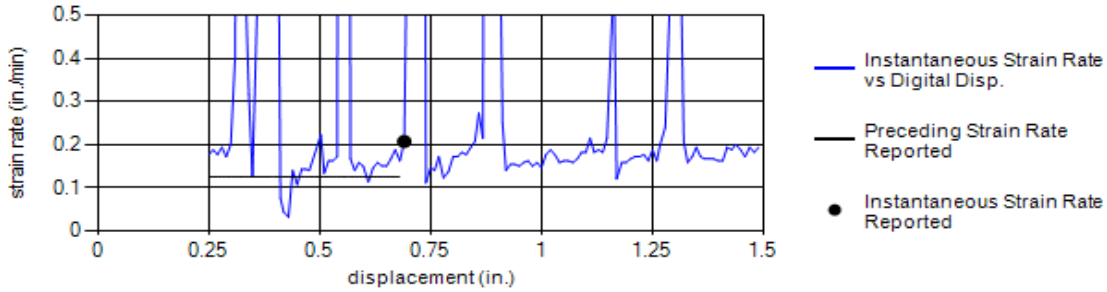
Personnel

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

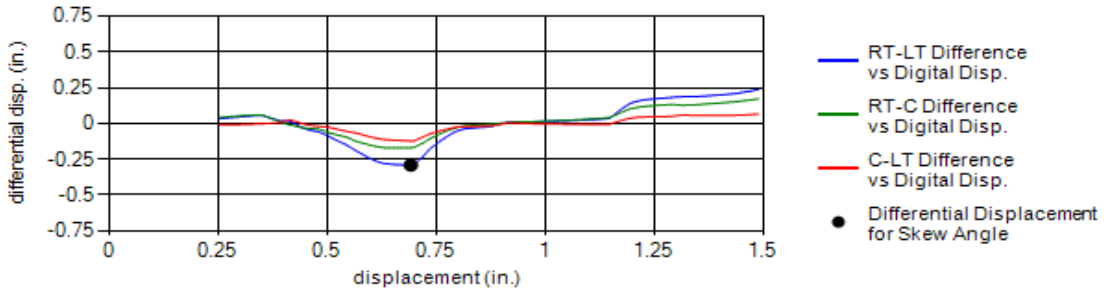
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3697	No Data	2599	3708	No Data	3335	1.97	2581



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.21	0.12	0.15



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
-0.29	-0.17	-0.12	No Data	-0.92	CW



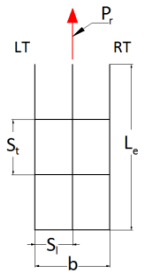
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/18/2011 11:04:00 AM
Test Identification:	TS26.07-G-6x12-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.):	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 B

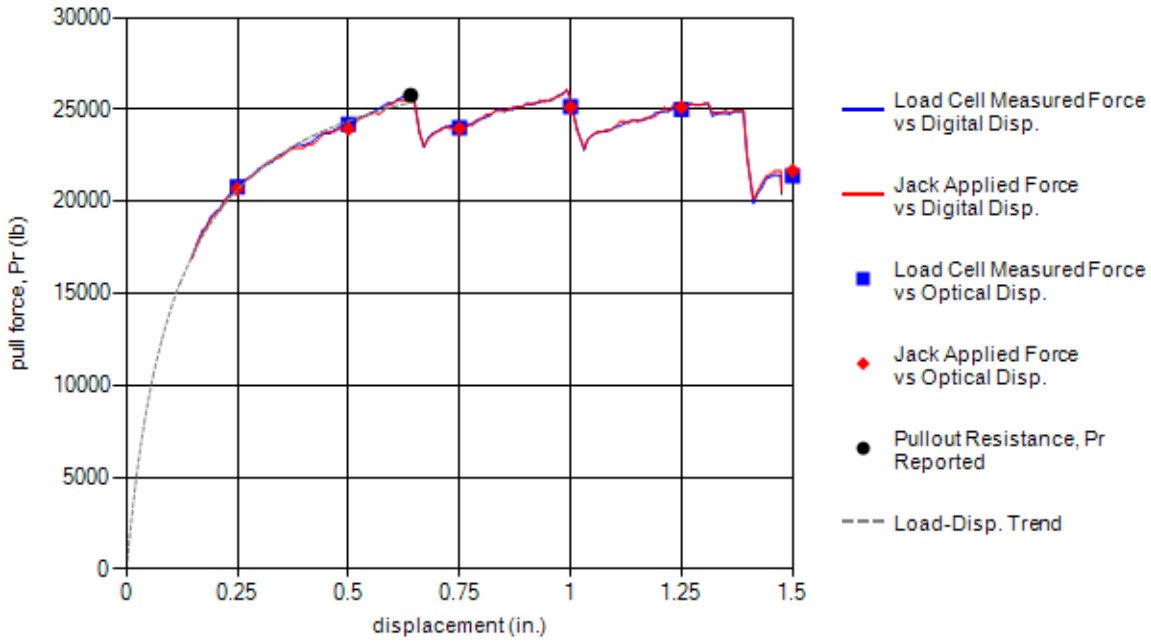
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	122.4	±1.4
Moisture Content, w (%):	4.9	±0.5%
Relative Compaction, C_R (%):	98.4	±1.1%

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	5072	25761	39.5	**0.85**

Load-Displacement Curve

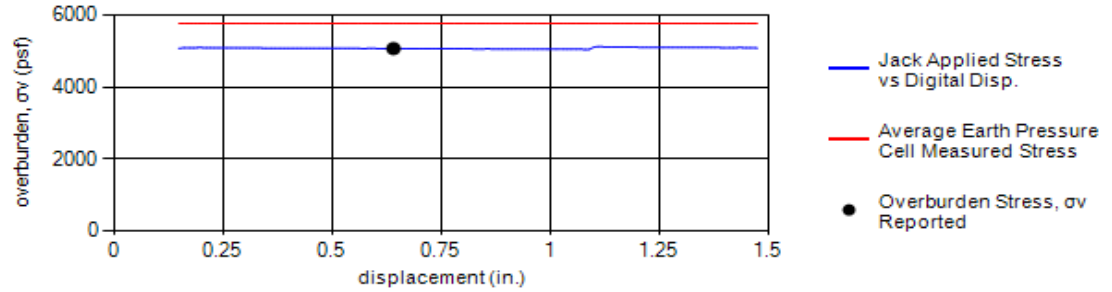


Comments

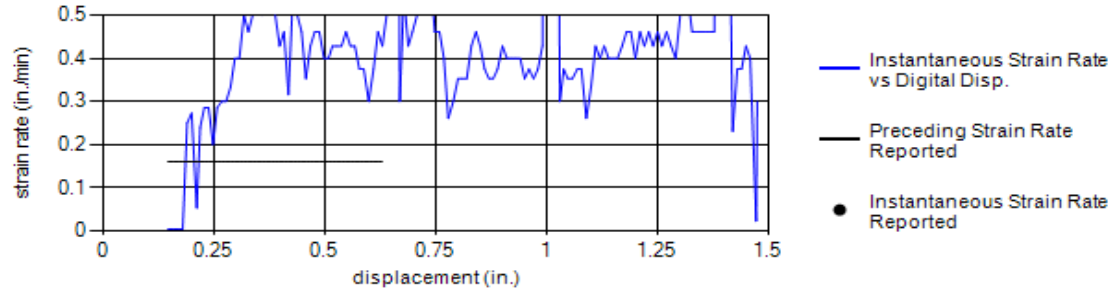
Personnel

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

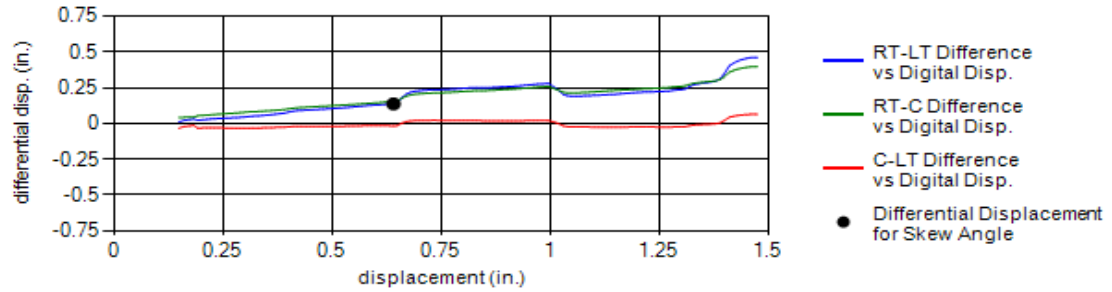
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
6282	No Data	5066	5966	No Data	5771	1.01	5072



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.50	0.16	0.21



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.14	0.15	-0.02	No Data	0.66	CCW



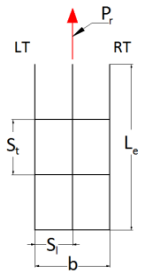
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/18/2011 10:42:00 AM
Test Identification:	TS26.08-G-9x12-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.):	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

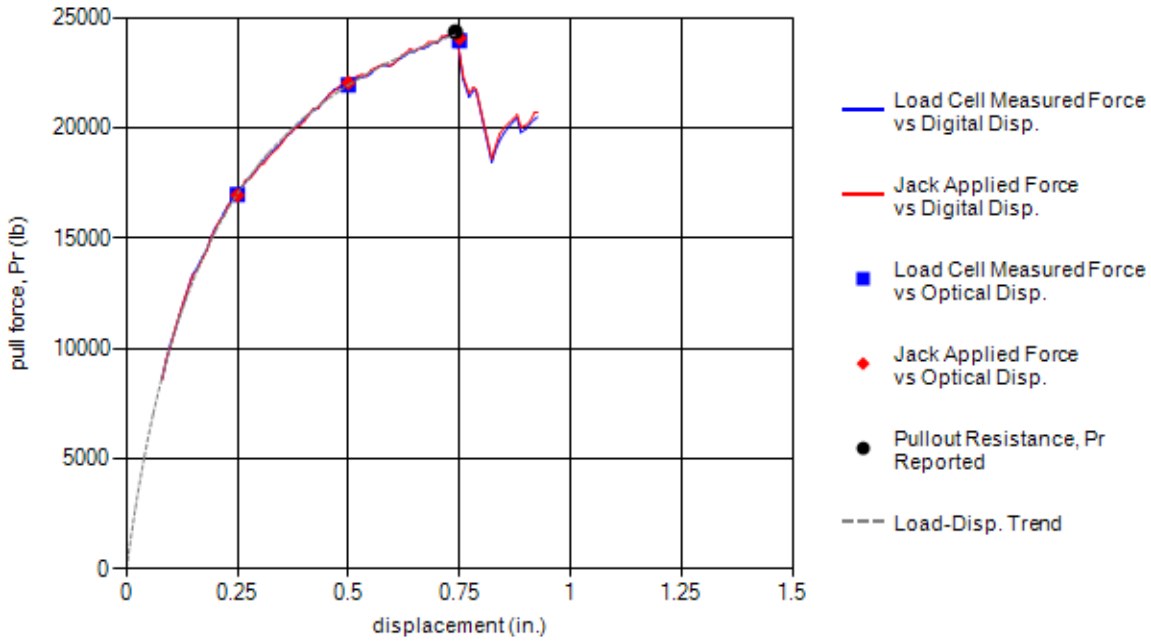
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	122.4	±1.4
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	4.9	±0.5%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	98.4	±1.1%

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	5075	24347	39.5	**0.53**

Load-Displacement Curve

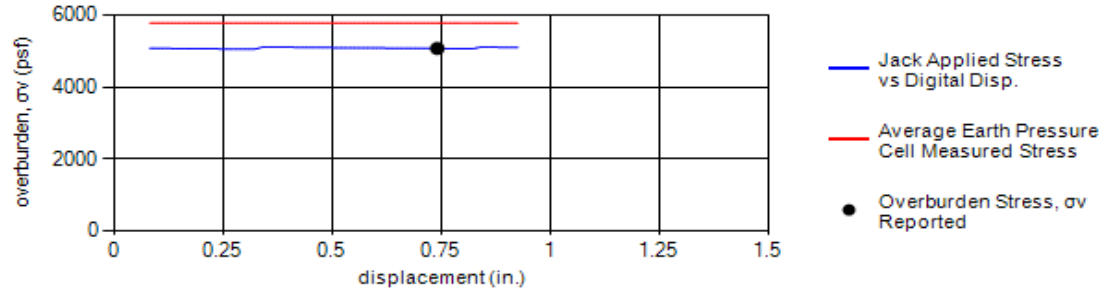


Comments

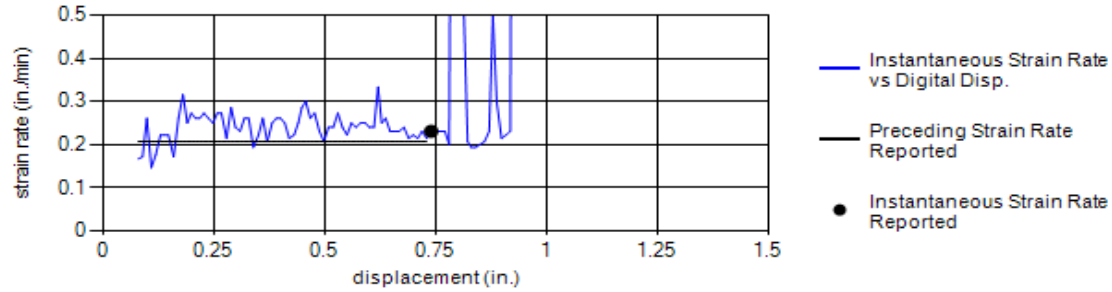
Personnel

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

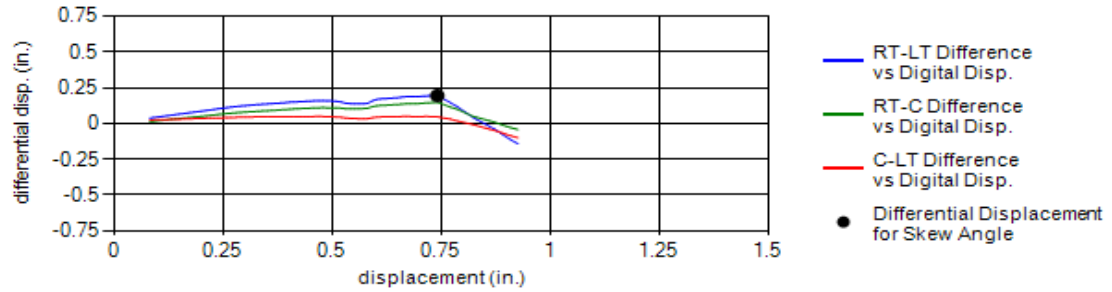
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
6259	No Data	5103	5991	No Data	5784	1.00	5075



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.23	0.21	0.21



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.20	0.15	0.05	No Data	0.62	CCW



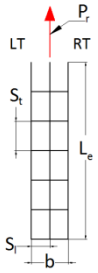
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/18/2011 9:18:00 AM
Test Identification:	TS26.09-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

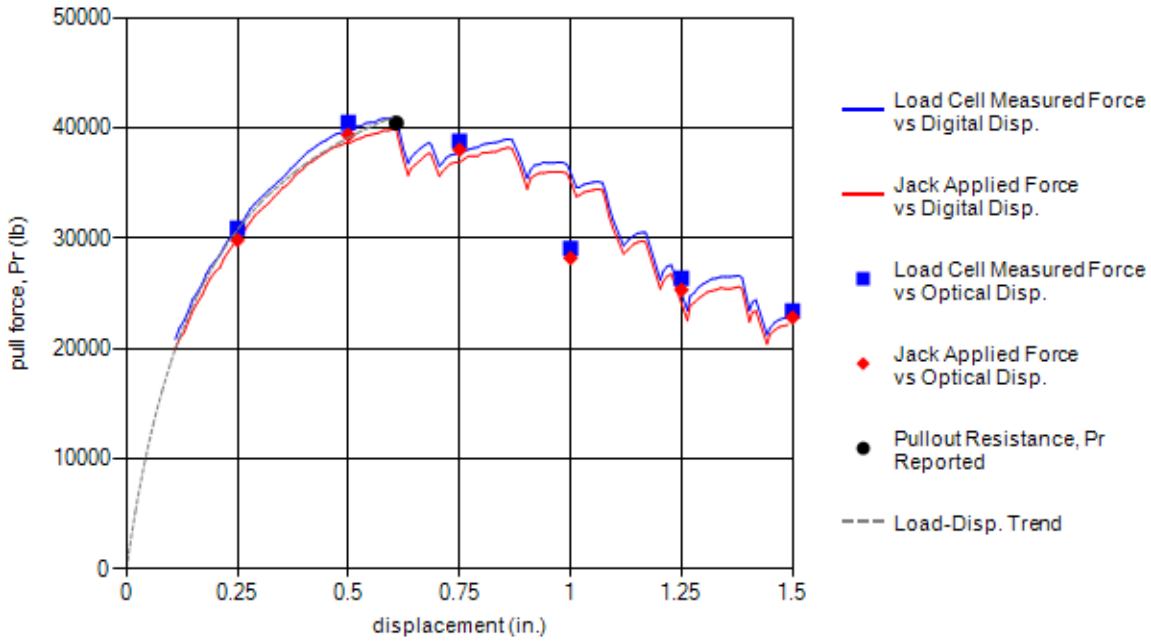
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	122.4	±1.4
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	4.9	±0.5%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	98.4	±1.1%

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	2533	40429	19.7	**1.33**

Load-Displacement Curve

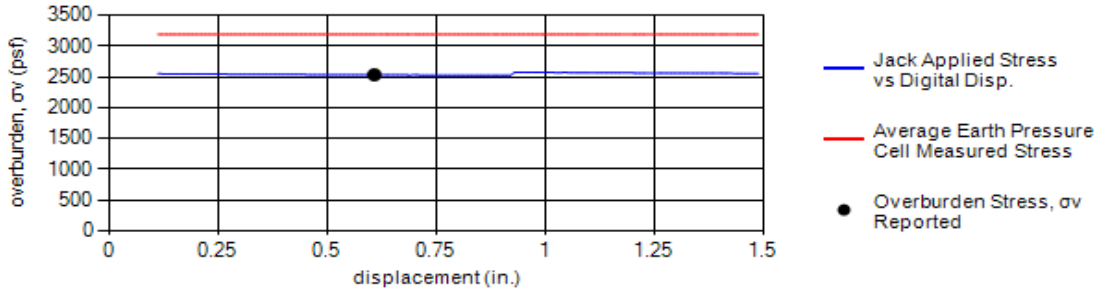


Comments

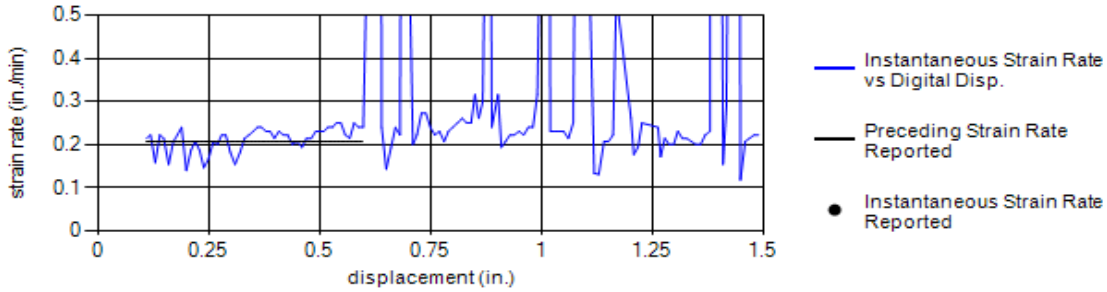
Personnel

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

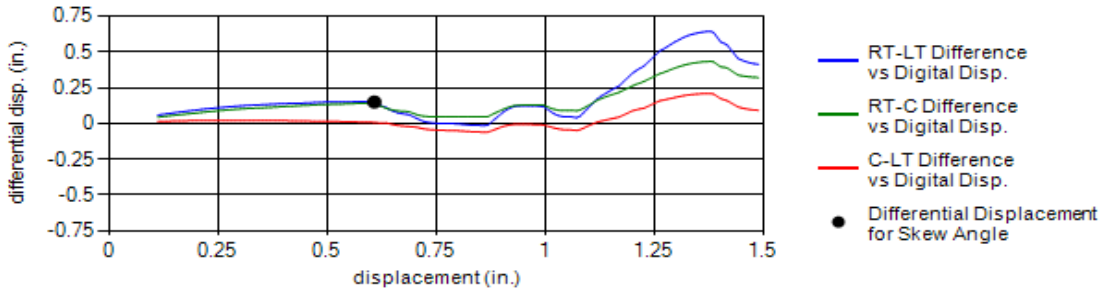
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
4177	No Data	2451	2946	No Data	3191	1.21	2533



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.67	0.21	0.22



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.15	0.14	0.01	No Data	0.72	CCW



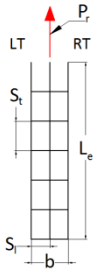
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/18/2011 8:43:00 AM
Test Identification:	TS26.10-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

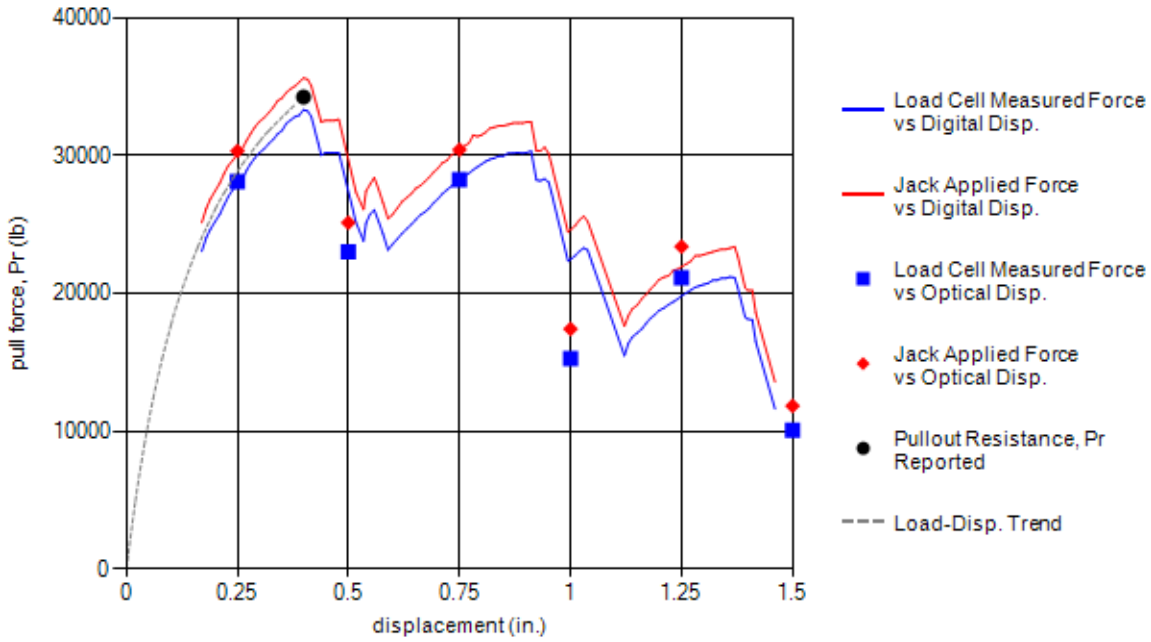
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	122.4	±1.4
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	4.9	±0.5%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	98.4	±1.1%

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	2552	34230	19.9	**0.75**

Load-Displacement Curve

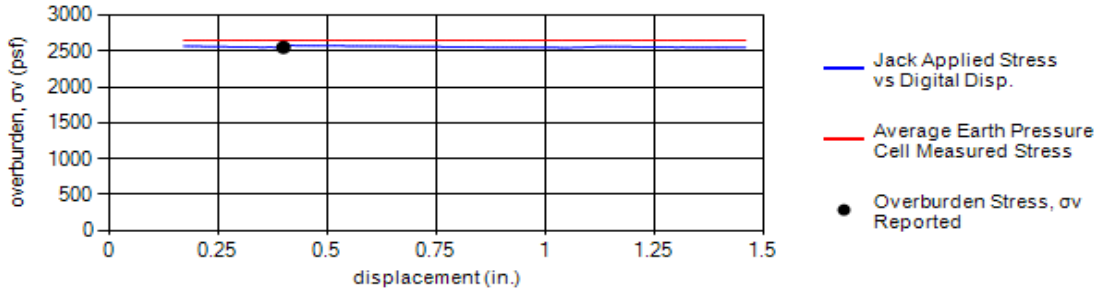


Comments

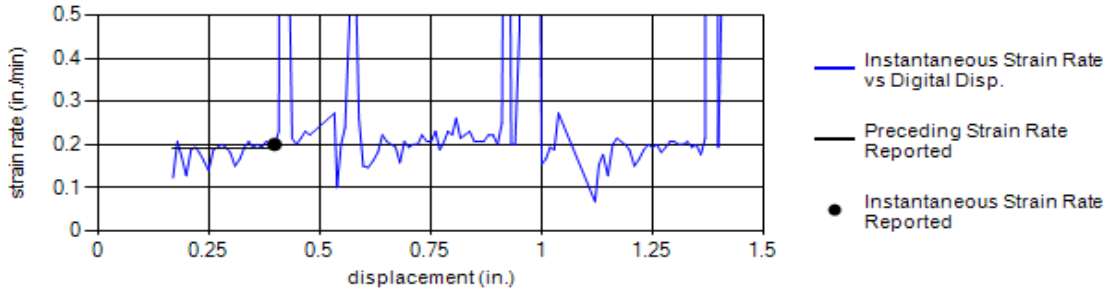
Personnel

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

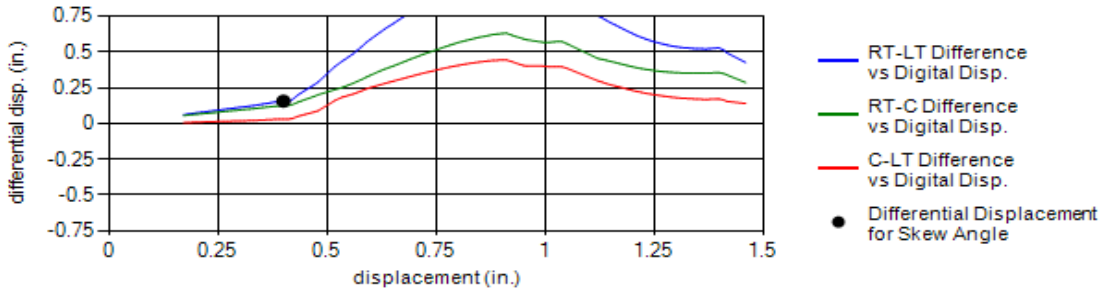
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2630	No Data	2387	2946	No Data	2654	1.13	2552



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.20	0.19	0.21



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.16	0.13	0.03	No Data	0.50	CCW



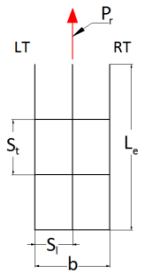
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/18/2011 9:46:00 AM
Test Identification:	TS26.11-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

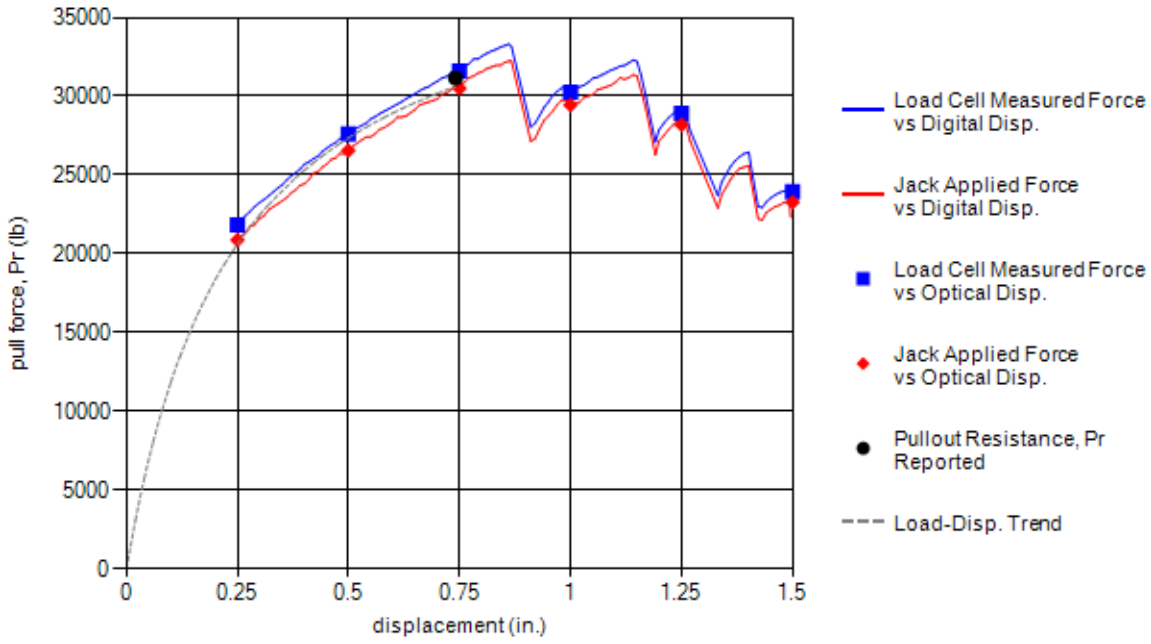
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	122.4 ±1.4
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	4.9 ±0.5%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	98.4 ±1.1%

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	5046	31150	39.3	**1.03**

Load-Displacement Curve

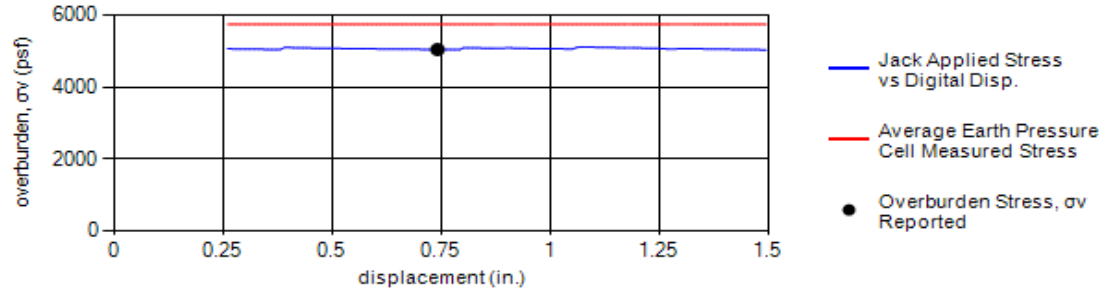


Comments

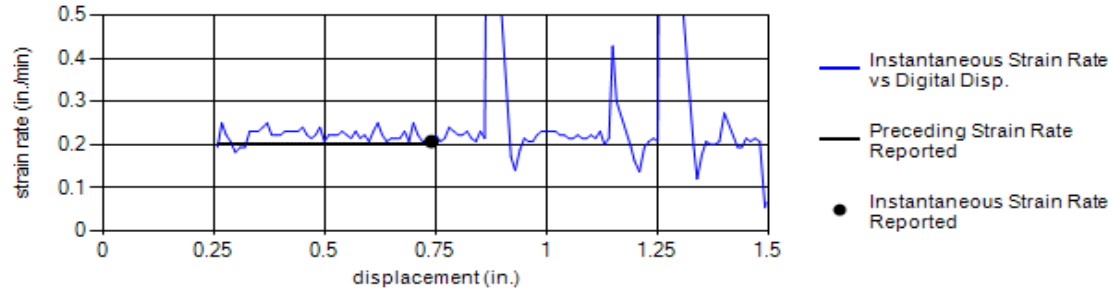
Personnel

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

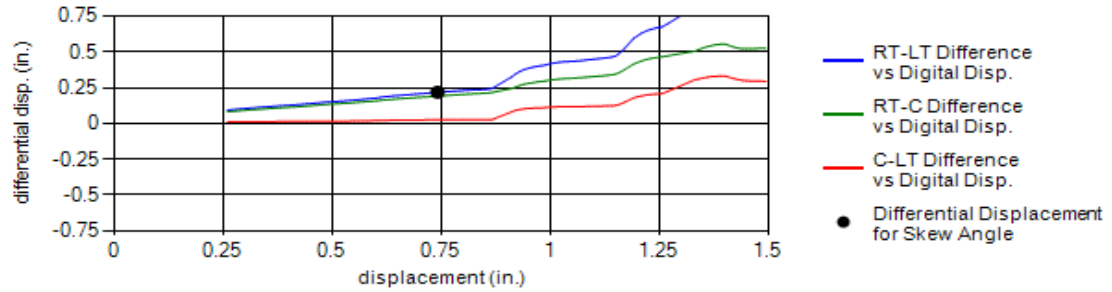
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
6119	No Data	5139	5988	No Data	5749	1.01	5046



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.21	0.20	0.22



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.22	0.19	0.03	No Data	1.05	CCW



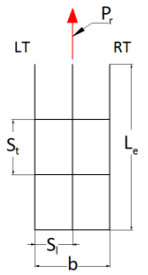
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/18/2011 10:09:00 AM
Test Identification:	TS26.12-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

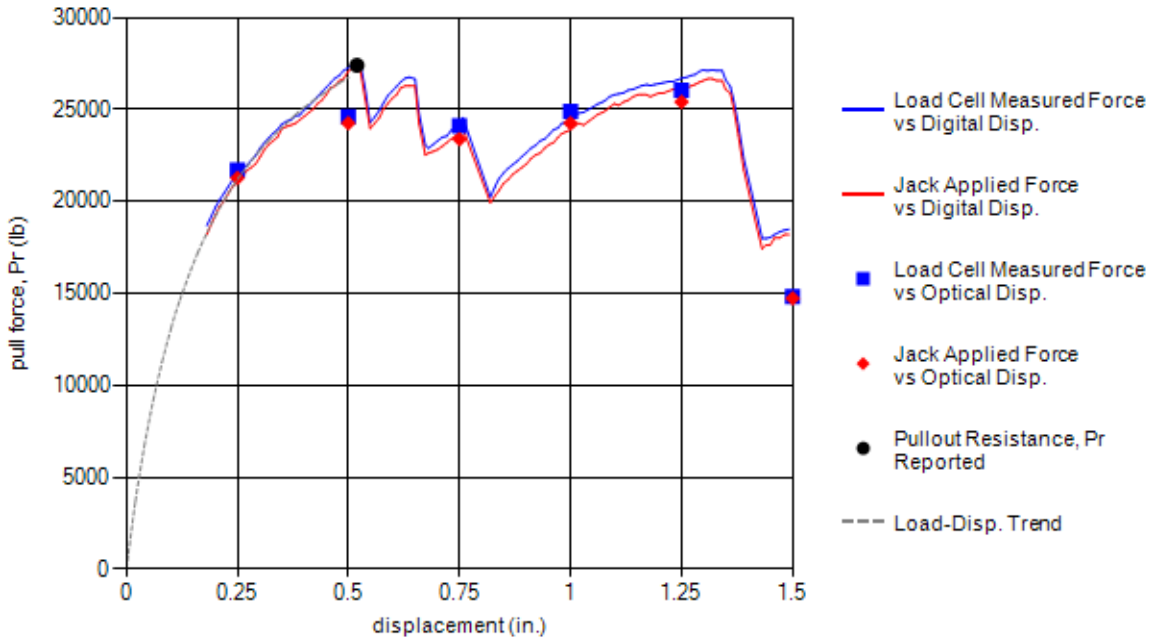
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	122.4	±1.4
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	4.9	±0.5%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	98.4	±1.1%

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	5099	27395	39.7	**0.60**

Load-Displacement Curve

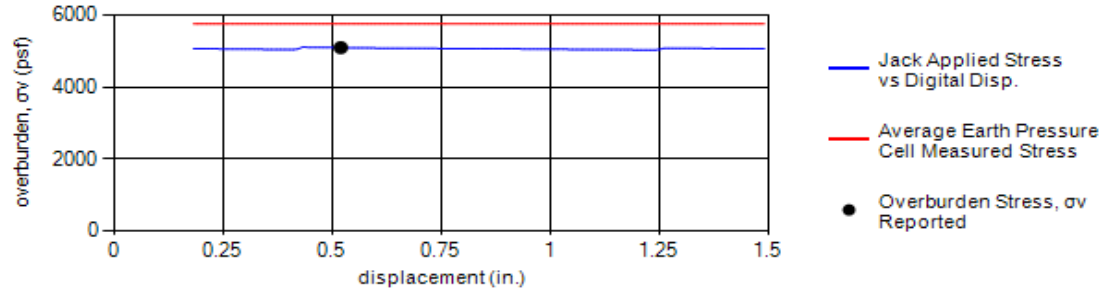


Comments

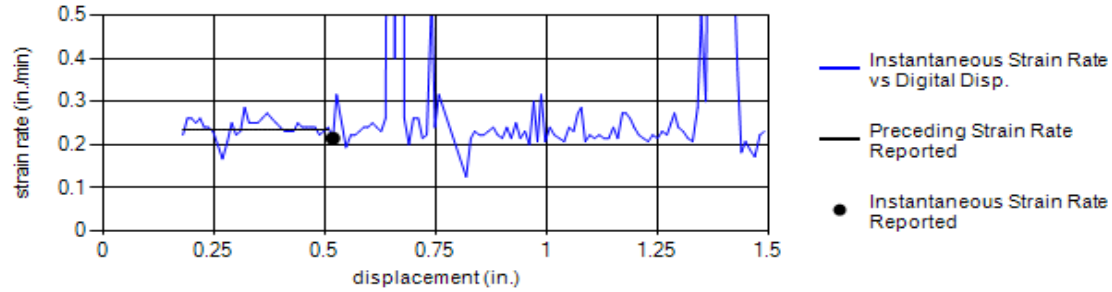
Personnel

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

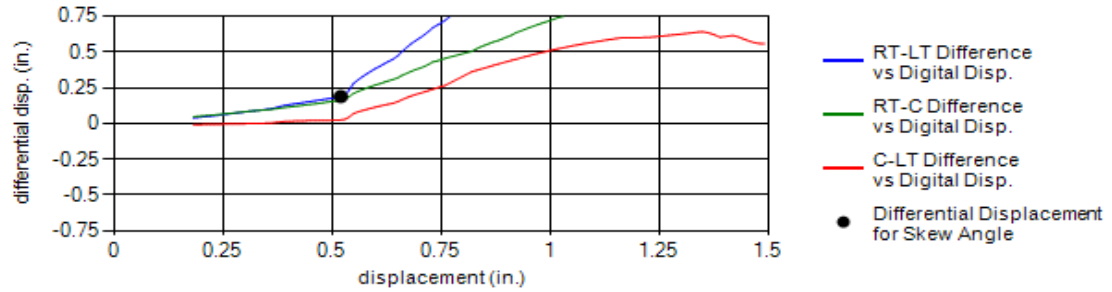
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
6194	No Data	5130	5955	No Data	5760	1.01	5099



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.21	0.23	0.24



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.19	0.16	0.03	No Data	0.60	CCW



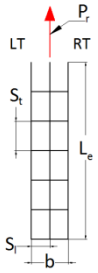
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/27/2011 3:01:00 PM
Test Identification:	TS27.01-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

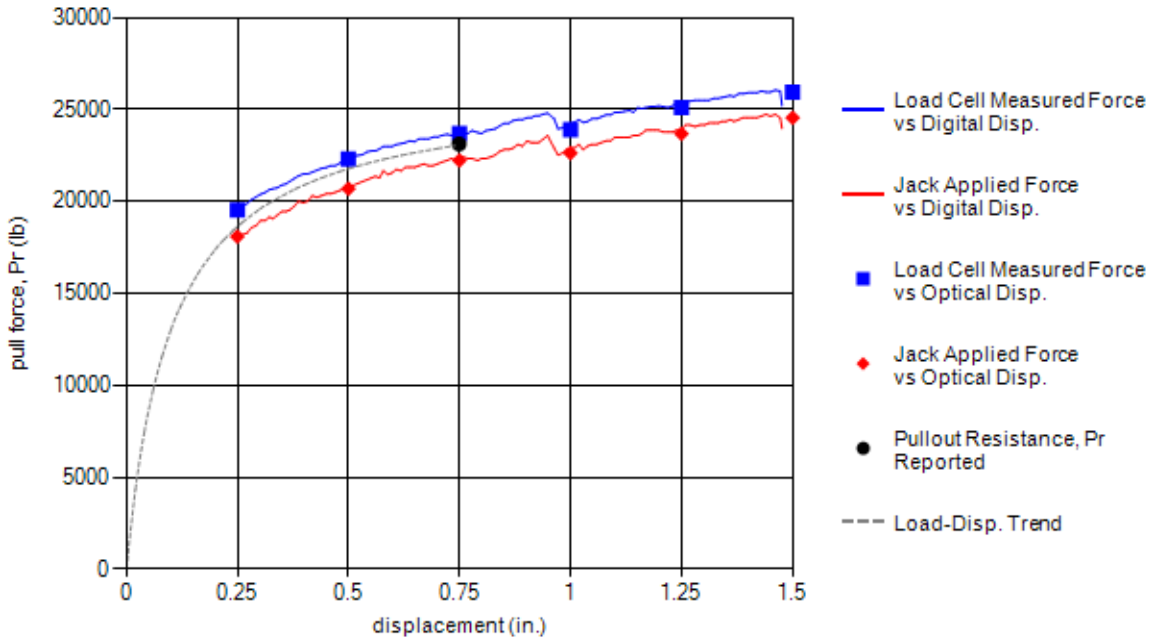
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	119.8 ±1.2
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	8.0 ±0.2%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	96.2 ±0.9%

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	1506	23117	11.6	**0.85**

Load-Displacement Curve

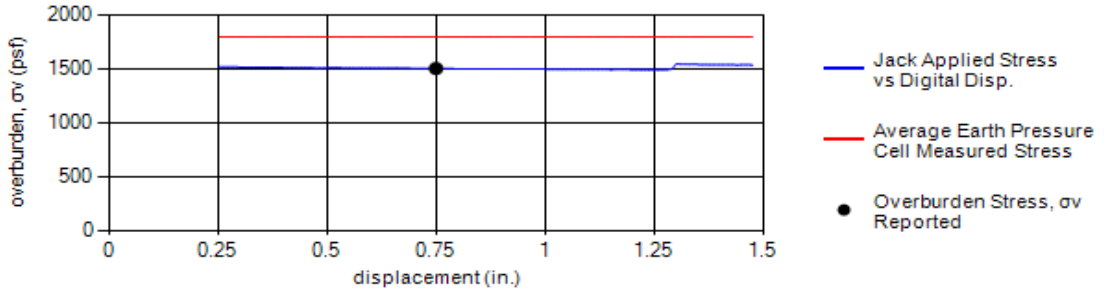


Comments

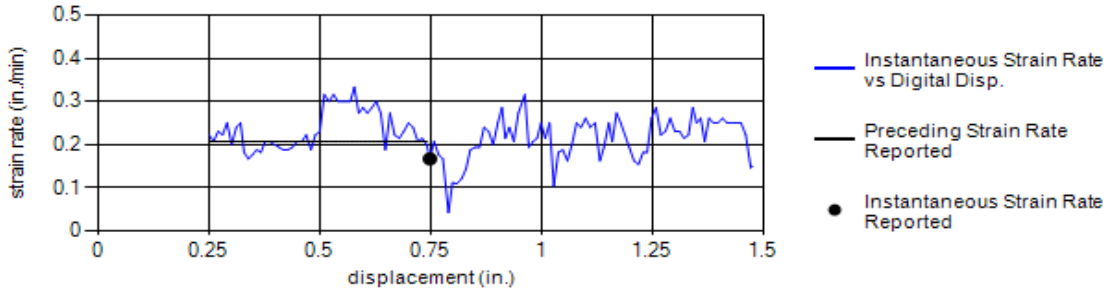
Personnel

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

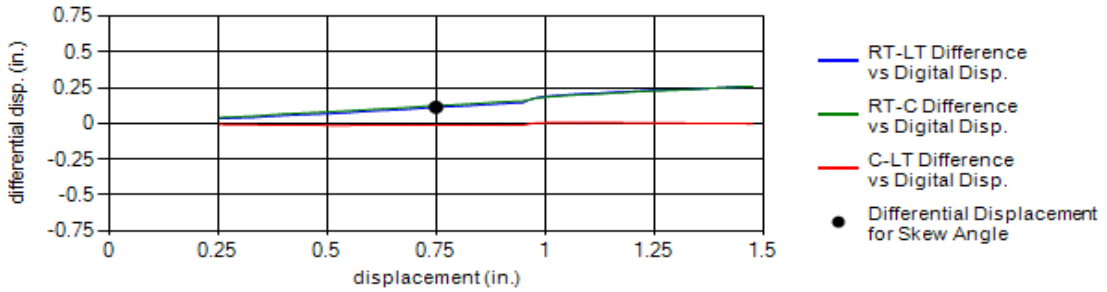
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2076	No Data	1670	1650	No Data	1798	1.03	1506



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.17	0.21	0.20



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.11	0.13	-0.01	No Data	0.36	CCW



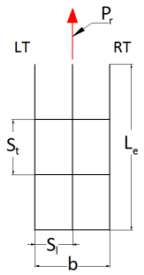
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/27/2011 2:25:00 PM
Test Identification:	TS27.02-G-9x12-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.):	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 B

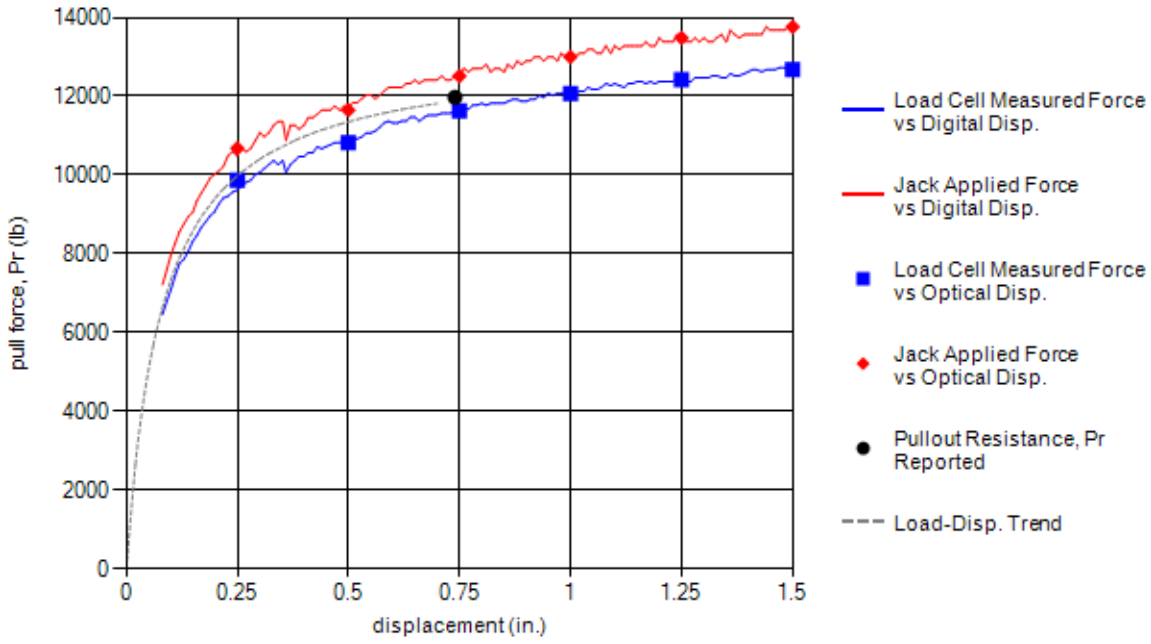
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	119.8	±1.2
Moisture Content, w (%):	8.0	±0.2%
Relative Compaction, C_R (%):	96.2	±0.9%

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	1519	11974	11.7	**0.88**

Load-Displacement Curve

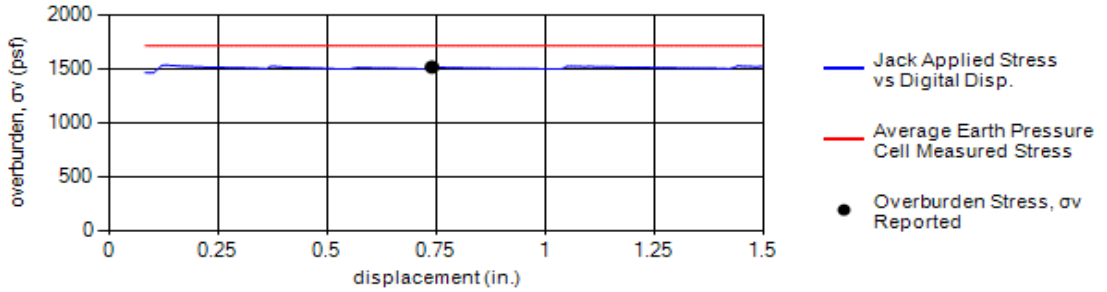


Comments

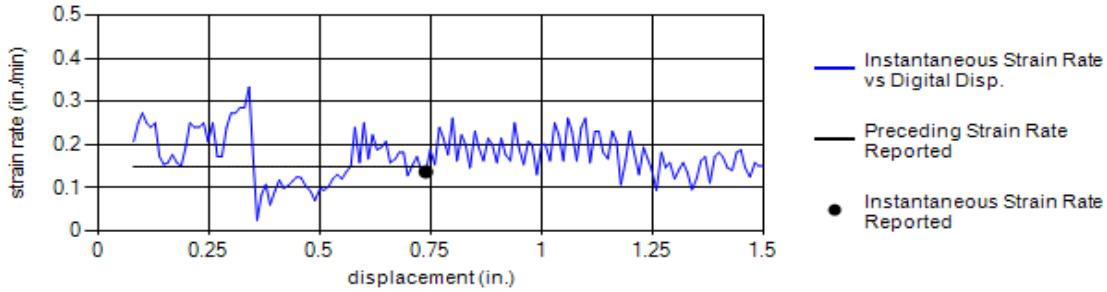
Personnel

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

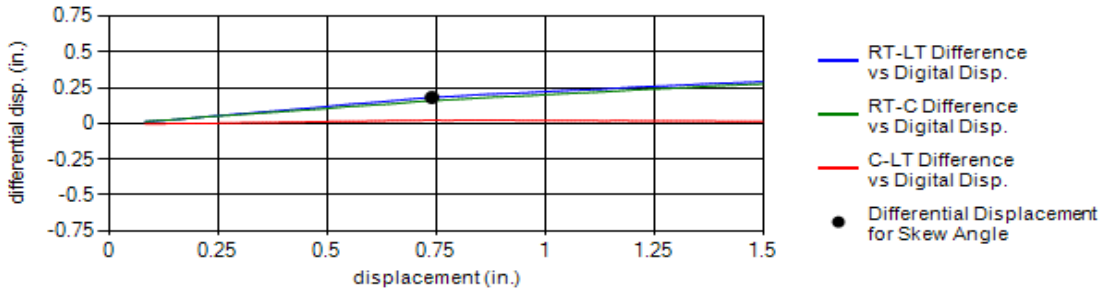
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1826	No Data	1671	1649	No Data	1715	1.02	1518



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



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.18	0.16	0.02	No Data	0.58	CCW



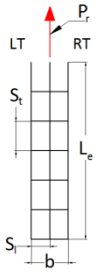
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/31/2011 2:06:00 PM
Test Identification:	TS27.03-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

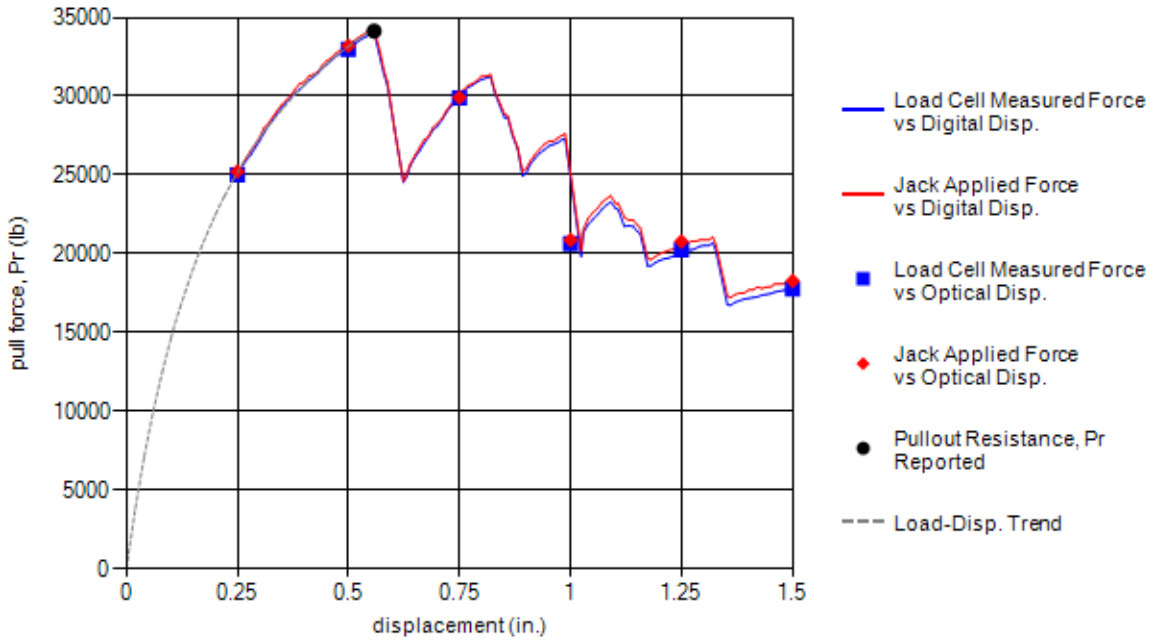
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	119.8	±1.2
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	8.0	±0.2%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	96.2	±0.9%

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	2551	34138	19.7	**0.74**

Load-Displacement Curve

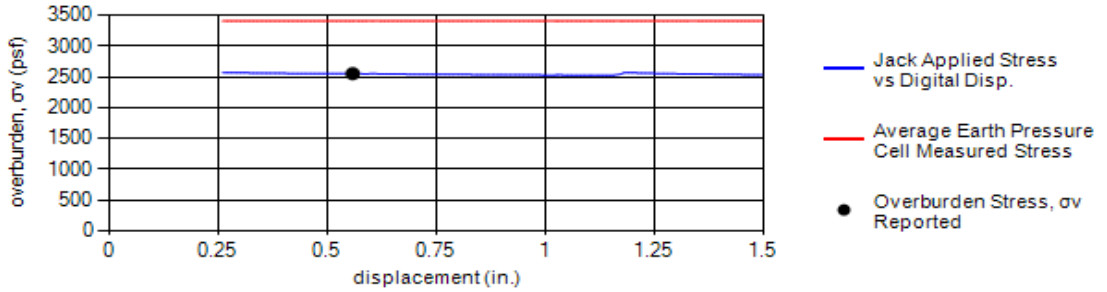


Comments

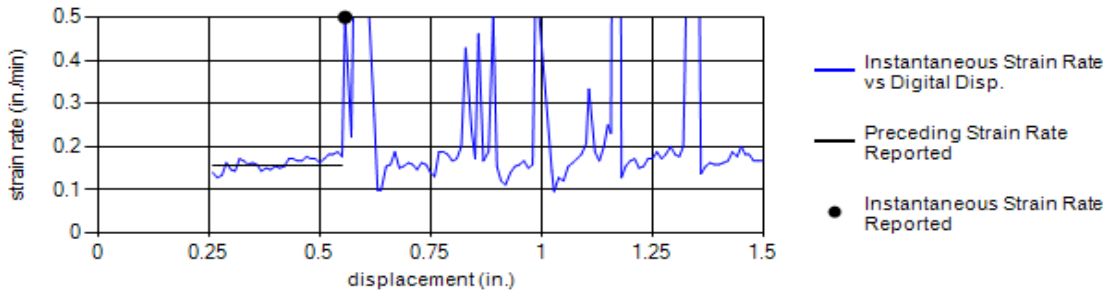
Personnel

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

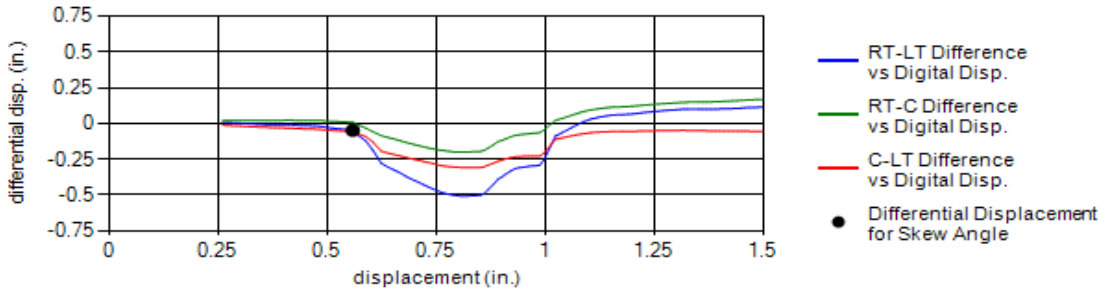
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
4125	No Data	2994	3102	No Data	3407	2.00	2551



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.50	0.16	0.16



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
-0.05	0.01	-0.06	No Data	-0.15	CW



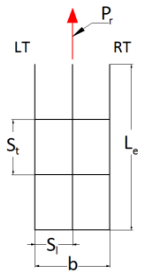
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/31/2011 1:31:00 PM
Test Identification:	TS27.04-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

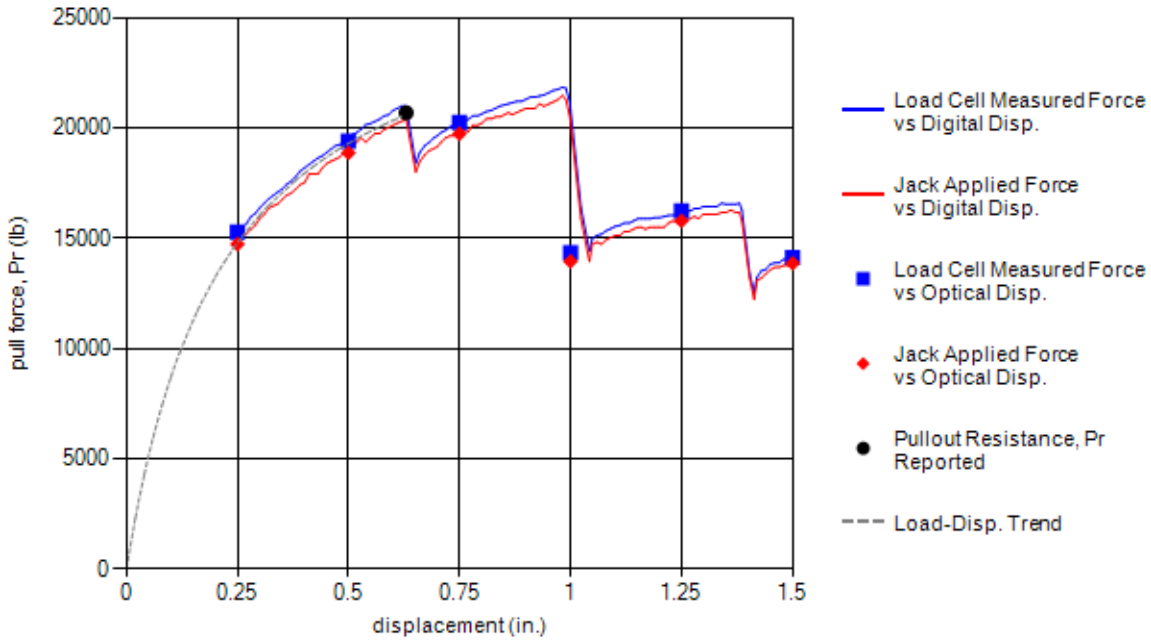
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	119.8	±1.2
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	8.0	±0.2%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	96.2	±0.9%

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	0.63	5082	20680	39.3	**0.68**

Load-Displacement Curve

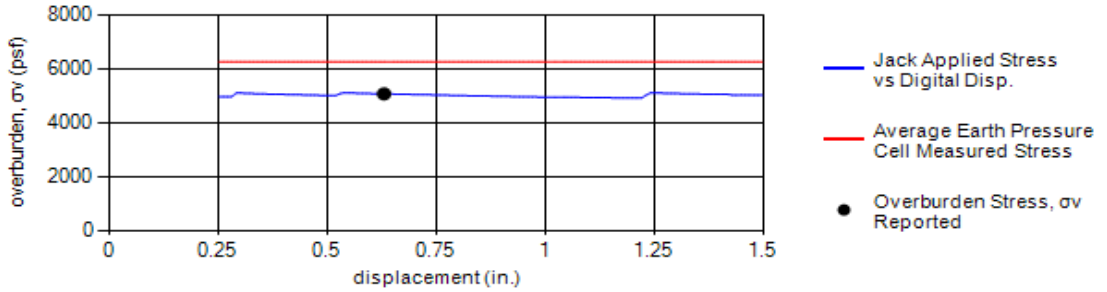


Comments

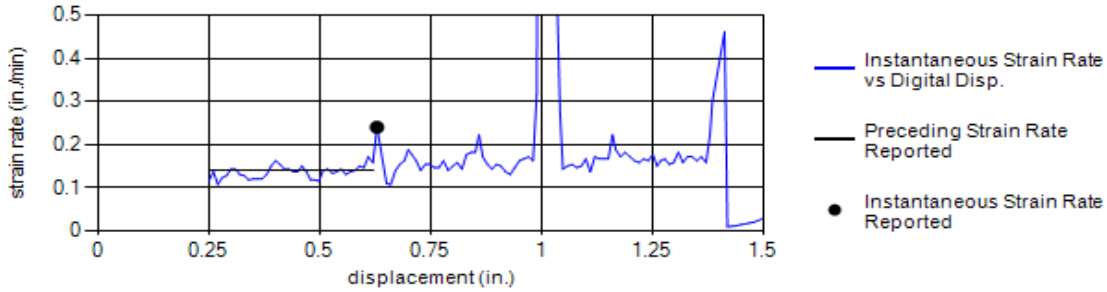
Personnel

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

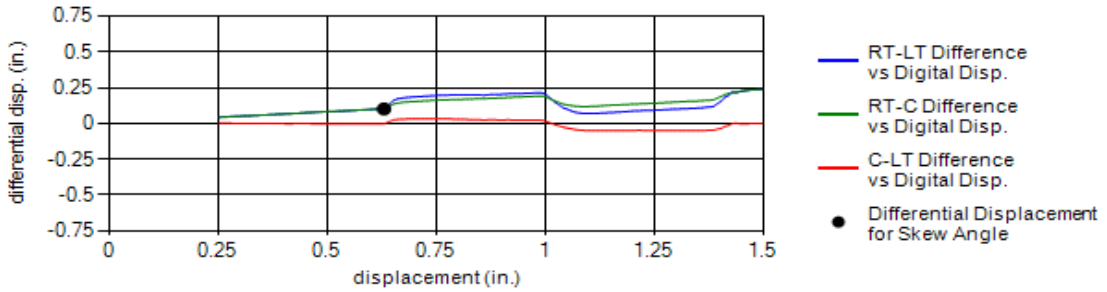
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
6920	No Data	6046	5869	No Data	6279	1.05	5082



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.24	0.14	0.15



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.10	0.10	0.00	No Data	0.49	CCW



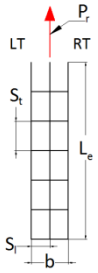
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/31/2011 3:38:00 PM
Test Identification:	TS27.05-G-6x12-W9.5xW11-L6-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):	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

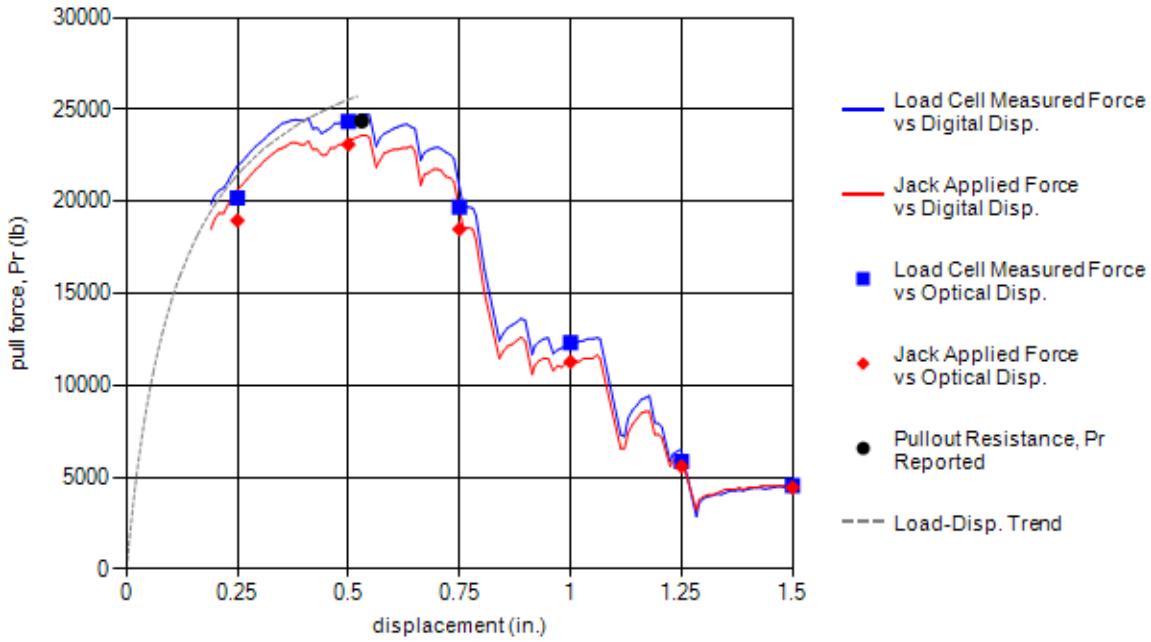
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	119.8 ±1.2
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	8.0 ±0.2%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	96.2 ±0.9%

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	0.53	659	24368	5.1	**3.08**

Load-Displacement Curve

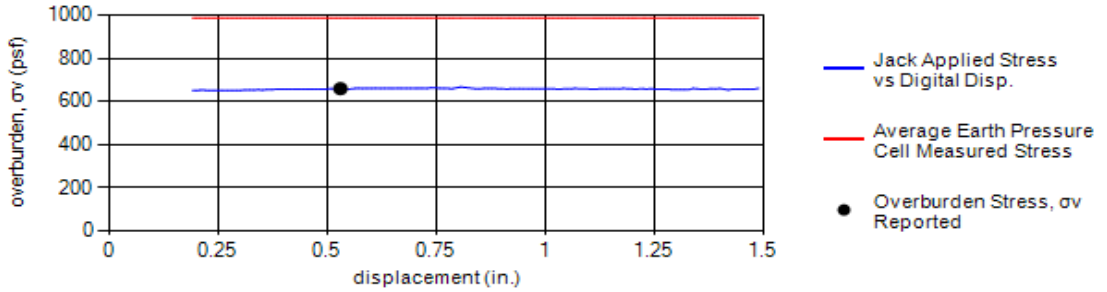


Comments

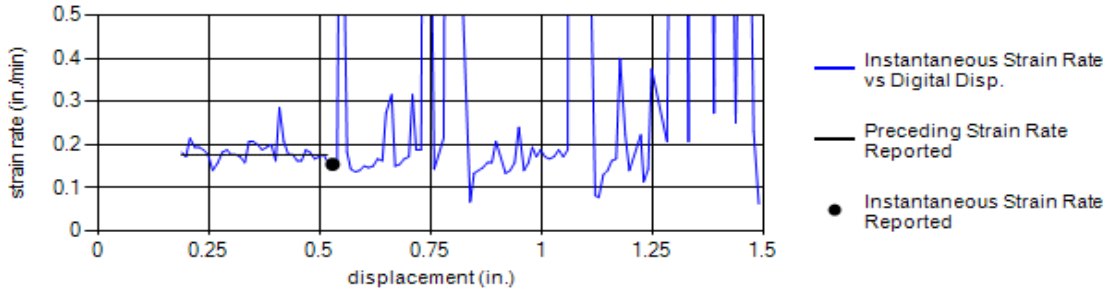
Personnel

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

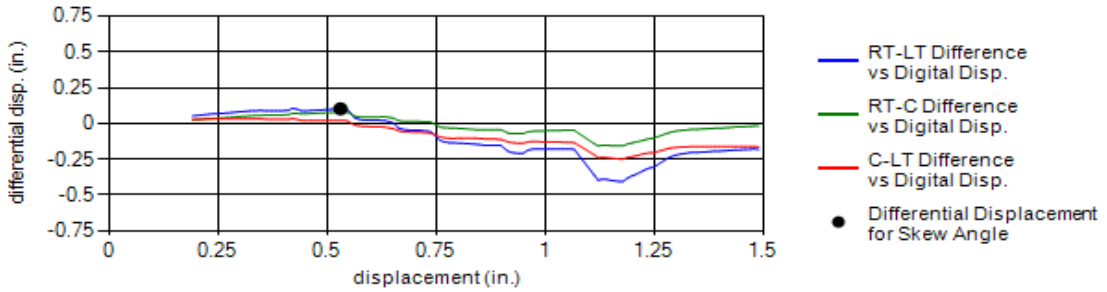
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1348	No Data	872	744	No Data	988	7.95	659



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.15	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	0.08	0.02	No Data	0.49	CCW



Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

Appendix I

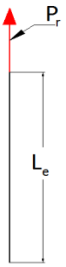
MSE Reinforcement Pullout Test Reports: Smooth Bars in Type B Backfill

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/31/2011 9:12:00 AM
Test Identification:	TS27.10-B-W20-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.):	0.5	*Diameter, t (in.):*	--	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	--	*Spacing, S_l (in.):*	--

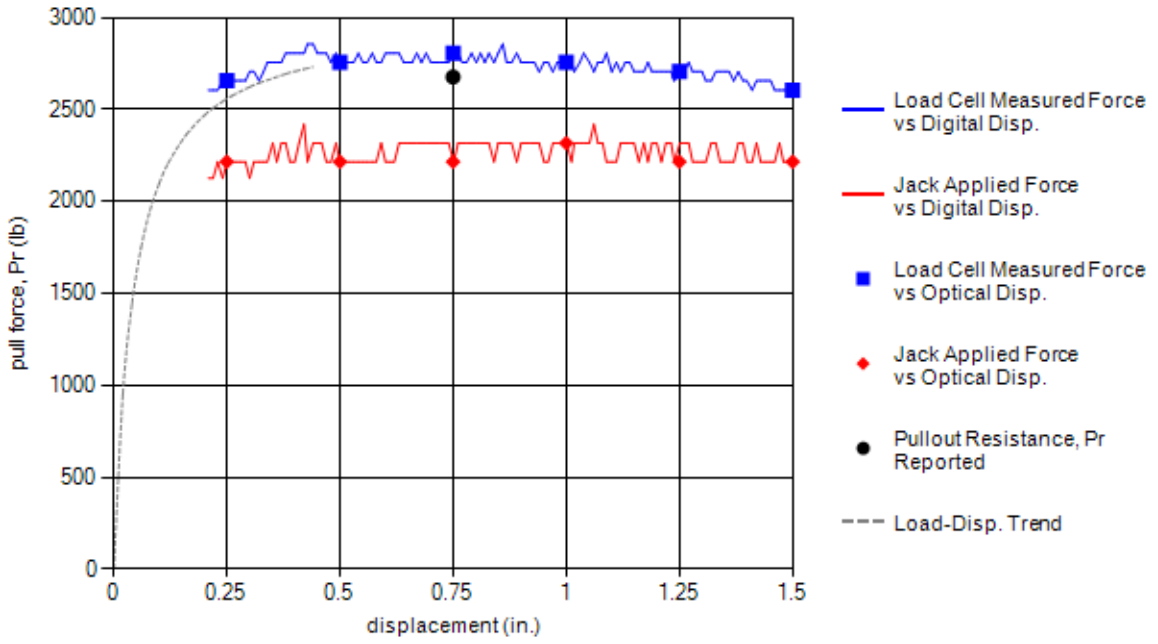
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	119.8	±1.2
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	8.0	±0.2%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	96.2	±0.9%

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	2676	5.1	--

Load-Displacement Curve



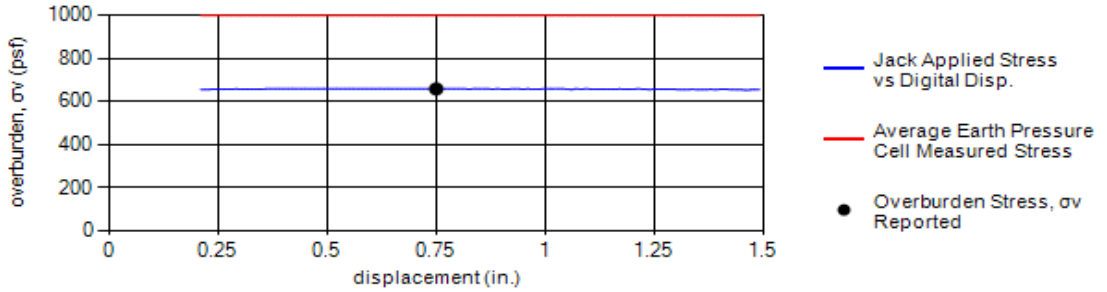
Comments

Reported pullout resistance corresponds to longitudinal bar contribution to welded steel grid system.

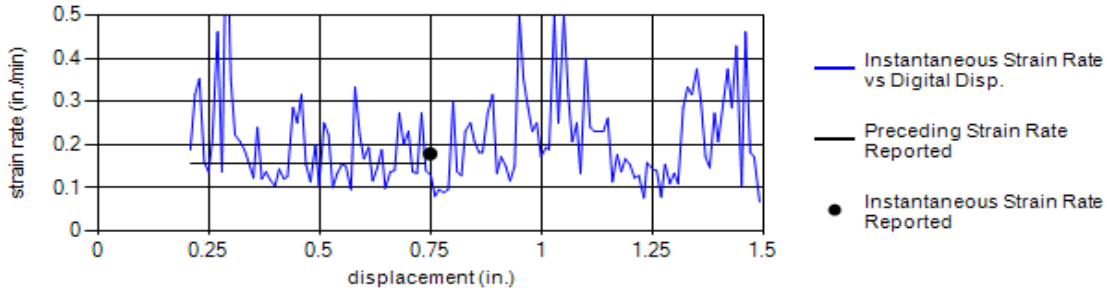
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1199	No Data	860	937	No Data	999	7.55	658



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.18	0.15	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

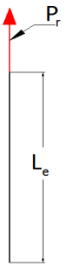
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/31/2011 8:50:00 AM
Test Identification:	TS27.11-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				

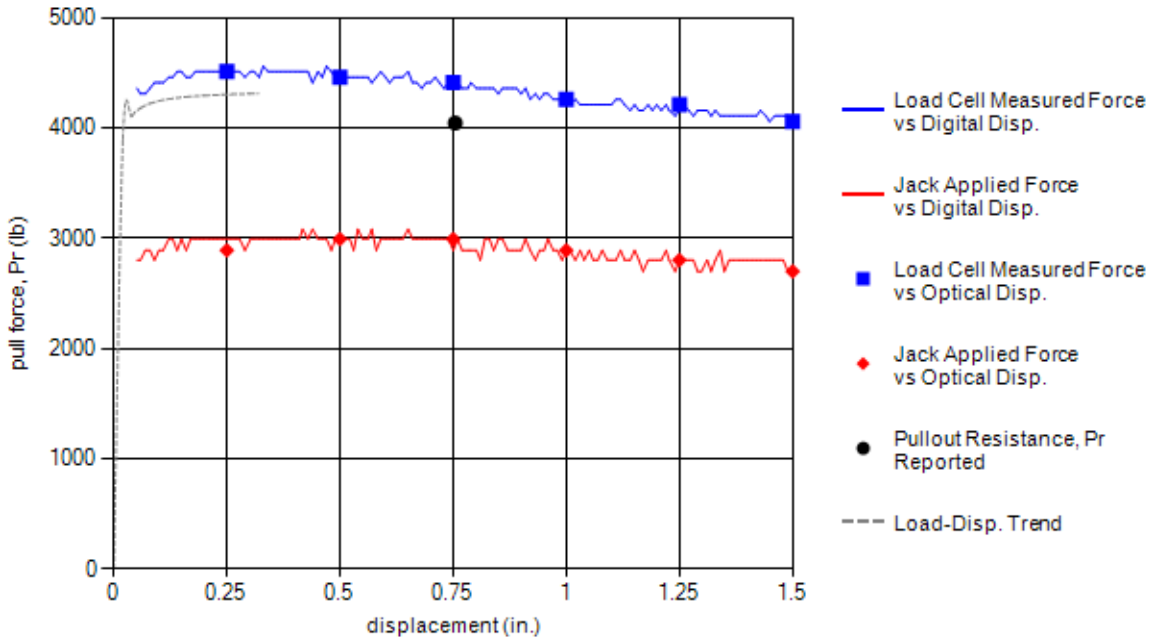
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	119.8 ±1.2
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	8.0 ±0.2%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	96.2 ±0.9%

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	1540	4043	11.9	--

Load-Displacement Curve



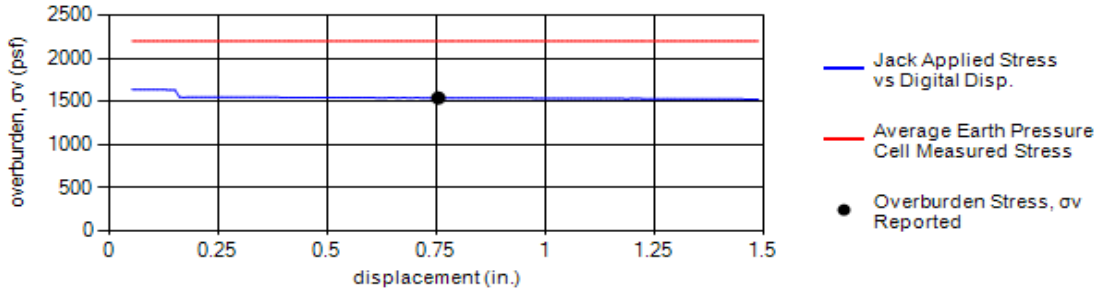
Comments

Reported pullout resistance corresponds to longitudinal bar contribution to welded steel grid system.

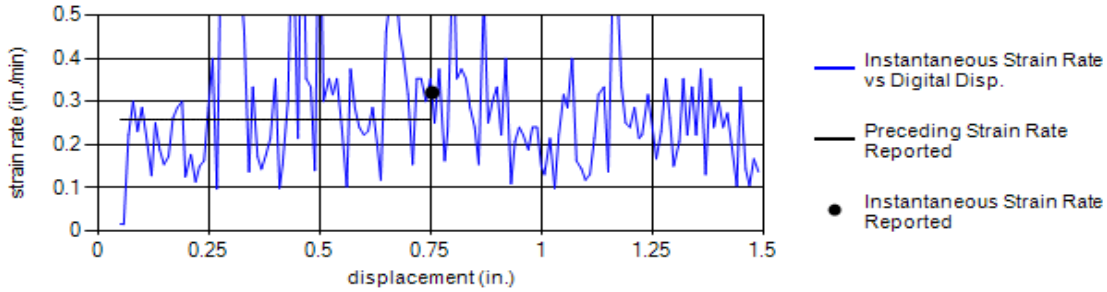
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2695	No Data	1903	2008	No Data	2202	3.21	1540



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.32	0.26	0.21



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

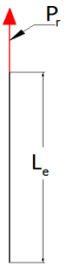
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/31/2011 8:14:00 AM
Test Identification:	TS27.13-B-W20-L3-Z40-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):	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

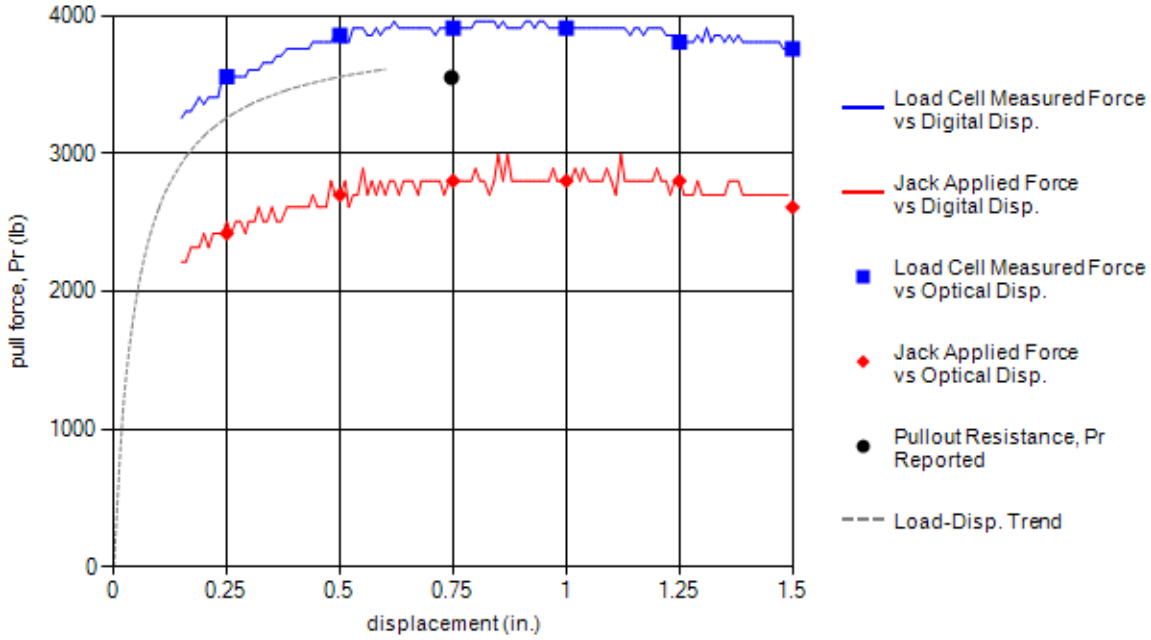
Specification:	TxDOT Item 423 - Type B

Moisture Density Relationship (TEX-114-E)		In-Place Density (TEX-115-E)		
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Dry Unit Weight, γ_d (pcf):*	119.8	±1.2
Optimum Moisture Content, OMC (%):	7.8%	*Moisture Content, w (%):*	8.0	±0.2%
		Relative Compaction, C_R (%):	96.2	±0.9%

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	4963	3550	38.4	--

Load-Displacement Curve



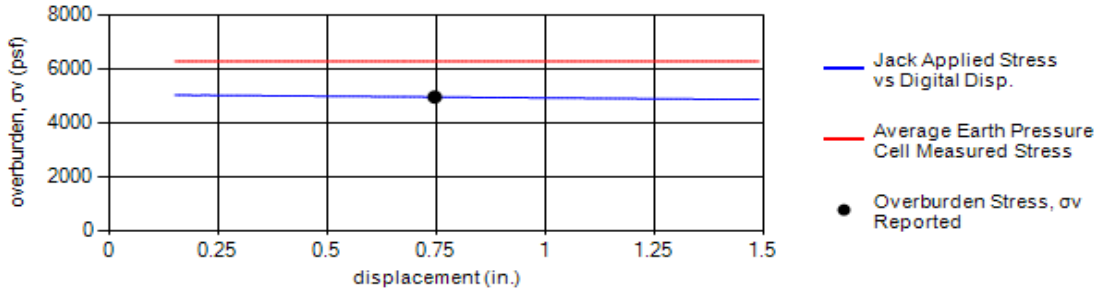
Comments

Reported pullout resistance corresponds to longitudinal bar contribution to welded steel grid system.

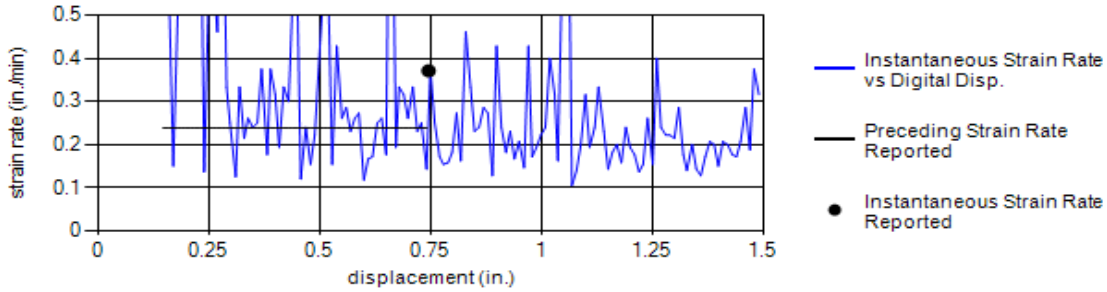
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
7004	No Data	5997	5865	No Data	6289	1.03	4963



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

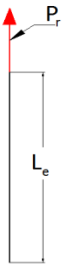
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	6/1/2011 10:47:00 AM
Test Identification:	TS27.14-B-W20-L6-Z20-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.):	0.5	*Diameter, t (in.):*	--	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	--	*Spacing, S_l (in.):*	--

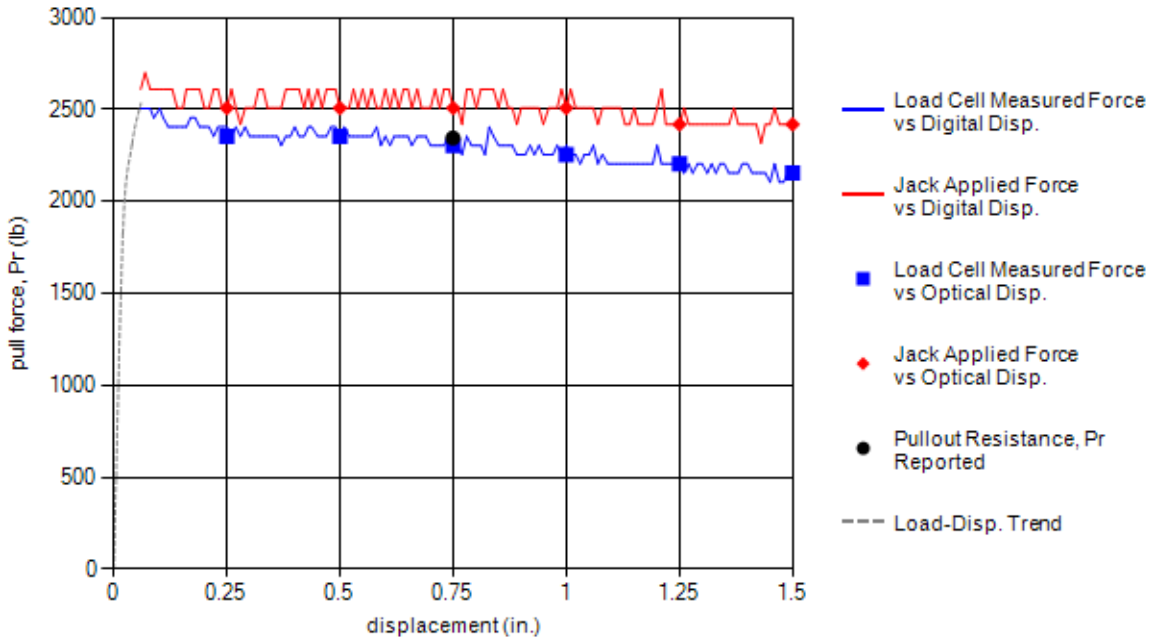
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	119.8	±1.2
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	8.0	±0.2%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	96.2	±0.9%

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	2554	2344	19.7	--

Load-Displacement Curve



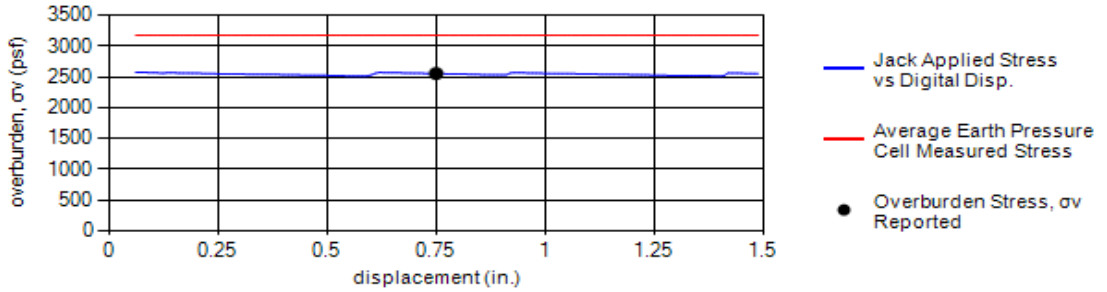
Comments

Reported pullout resistance corresponds to longitudinal bar contribution to welded steel grid system.

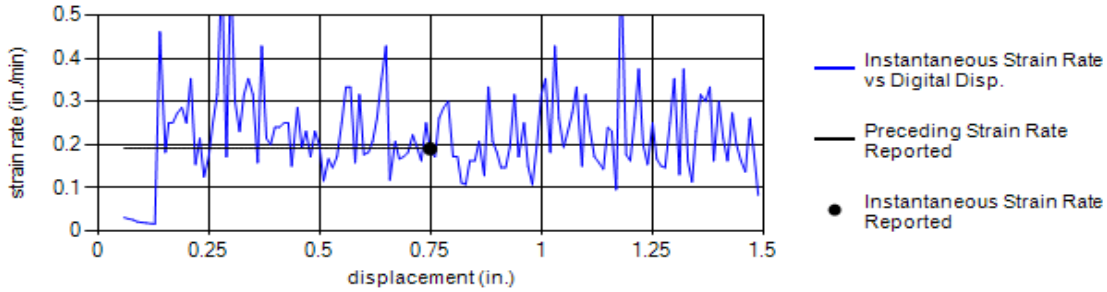
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3347	No Data	3097	3086	No Data	3177	2.04	2553



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

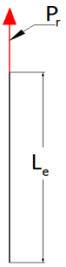
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/31/2011 9:47:00 AM
Test Identification:	TS27.15-B-W20-L6-Z5-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				

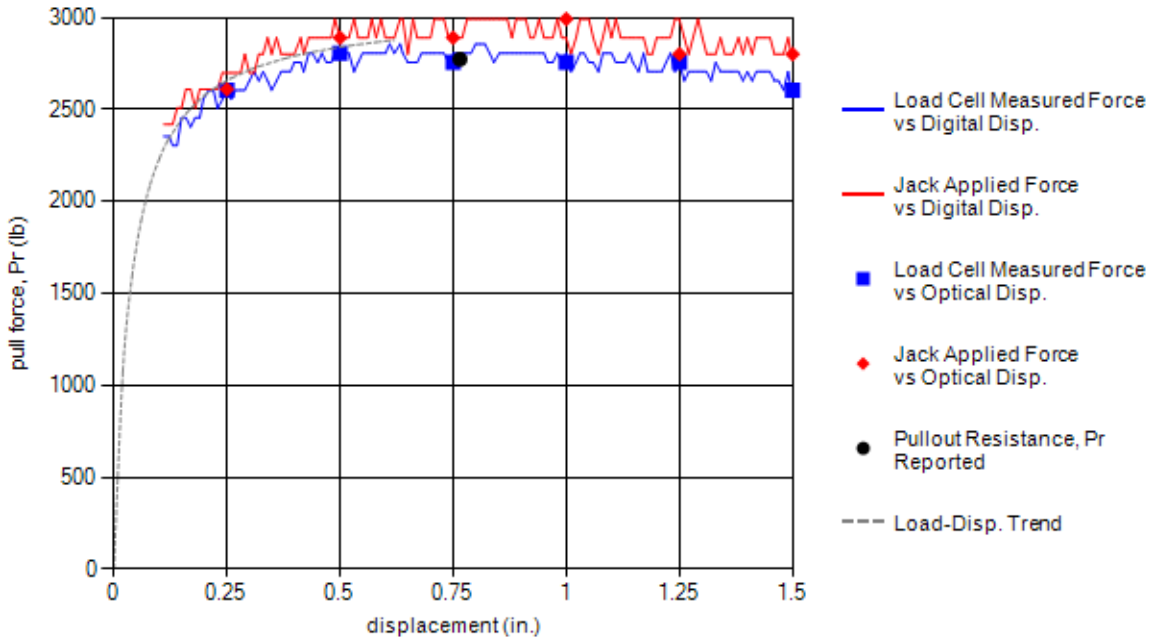
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	119.8 ±1.2
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	8.0 ±0.2%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	96.2 ±0.9%

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	645	2773	5.0	--

Load-Displacement Curve



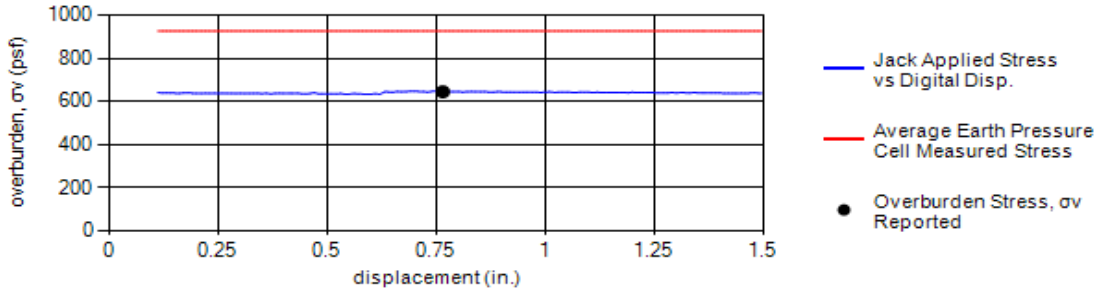
Comments

Reported pullout resistance corresponds to longitudinal bar contribution to welded steel grid system.

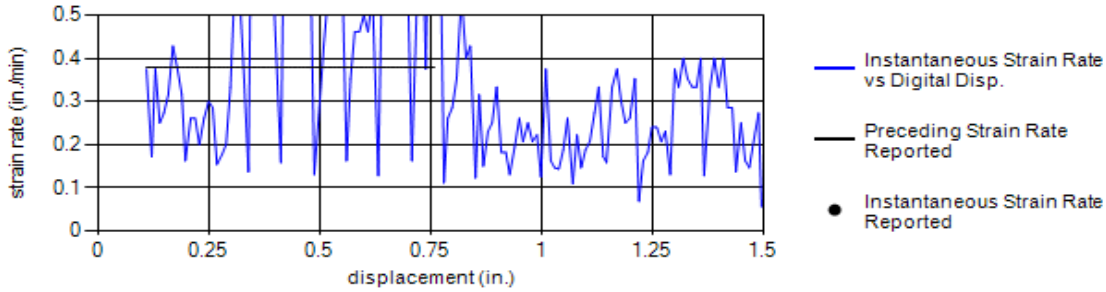
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1105	No Data	824	854	No Data	927	7.91	644



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
1.78	0.38	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

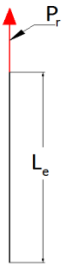
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/31/2011 10:12:00 AM
Test Identification:	TS27.16-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				

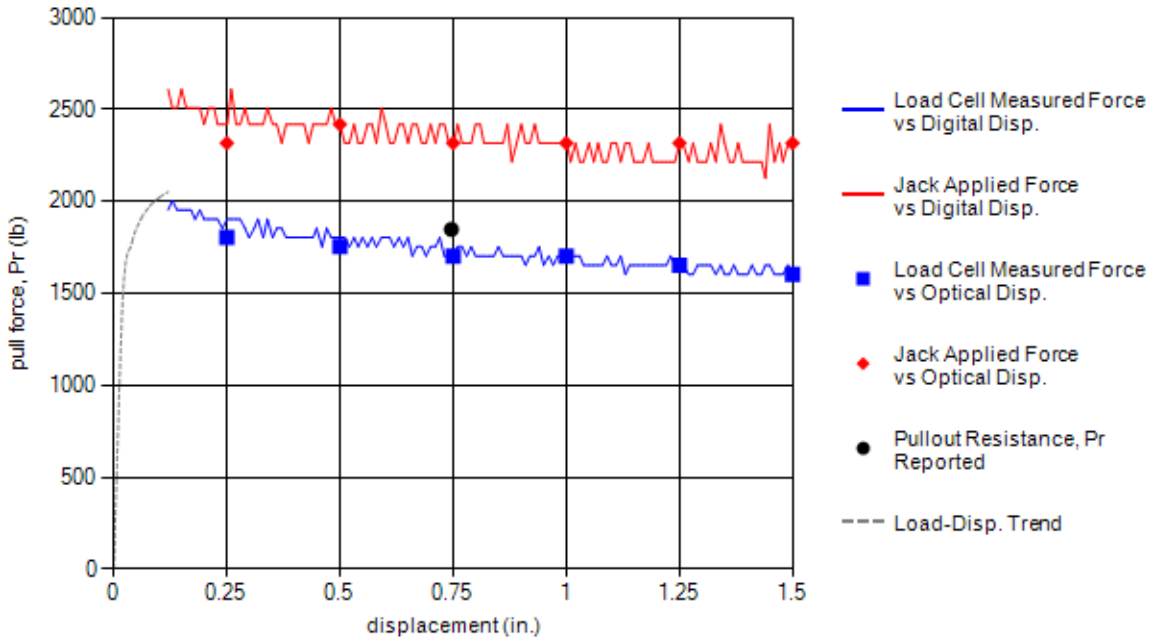
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	119.8 ±1.2
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	8.0 ±0.2%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	96.2 ±0.9%

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	1548	1847	12.0	--

Load-Displacement Curve



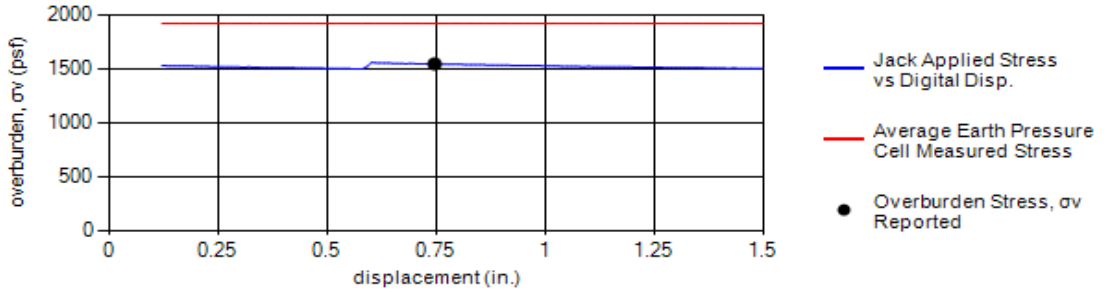
Comments

Reported pullout resistance corresponds to longitudinal bar contribution to welded steel grid system.

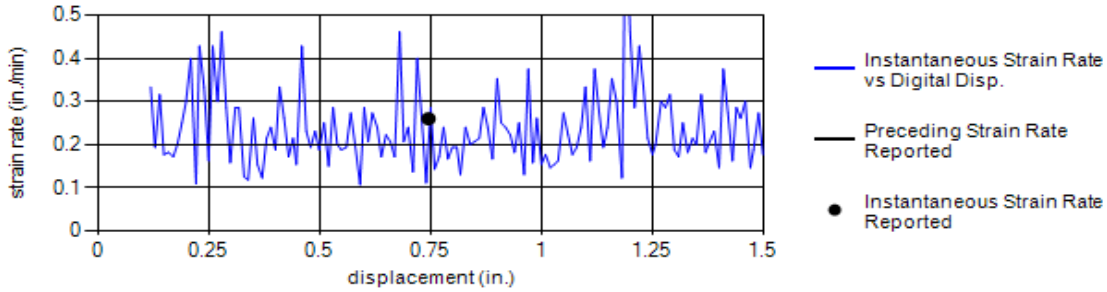
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2137	No Data	1833	1803	No Data	1924	3.42	1548



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.26	0.20	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

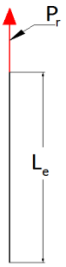
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/31/2011 10:01:00 AM
Test Identification:	TS27.17-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.):*	--

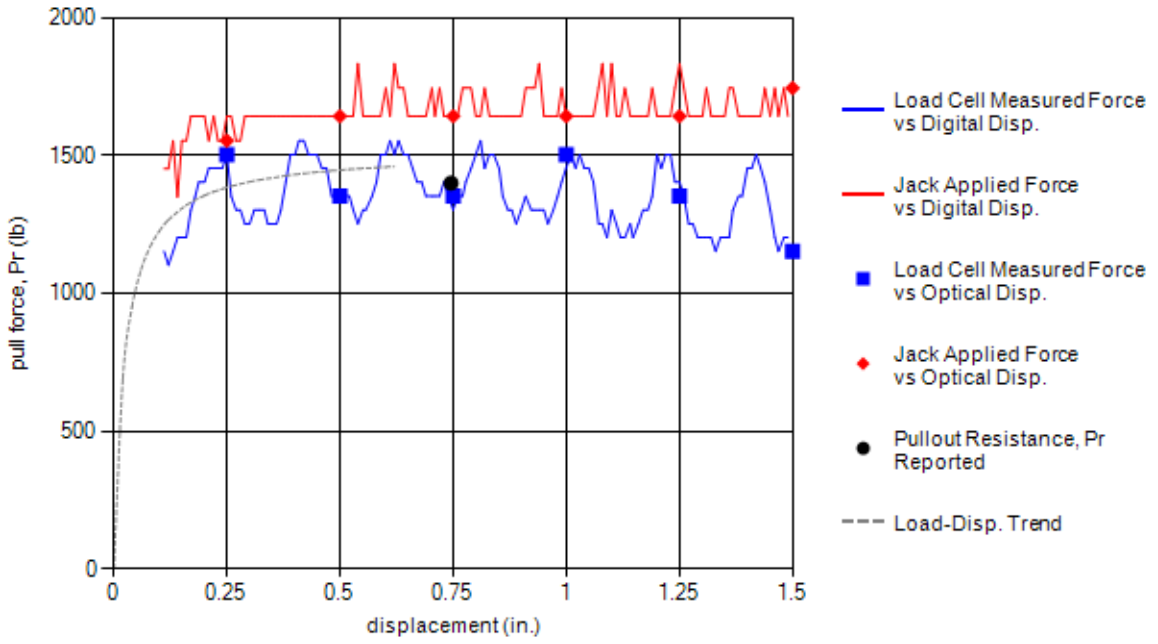
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	119.8	±1.2
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	8.0	±0.2%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	96.2	±0.9%

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	640	1399	4.9	--

Load-Displacement Curve



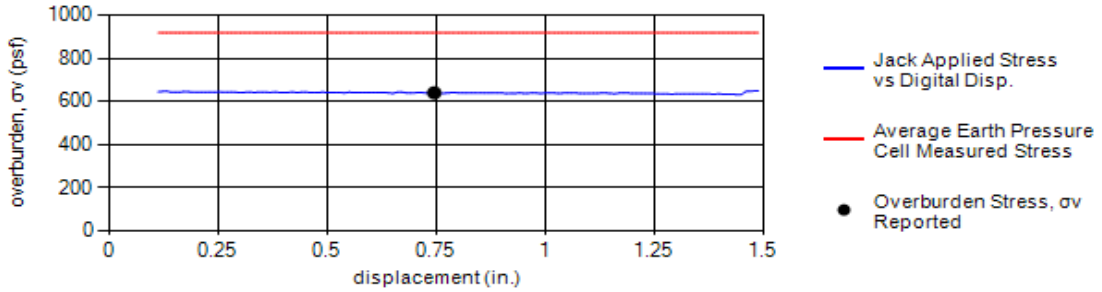
Comments

Reported pullout resistance corresponds to longitudinal bar contribution to welded steel grid system.

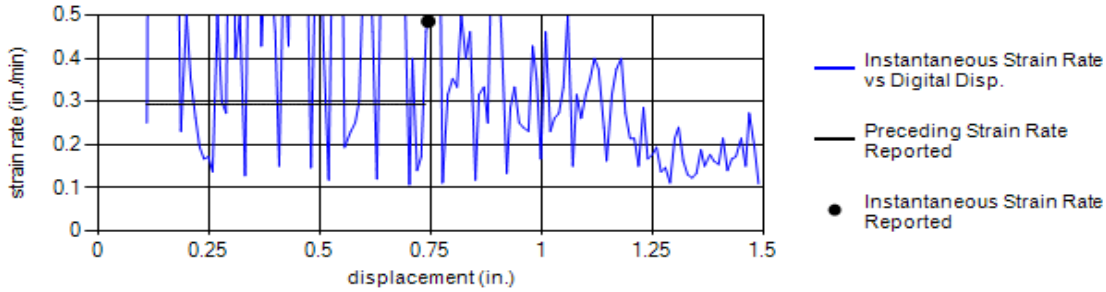
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1076	No Data	822	858	No Data	919	7.96	640



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.49	0.29	0.25



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

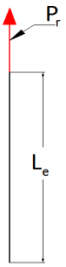
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/31/2011 11:09:00 AM
Test Identification:	TS27.18-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.):*	--

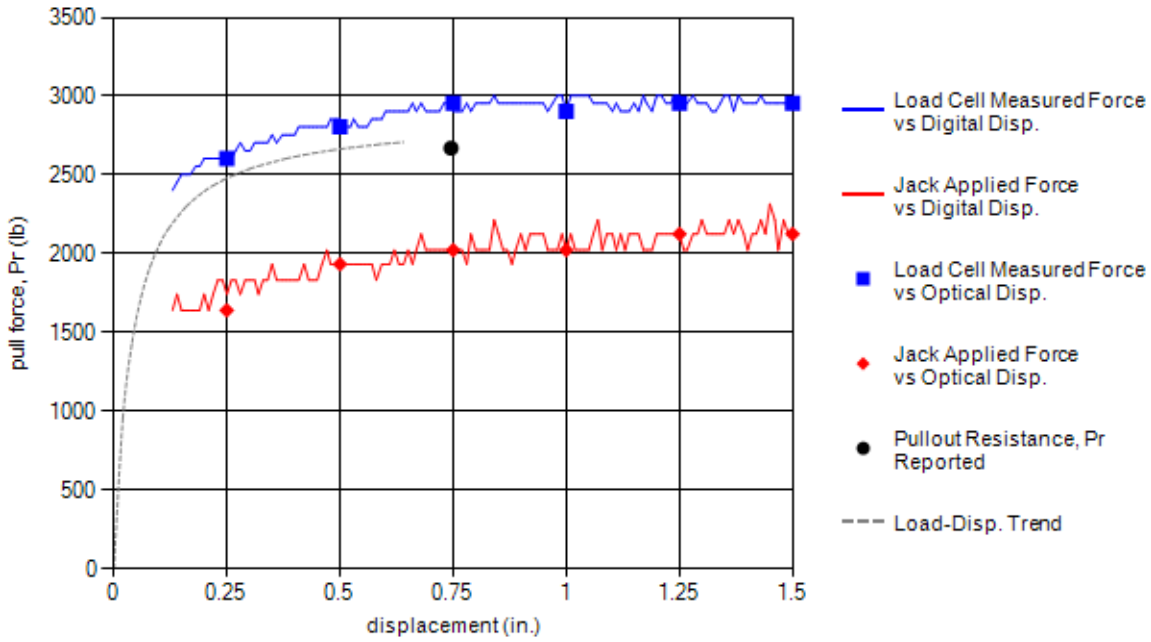
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	119.8	±1.2
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	8.0	±0.2%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	96.2	±0.9%

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	1568	2670	12.1	--

Load-Displacement Curve



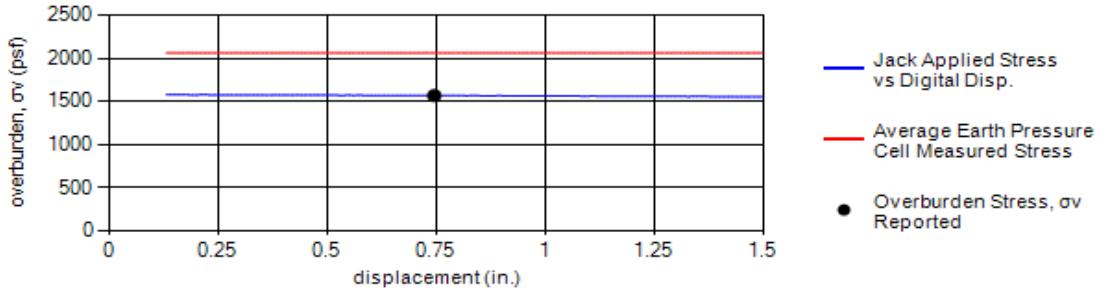
Comments

Reported pullout resistance corresponds to longitudinal bar contribution to welded steel grid system.

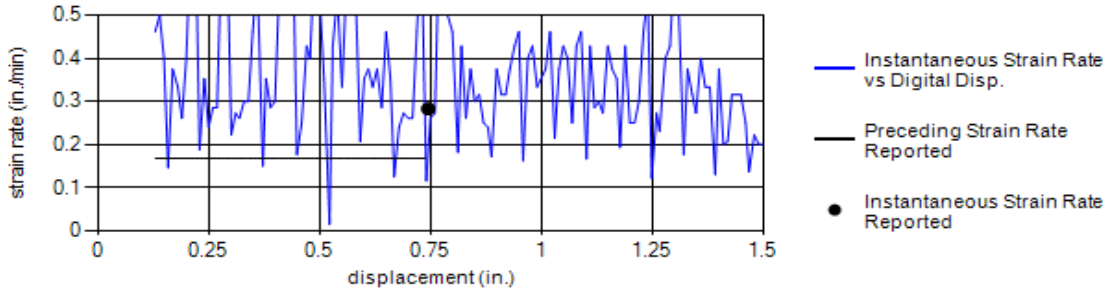
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2468	No Data	1821	1896	No Data	2062	3.26	1568



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.28	0.17	0.26



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

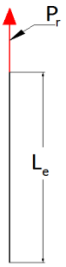
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/31/2011 10:57:00 AM
Test Identification:	TS27.19-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 B

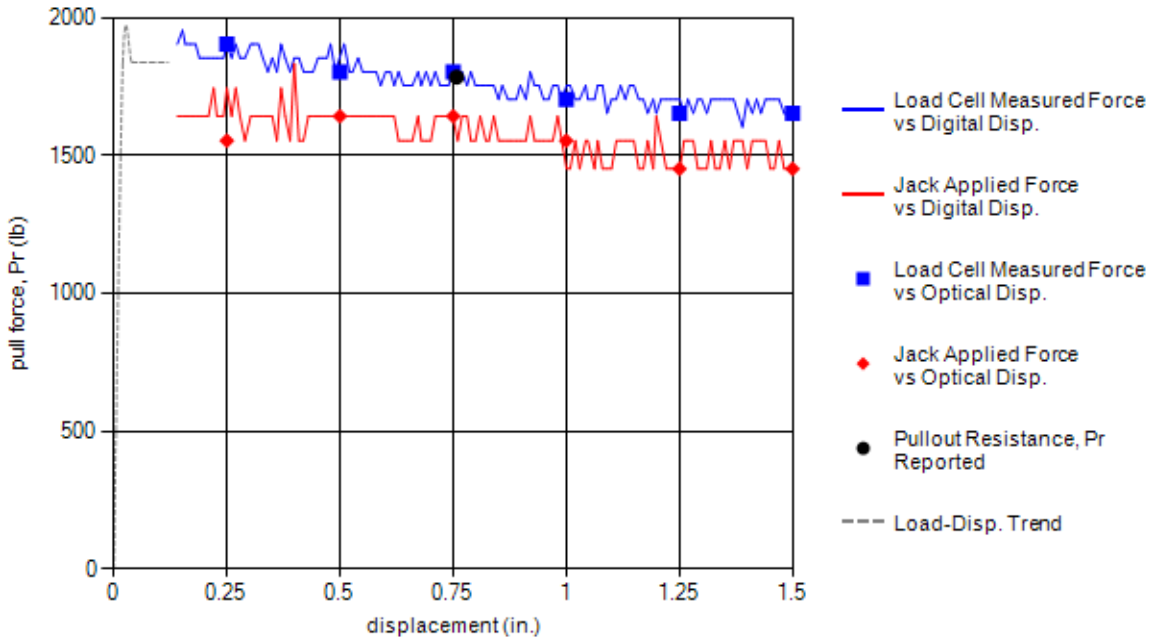
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5
Optimum Moisture Content, OMC (%):	7.8%

In-Place Density (TEX-115-E)		
Dry Unit Weight, γ_d (pcf):	119.8	±1.2
Moisture Content, w (%):	8.0	±0.2%
Relative Compaction, C_R (%):	96.2	±0.9%

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	5071	1784	39.2	--

Load-Displacement Curve



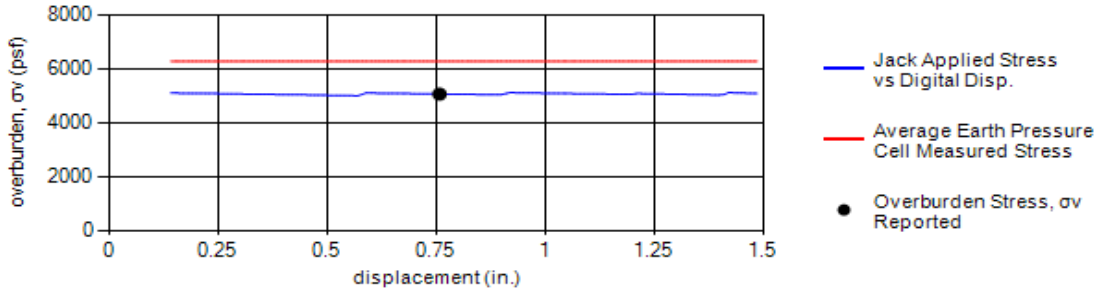
Comments

Reported pullout resistance corresponds to longitudinal bar contribution to welded steel grid system.

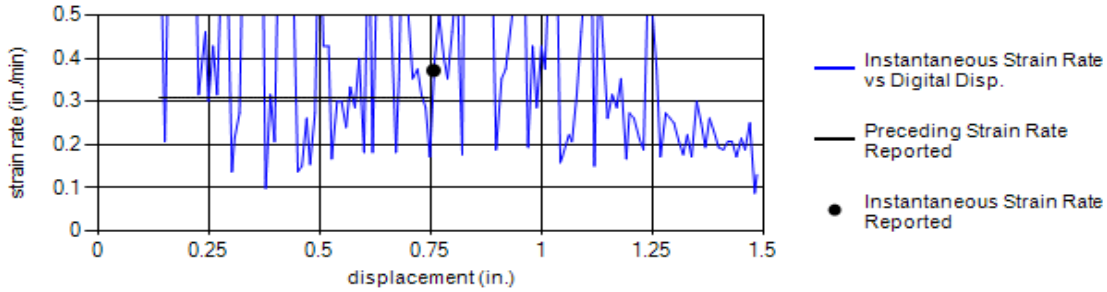
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
6919	No Data	6072	5887	No Data	6293	1.05	5071



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.37	0.31	0.30



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

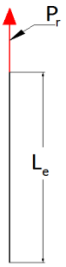
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	6/1/2011 11:03:00 AM
Test Identification:	TS27.20-B-W20-L6-Z20-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.):*	--

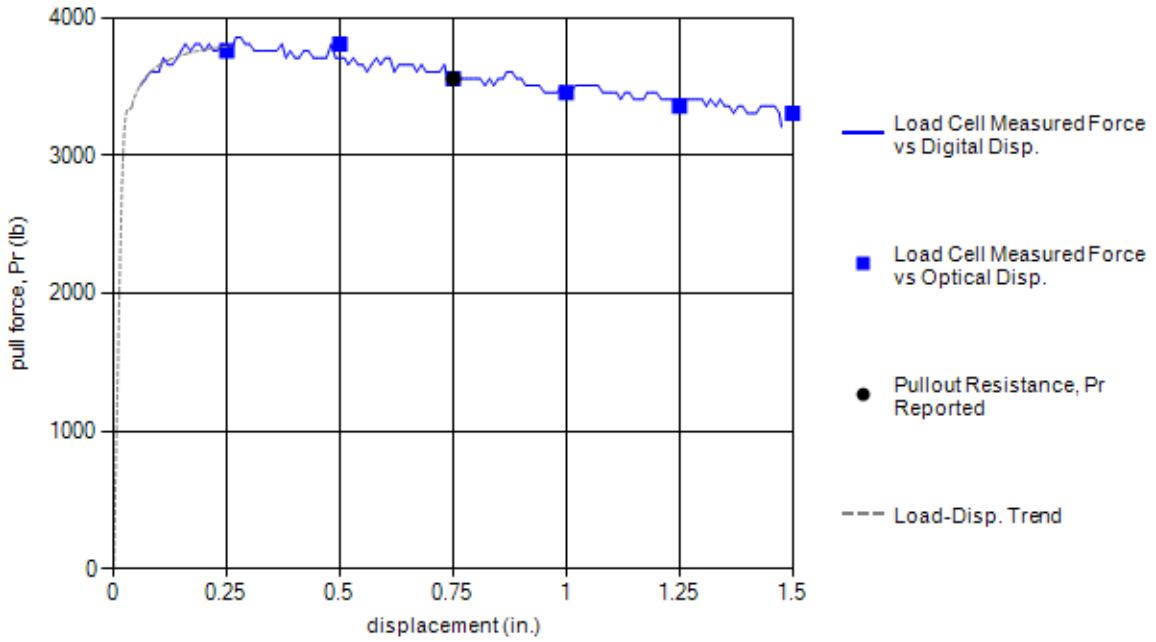
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	119.8	±1.2
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	8.0	±0.2%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	96.2	±0.9%

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	2514	3556	19.4	--

Load-Displacement Curve



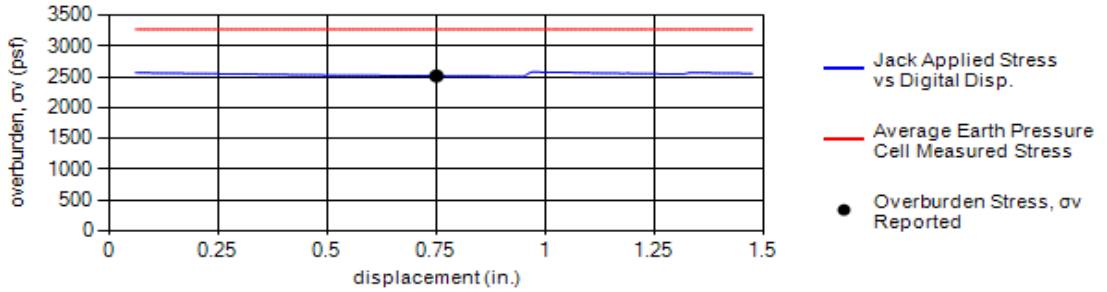
Comments

Hydraulic pullout jack transducer error; no hydraulic pullout jack data. Reported pullout resistance corresponds to longitudinal bar contribution to welded steel grid system.

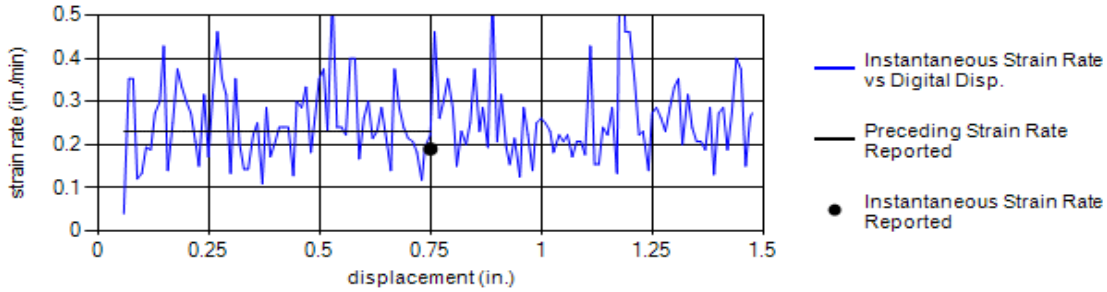
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3469	No Data	3196	3151	No Data	3272	2.01	2513



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.19	0.23	0.22



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

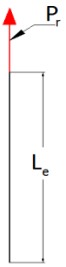
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/27/2011 4:29:00 PM
Test Identification:	TS27.21-B-W20-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.):	0.5	*Diameter, t (in.):*	--	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	--	*Spacing, S_l (in.):*	--

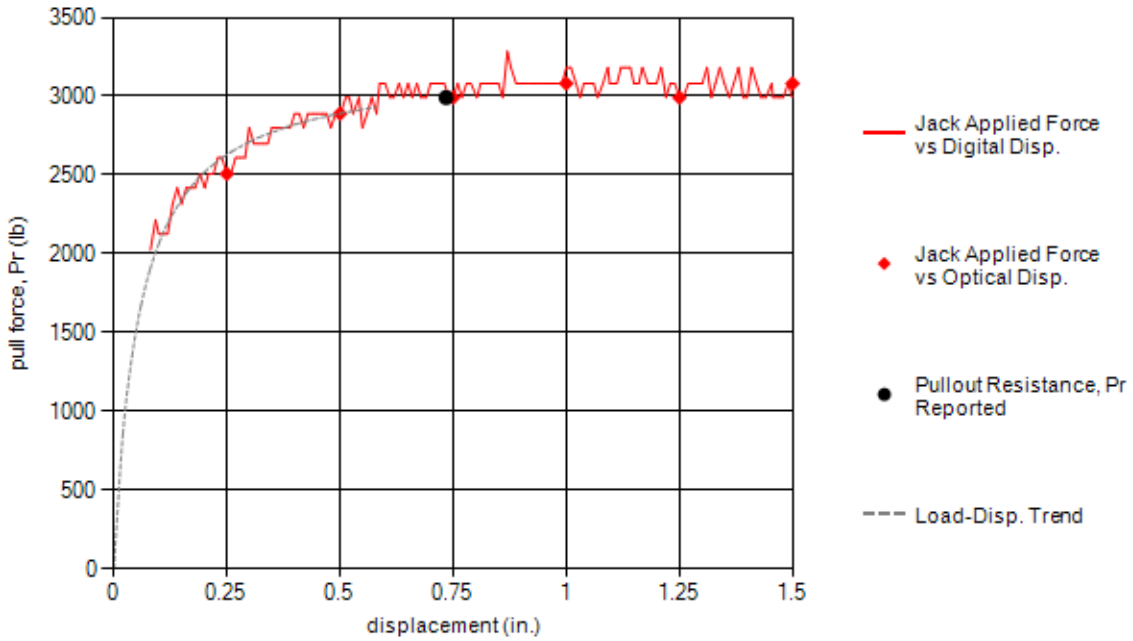
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	119.8	±1.2
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	8.0	±0.2%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	96.2	±0.9%

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	655	2992	5.1	--

Load-Displacement Curve



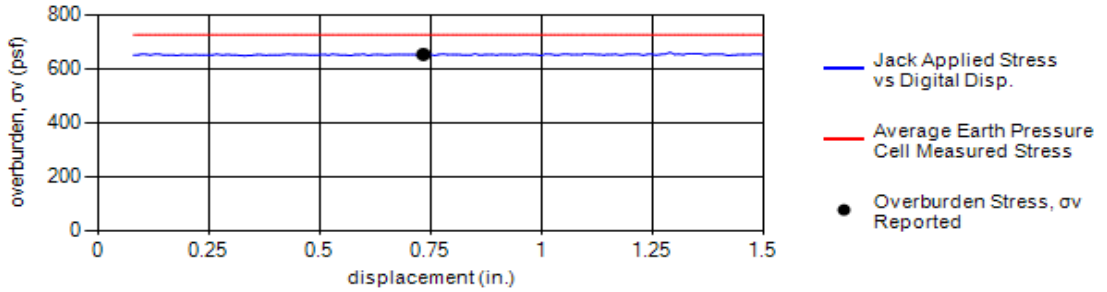
Comments

Load cell error; no load cell data. Reported pullout resistance corresponds to longitudinal bar contribution to welded steel grid system.

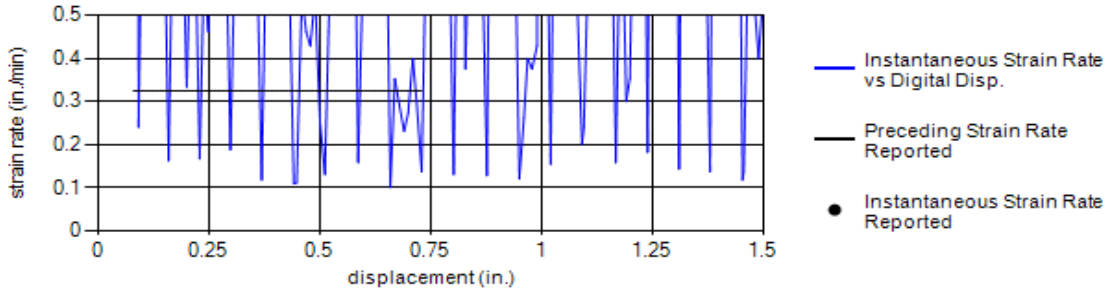
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
903	No Data	688	592	No Data	728	2.93	654



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.89	0.33	0.97



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

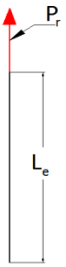
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/27/2011 4:16:00 PM
Test Identification:	TS27.22-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.):*	--

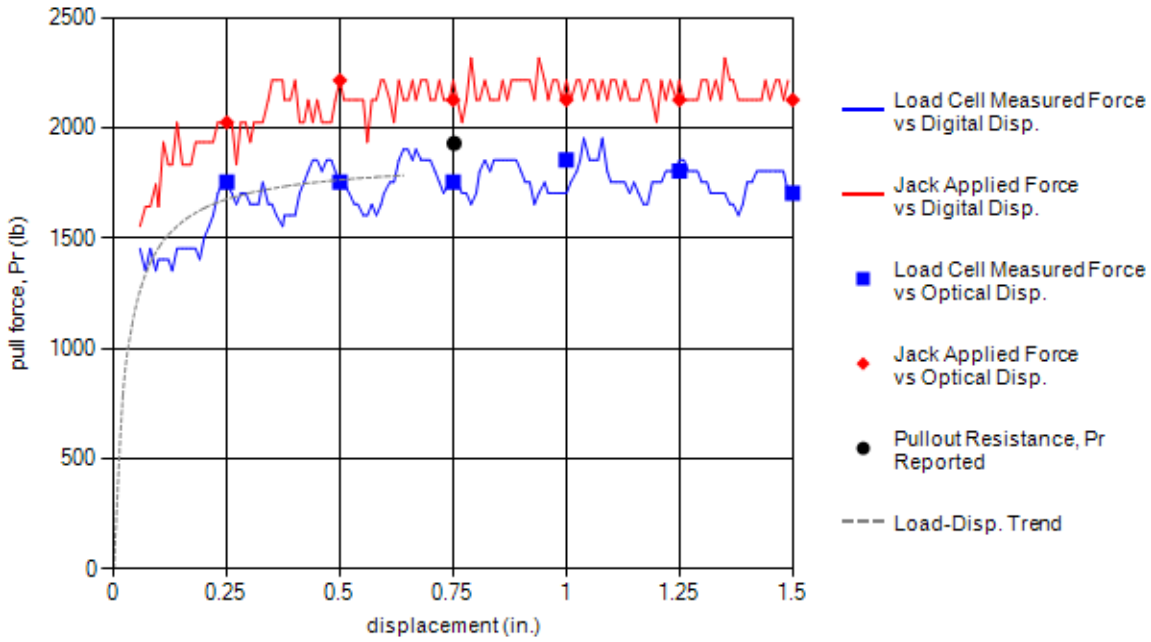
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	119.8	±1.2
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	8.0	±0.2%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	96.2	±0.9%

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	667	1929	5.2	--

Load-Displacement Curve



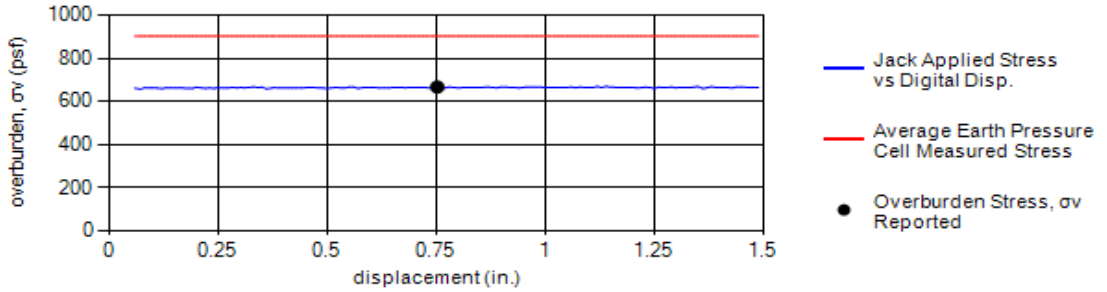
Comments

Reported pullout resistance corresponds to longitudinal bar contribution to welded steel grid system.

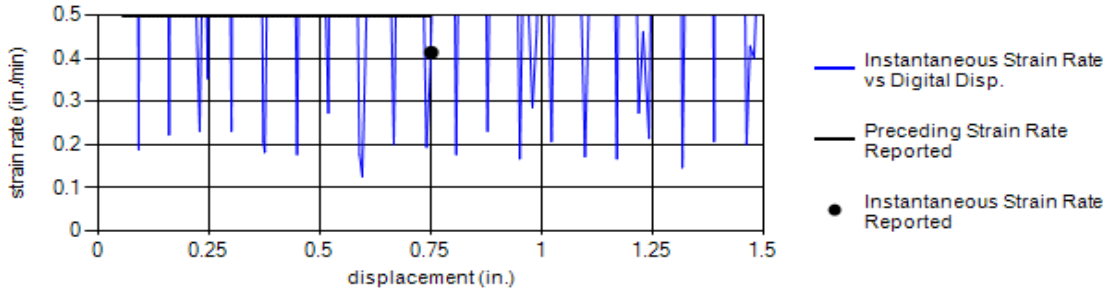
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1071	No Data	889	749	No Data	903	2.68	667



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.41	0.50	0.57



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

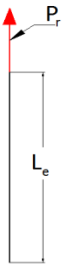
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/27/2011 4:03:00 PM
Test Identification:	TS27.23-B-W20-L6-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):	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.):*	--

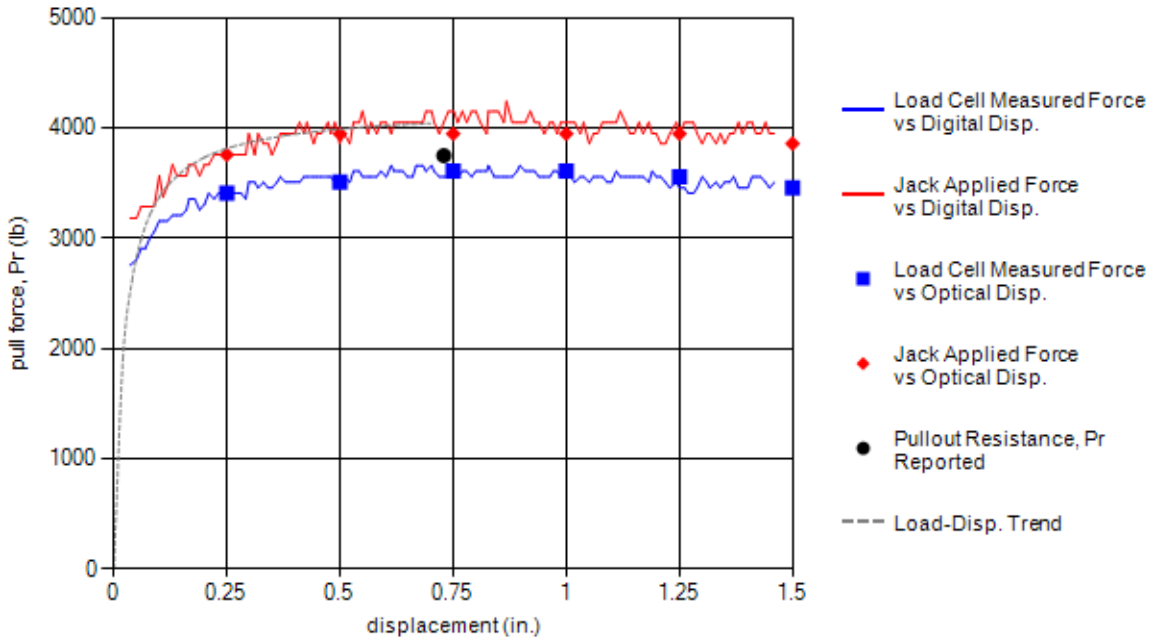
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	119.8	±1.2
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	8.0	±0.2%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	96.2	±0.9%

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	1538	3748	11.9	--

Load-Displacement Curve



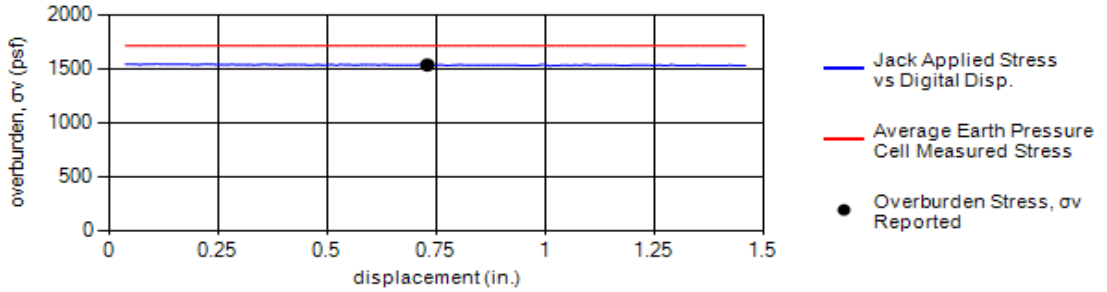
Comments

Reported pullout resistance corresponds to longitudinal bar contribution to welded steel grid system.

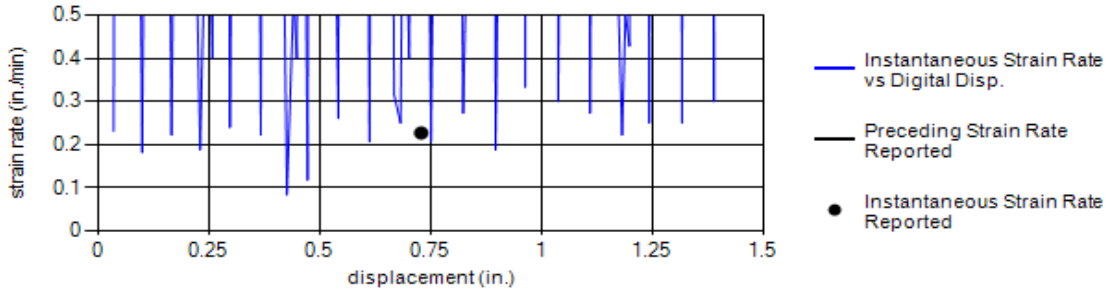
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1886	No Data	1710	1552	No Data	1716	1.24	1538



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.23	0.66	0.69



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

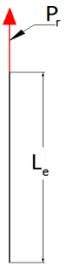
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/31/2011 7:14:00 AM
Test Identification:	TS27.24-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.):*	--

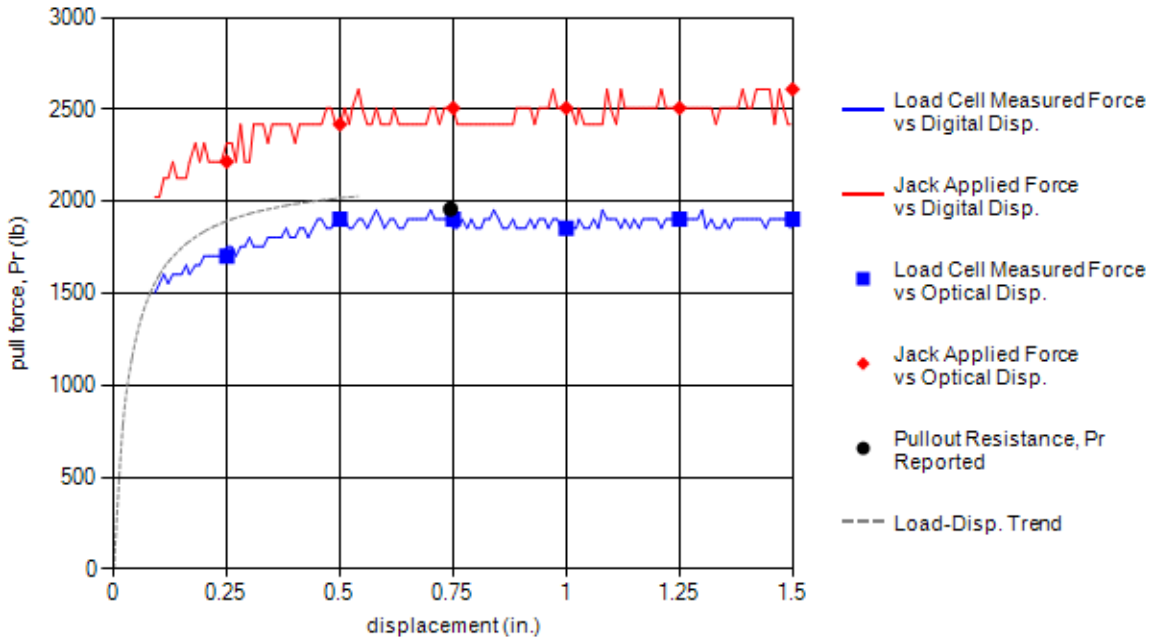
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	119.8	±1.2
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	8.0	±0.2%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	96.2	±0.9%

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	640	1958	4.9	--

Load-Displacement Curve



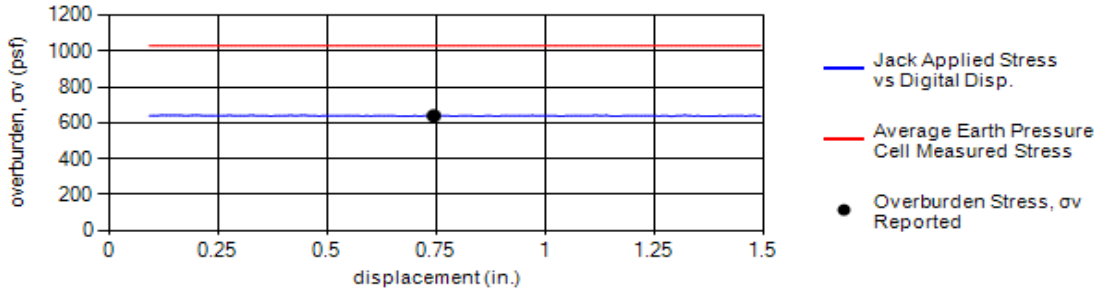
Comments

Reported pullout resistance corresponds to longitudinal bar contribution to welded steel grid system.

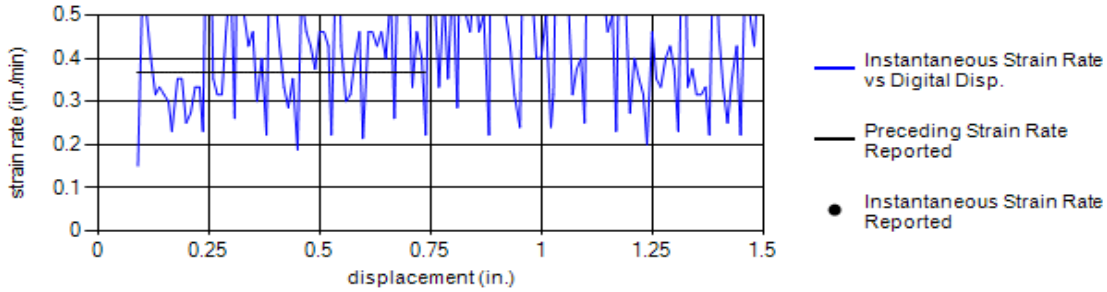
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1127	No Data	1014	950	No Data	1030	2.78	638



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.87	0.37	0.35



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

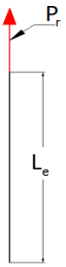
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/31/2011 7:45:00 AM
Test Identification:	TS27.25-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.):*	--

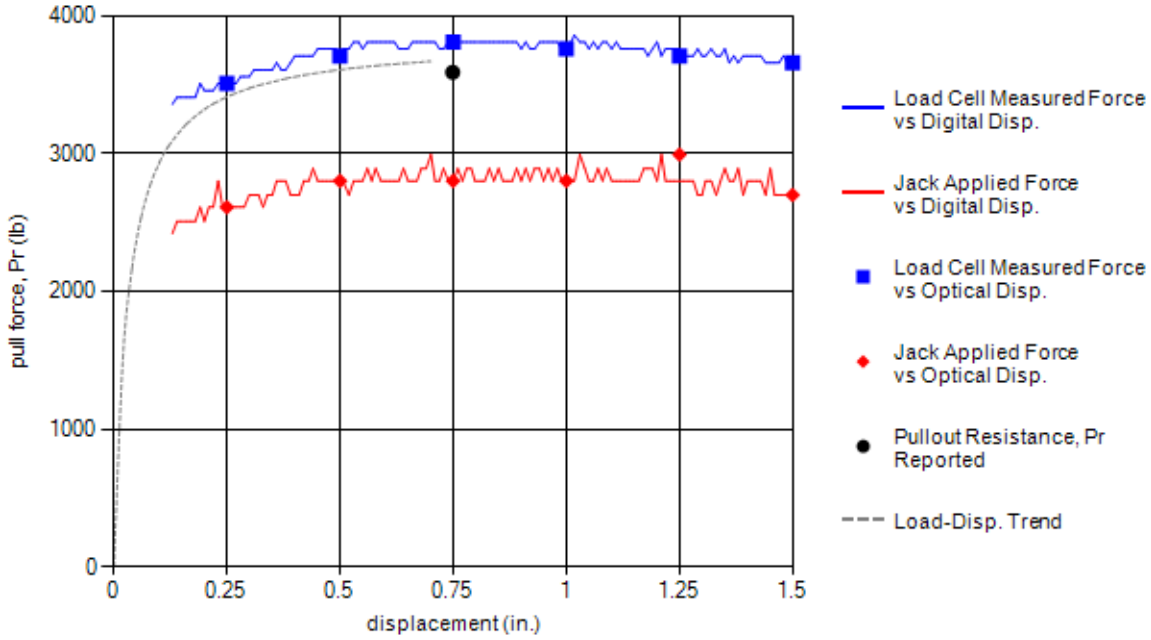
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	119.8	±1.2
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	8.0	±0.2%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	96.2	±0.9%

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	1596	3587	12.3	--

Load-Displacement Curve



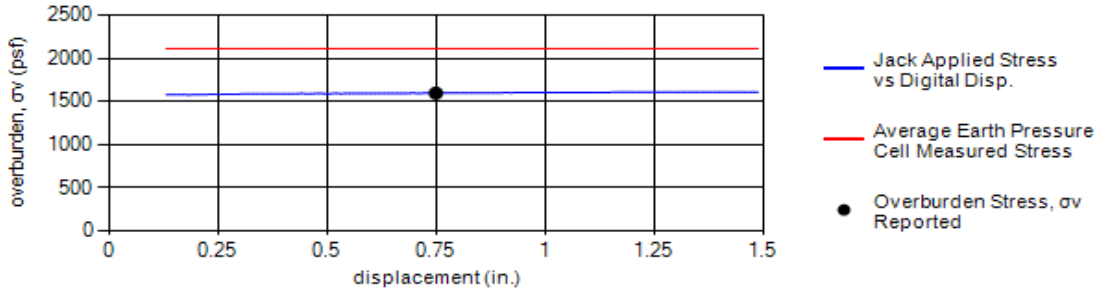
Comments

Reported pullout resistance corresponds to longitudinal bar contribution to welded steel grid system.

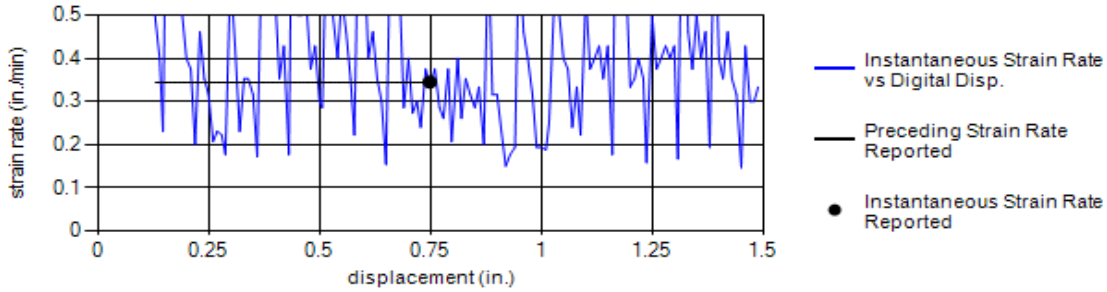
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2537	No Data	1925	1872	No Data	2111	3.12	1596



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.35	0.35	0.31



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

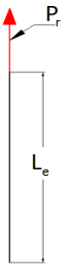
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/31/2011 7:35:00 AM
Test Identification:	TS27.26-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				

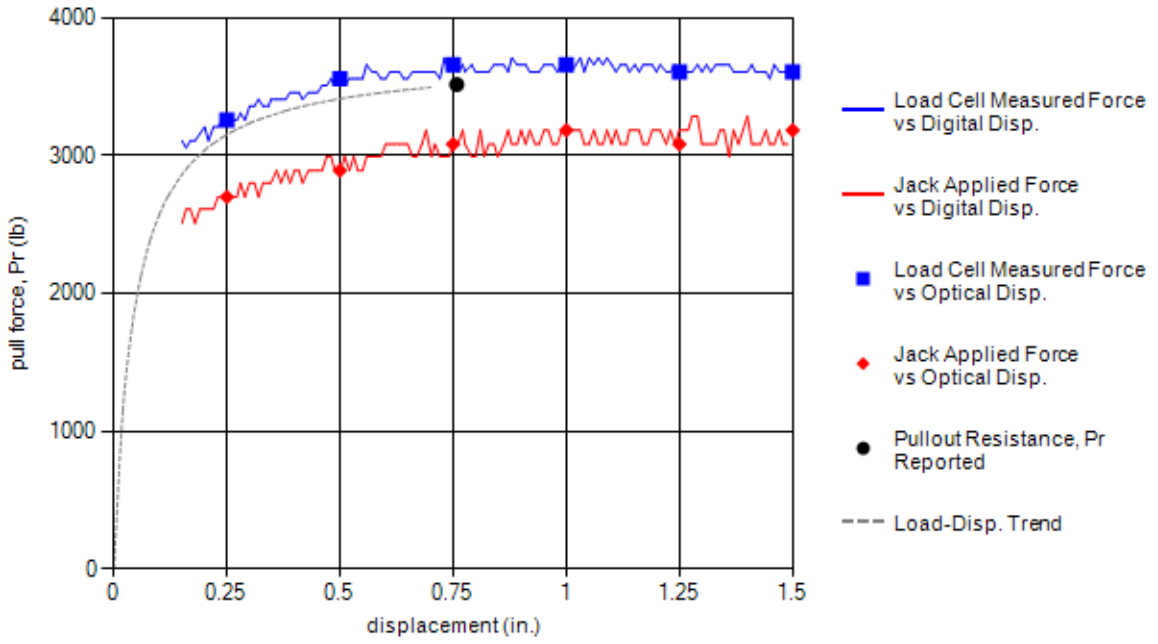
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)	
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	119.8 ±1.2
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	8.0 ±0.2%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	96.2 ±0.9%

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	4977	3513	38.5	--

Load-Displacement Curve



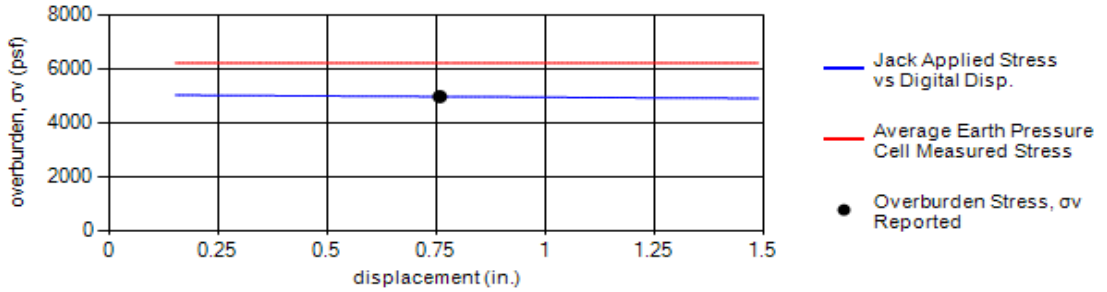
Comments

Reported pullout resistance corresponds to longitudinal bar contribution to welded steel grid system.

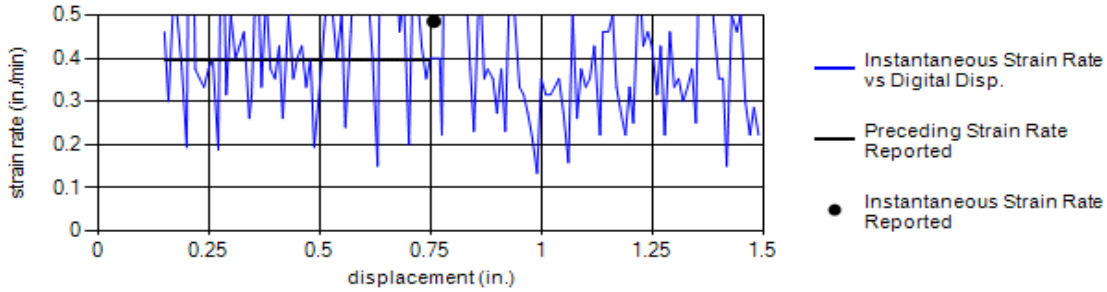
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
6881	No Data	6066	5742	No Data	6230	1.02	4977



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.49	0.40	0.34



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

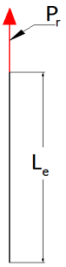
Backfill Material Properties				
Unified Soil Classification (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	6/1/2011 11:30:00 AM
Test Identification:	TS27.27-B-W20-L6-Z20-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.):	0.5	*Diameter, t (in.):*	--	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	--	*Spacing, S_l (in.):*	--

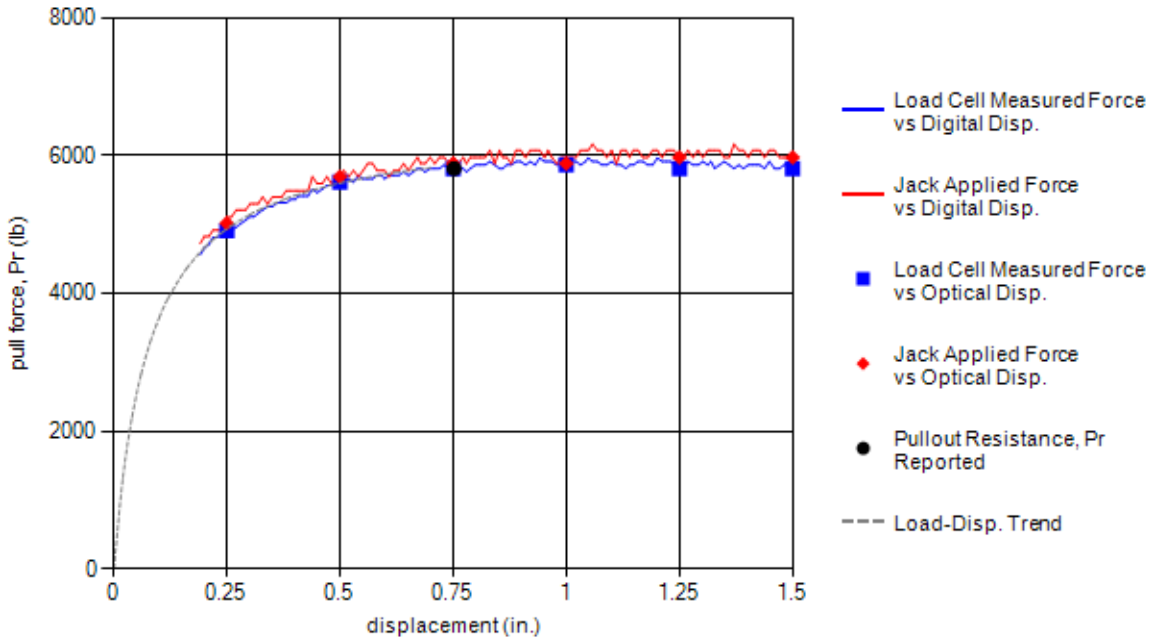
Backfill Material

Specification:	TxDOT Item 423 - Type B	In-Place Density (TEX-115-E)		
Moisture Density Relationship (TEX-114-E)		*Dry Unit Weight, γ_d (pcf):*	119.8	±1.2
Maximum Dry Unit Weight, γ_{dmax} (pcf):	124.5	*Moisture Content, w (%):*	8.0	±0.2%
Optimum Moisture Content, OMC (%):	7.8%	*Relative Compaction, C_R (%):*	96.2	±0.9%

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	2566	5807	19.8	--

Load-Displacement Curve



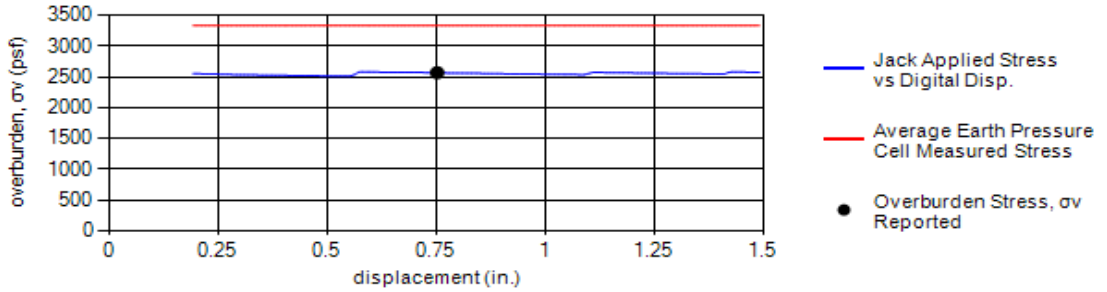
Comments

Reported pullout resistance corresponds to longitudinal bar contribution to welded steel grid system.

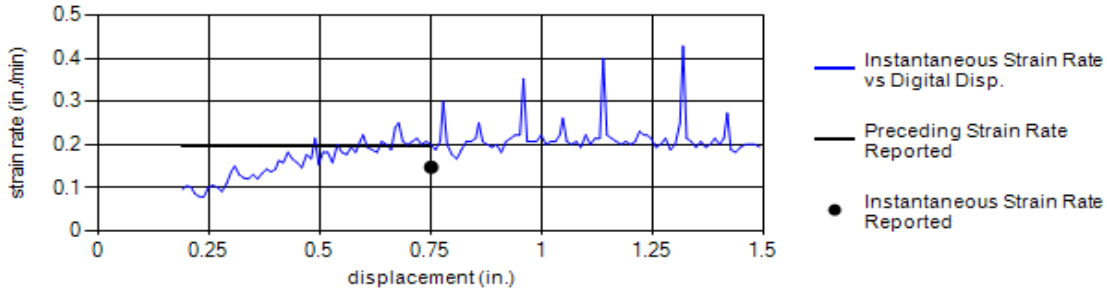
Personnel

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

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3617	No Data	3261	3112	No Data	3330	2.04	2566



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.15	0.19	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 (ASTM D 2487):		SP-SM	Shear Strength Properties (ASTM D 3080)	
Resistivity (TEX-129-E) *(ohm-cm):*		8004	*Cohesion, c (psf):*	112
Soil pH (TEX-128-E)*:*		7.9	*Internal Friction Angle, φ (deg.):*	43
Gradation	TEX-110-E	ASTM D422 D1140	Atterberg Limits (TEX-104-E, TEX-105-E, TEX-106-E, TEX-107-E)	
Sieve Size	*Percent Retained*	*Percent Retained*		
3"	0.0%	0.0%	*Liquid Limit, LL (%):*	non-plastic
No. 4	1.5%	0.8%	*Plastic Limit, PL (%):*	non-plastic
No. 40	28.3%	33.7%	*Plasticity Index, PI (%)*	non-plastic
No. 200	90.6%	91.4%	*Bar Linear Shrinkage, LS (%)*	2

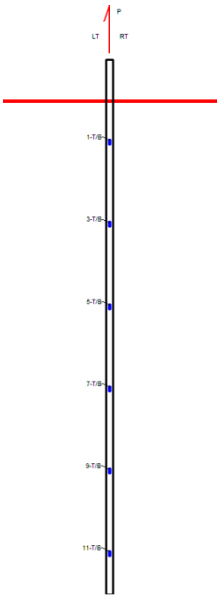
Appendix J

MSE Reinforcement Pullout Test Strain Gage Reports: Ribbed Strips in Type B Backfill

STRAIN GAGE REPORT FOR MSE REINFORCEMENT PULLOUT TEST

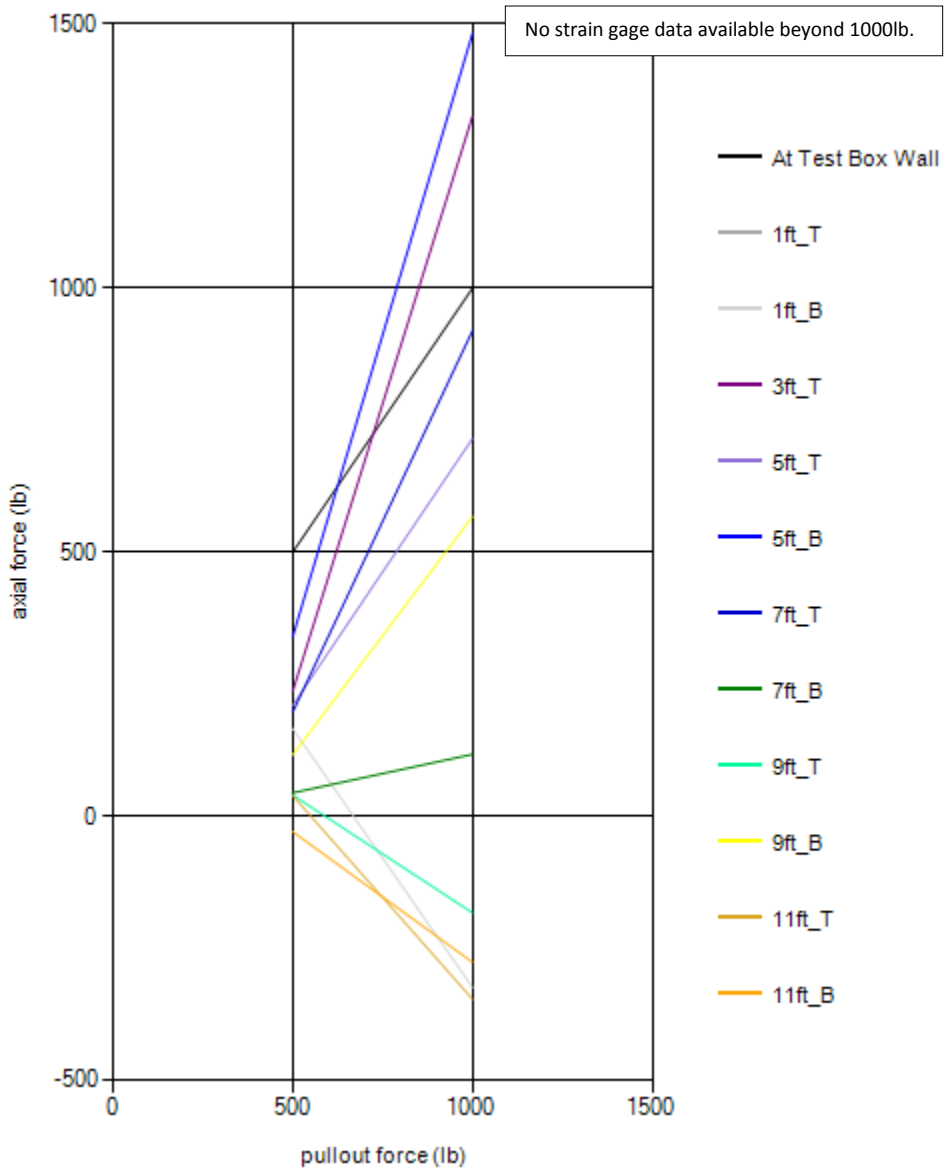
Test Information	
Test Date:	6/20/2011 1:08:00 PM
Test Identification:	TS29.01-S-L12-Z5-T
Test Facility:	12'x12'x4' MSE Test Box

Sketch

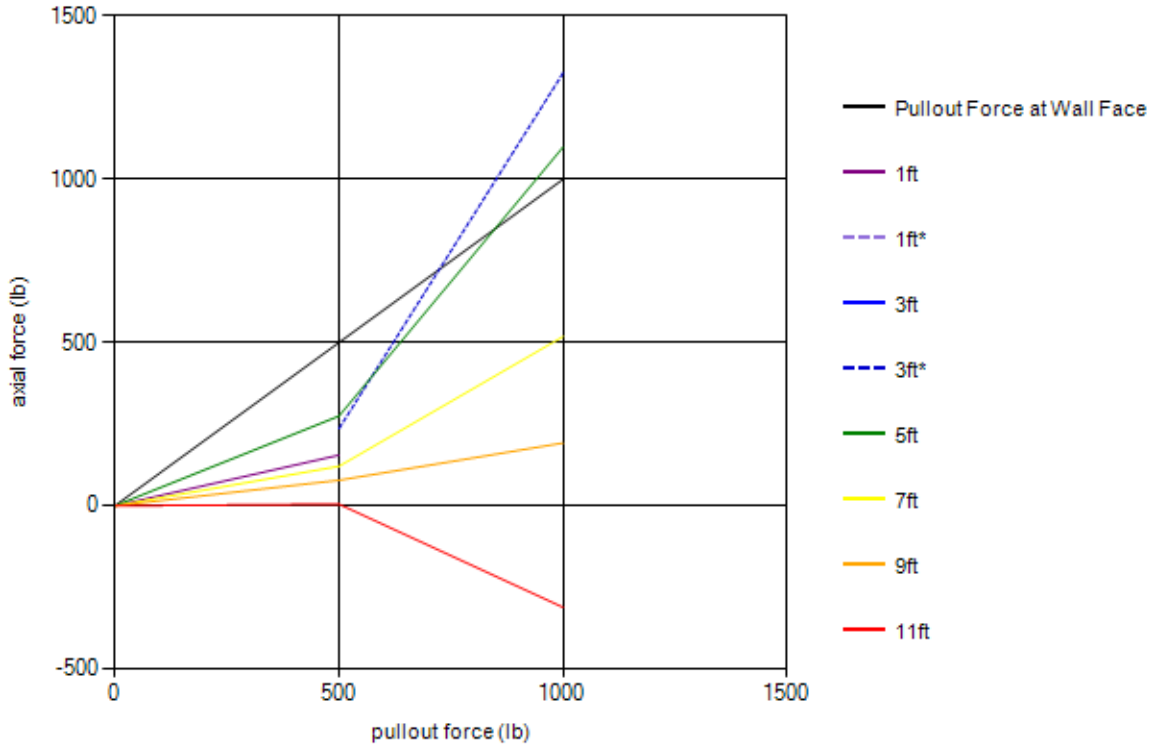


MSE Reinforcement	
Type:	Ribbed Strip
Length, L_e (ft):	12
Width, b (in.):	2
Skew Angle, β (°):	0

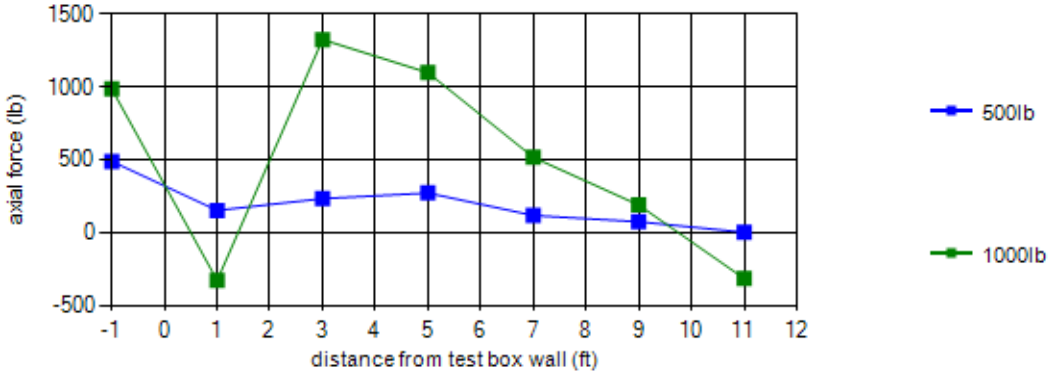
Axial Load-Pullout Load Data by Gage



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*					
	1ft	*3ft**	*5ft*	*7ft*	*9ft*	*11ft*
500	155	236*	275	121	78	5
1000	-324*	1326*	1099	519	193	-311

* calculated from 1 strain gage.

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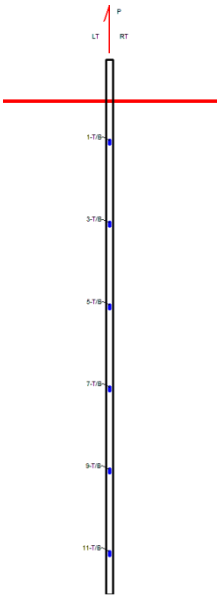
STRAIN GAGE REPORT FOR MSE REINFORCEMENT PULLOUT TEST

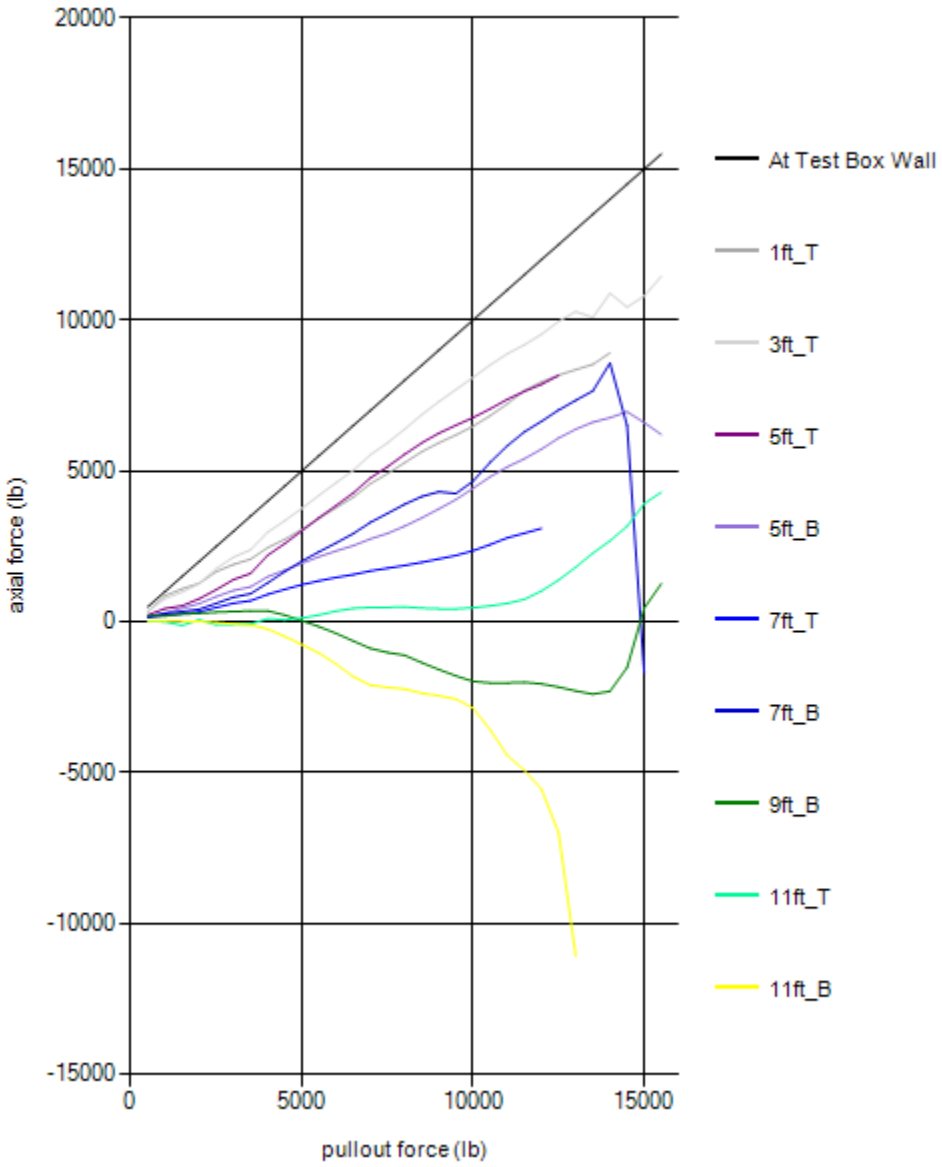
Test Information	
Test Date:	6/20/2011 1:41:00 PM
Test Identification:	TS29.02-S-L12-Z12-T
Test Facility:	12'x12'x4' MSE Test Box

Sketch

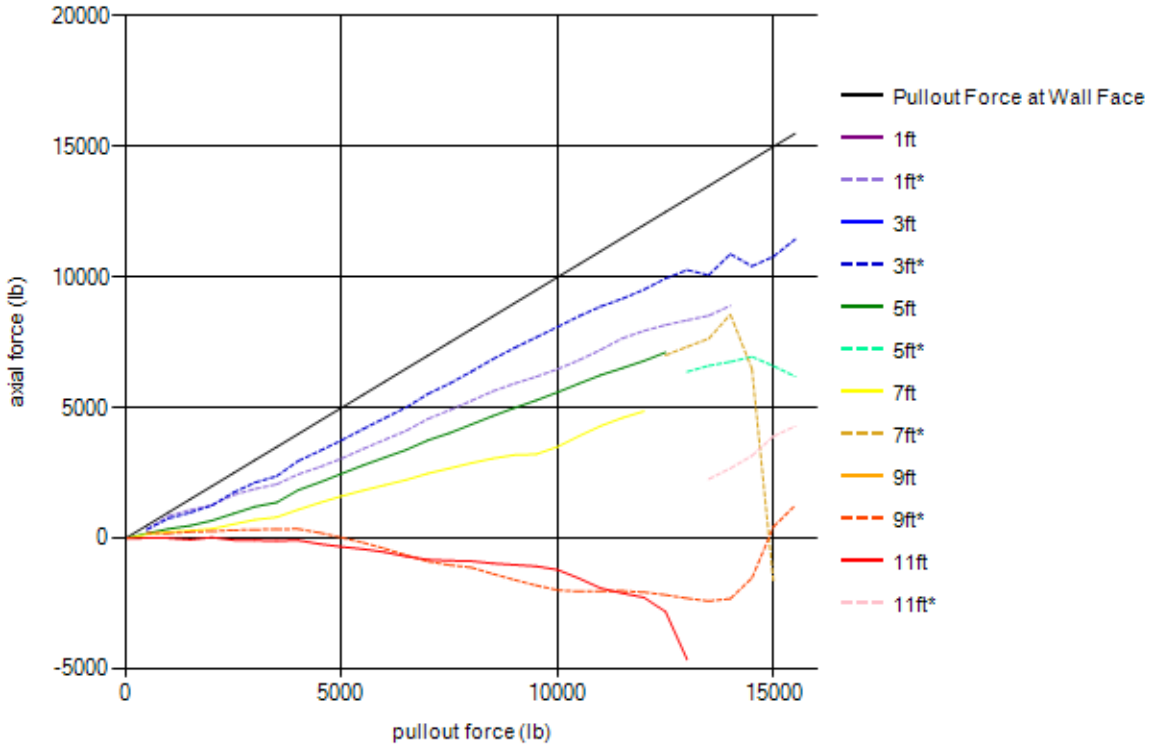


MSE Reinforcement	
Type:	Ribbed Strip
Length, L_e (ft):	12
Width, b (in.):	2
Skew Angle, β (°):	0

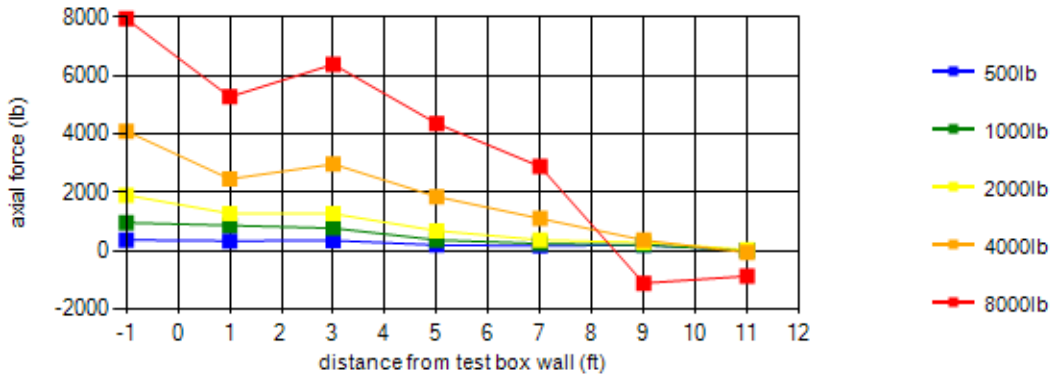
Axial Load-Pullout Load Data by Gage



Axial Load-Pullout Load And Moment-Pullout Load Data by Location



Axial Load-Distance from Test Box Wall Plot – Service Loads

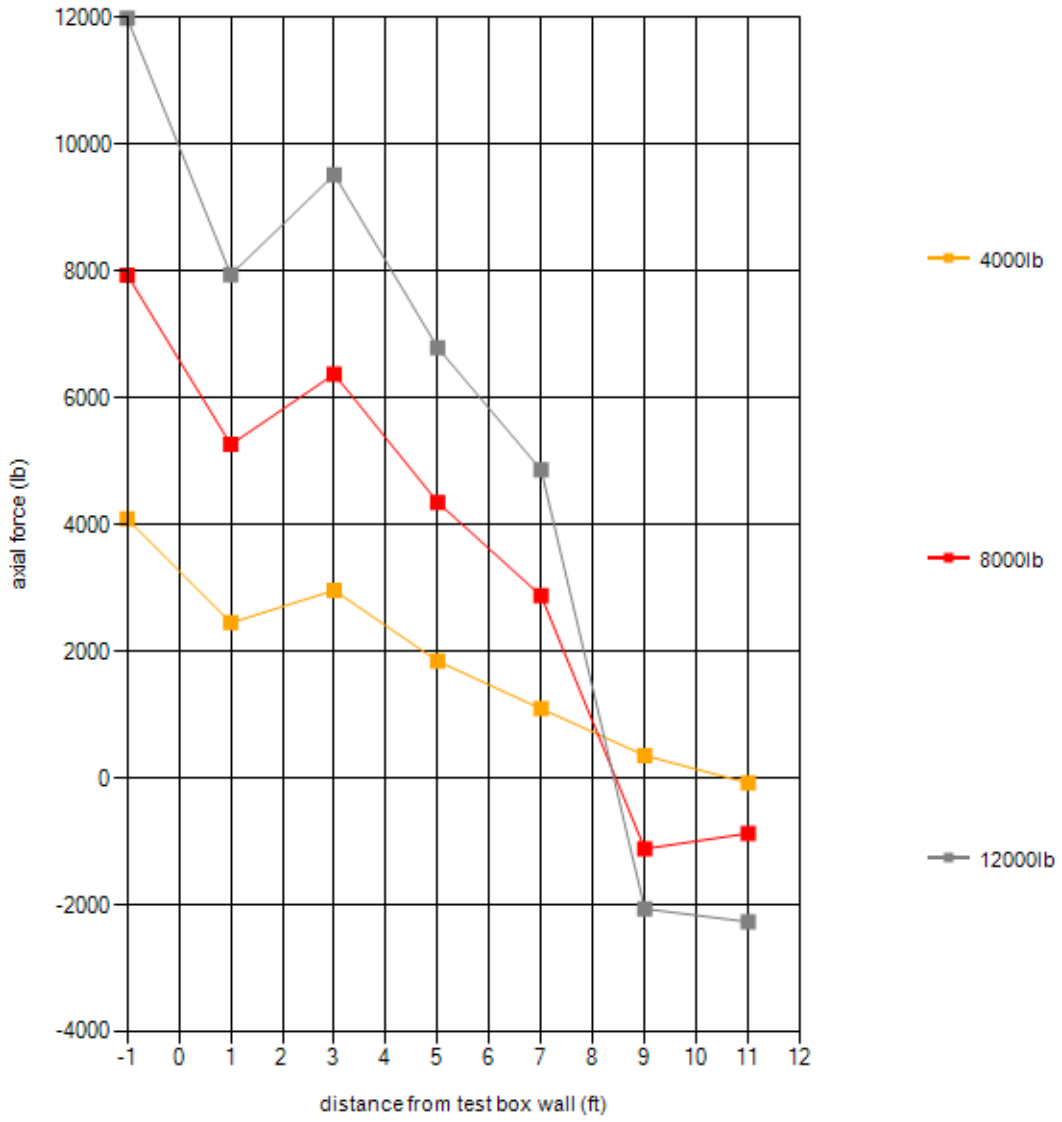


Axial Load Results

Pullout Resistance, P_r (lb)	*Axial Load, P (lb) calculated from strain data at distances from test box wall*					
	*1ft**	*3ft**	*5ft*	*7ft*	*9ft**	*11ft*
500	339*	350*	195	161	200*	18
1000	866*	770*	368	244	192*	10
2000	1273*	1264*	683	367	281*	37
3000	1898*	2142*	1218	715	340*	-78
4000	2456*	2968*	1850	1100	362*	-71
5000	3060*	3756*	2477	1617	34*	-317
6000	3778*	4606*	3098	2041	-386*	-524
7000	4575*	5530*	3756	2488	-881*	-813
8000	5268*	6380*	4356	2880	-1111*	-867
9000	5929*	7291*	4995	3195	-1582*	-1008
10000	6480*	8095*	5594	3508	-1974*	-1200
11000	7221*	8882*	6252	4308	-2024*	-1906
12000	7949*	9526*	6795	4867	-2057*	-2262
13000	8353*	10275*	6381*	7337*	-2291*	-4638
14000	8908*	10887*	6762*	8573*	-2305*	2682*
15000	ND	10793*	6599*	-1703*	452*	3912*

* calculated from 1 strain gage.

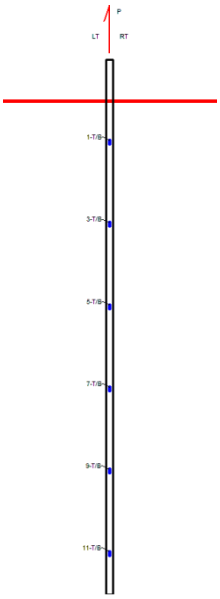
Axial Load-Distance from Test Box Wall Plot – All



STRAIN GAGE REPORT FOR MSE REINFORCEMENT PULLOUT TEST

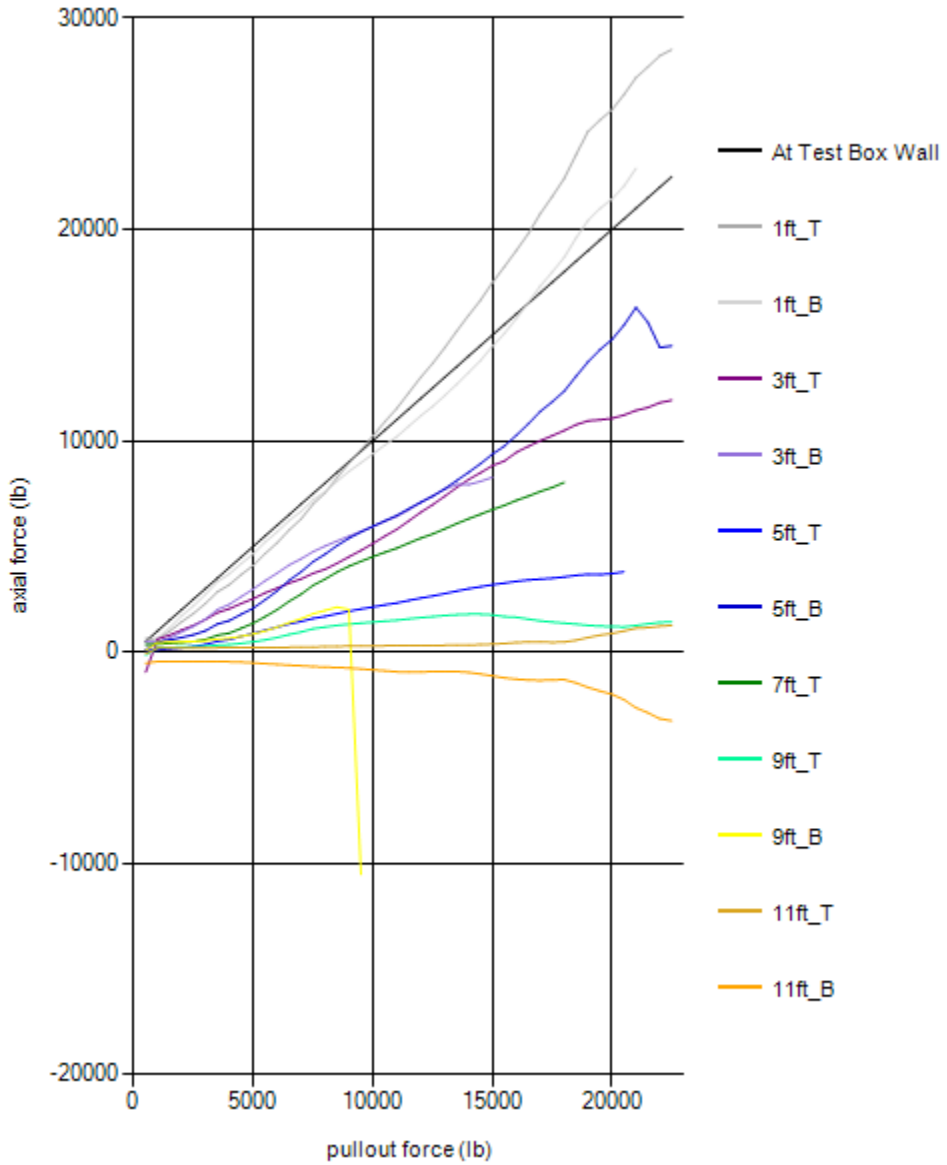
Test Information	
Test Date:	6/20/2011 2:40:00 PM
Test Identification:	TS29.03-S-L12-Z20-T
Test Facility:	12'x12'x4' MSE Test Box

Sketch

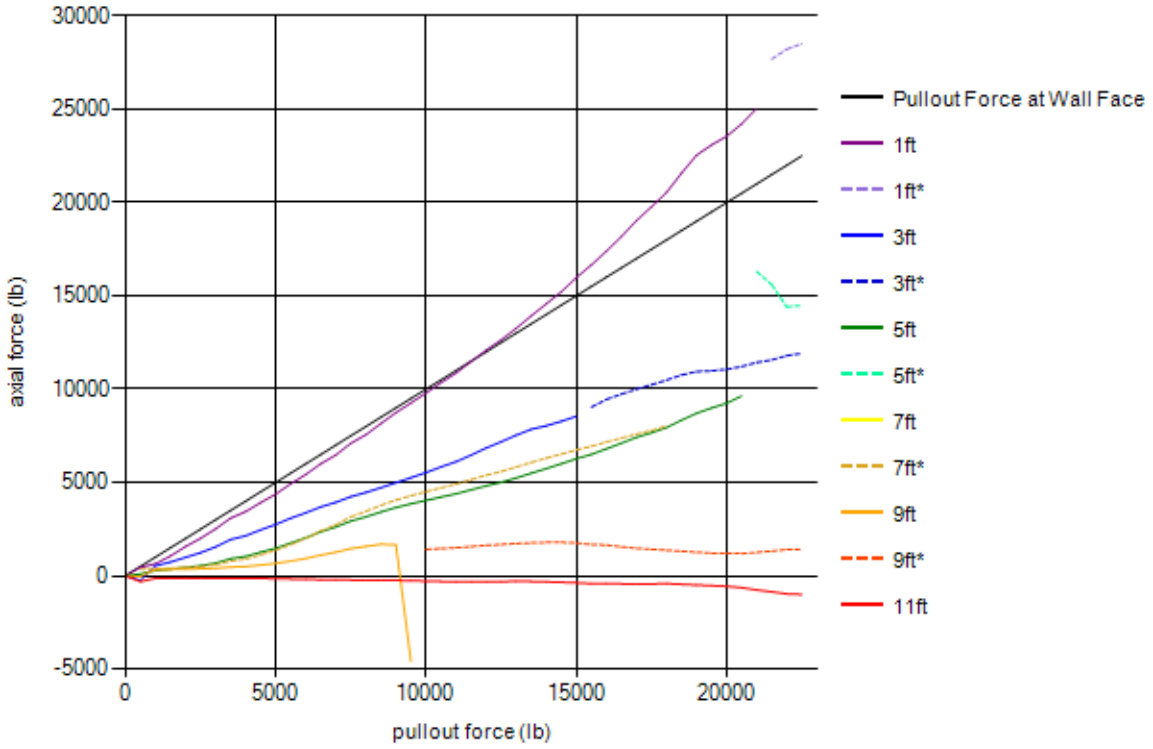


MSE Reinforcement	
Type:	Ribbed Strip
Length, L_e (ft):	12
Width, b (in.):	2
Skew Angle, β (°):	0

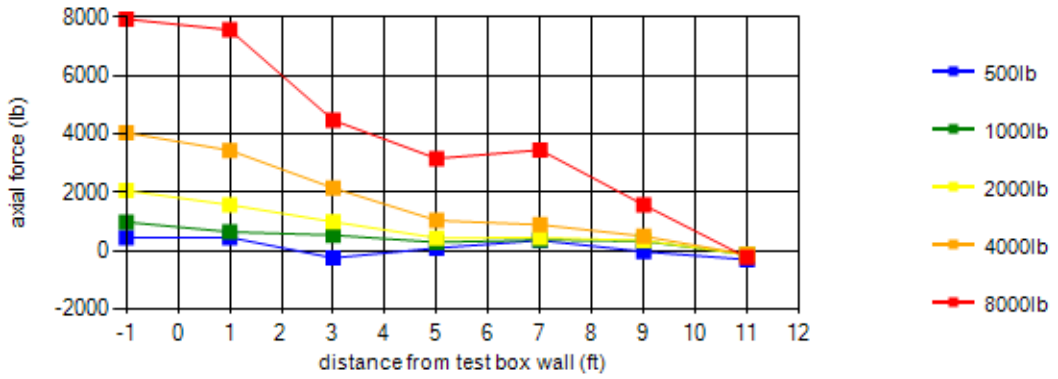
Axial Load-Pullout Load Data by Gage



Axial Load-Pullout Load And Moment-Pullout Load Data by Location



Axial Load-Distance from Test Box Wall Plot – Service Loads

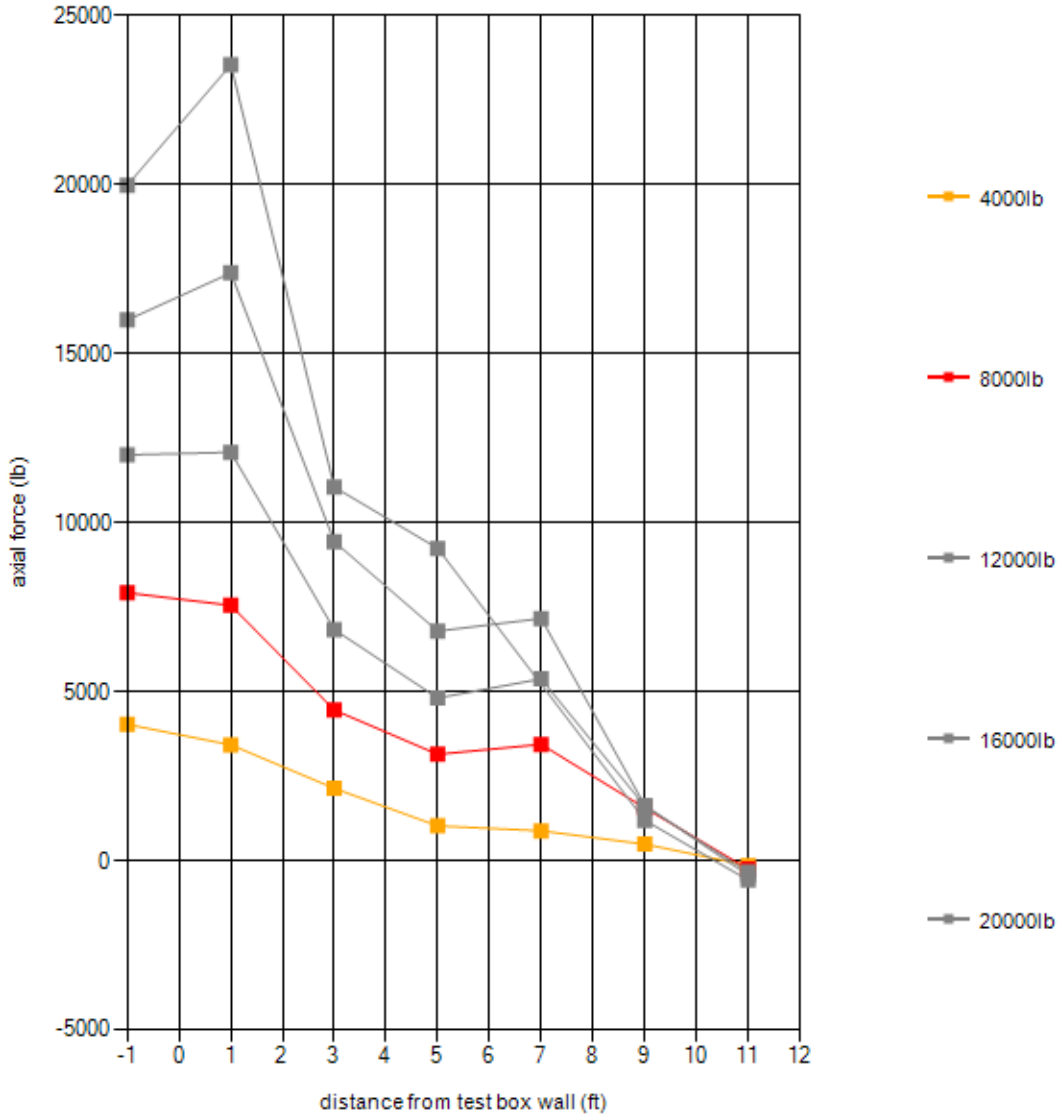


Axial Load Results

Pullout Resistance, P_r (lb)	*Axial Load, P (lb) calculated from strain data at distances from test box wall*					
	1ft	*3ft*	*5ft*	*7ft**	*9ft*	*11ft*
500	452	-249	91	354*	-32	-306
1000	641	533	287	369*	330	-136
2000	1569	988	439	445*	351	-135
3000	2512	1548	678	590*	403	-130
4000	3437	2148	1036	891*	495	-131
5000	4372	2752	1477	1368*	662	-156
6000	5432	3378	2034	2005*	929	-189
7000	6475	3933	2618	2732*	1261	-213
8000	7560	4467	3156	3448*	1571	-233
9000	8742	4994	3657	4059*	1663	-243
10000	9797	5533	4041	4509*	1415*	-282
11000	10863	6111	4391	4914*	1500*	-319
12000	12090	6846	4819	5387*	1628*	-319
13000	13262	7536	5242	5827*	1726*	-298
14000	14574	8038	5748	6304*	1788*	-318
15000	15977	8545	6275	6744*	1759*	-379
16000	17395	9448*	6801	7172*	1646*	-420
17000	19029	10000*	7417	7597*	1471*	-435
18000	20543	10485*	7948	8027*	1366*	-420
19000	22538	10942*	8704	ND	1256*	-498
20000	23550	11061*	9249	ND	1204*	-565
21000	25036	11429*	16305*	ND	1254*	-760
22000	28217*	11796*	14412*	ND	1400*	-969

* calculated from 1 strain gage.

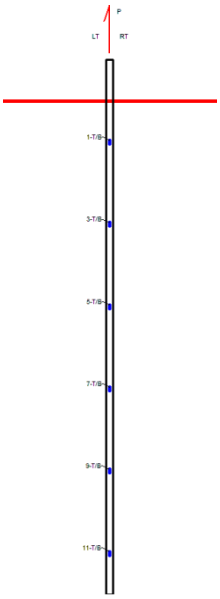
Axial Load-Distance from Test Box Wall Plot – All



STRAIN GAGE REPORT FOR MSE REINFORCEMENT PULLOUT TEST

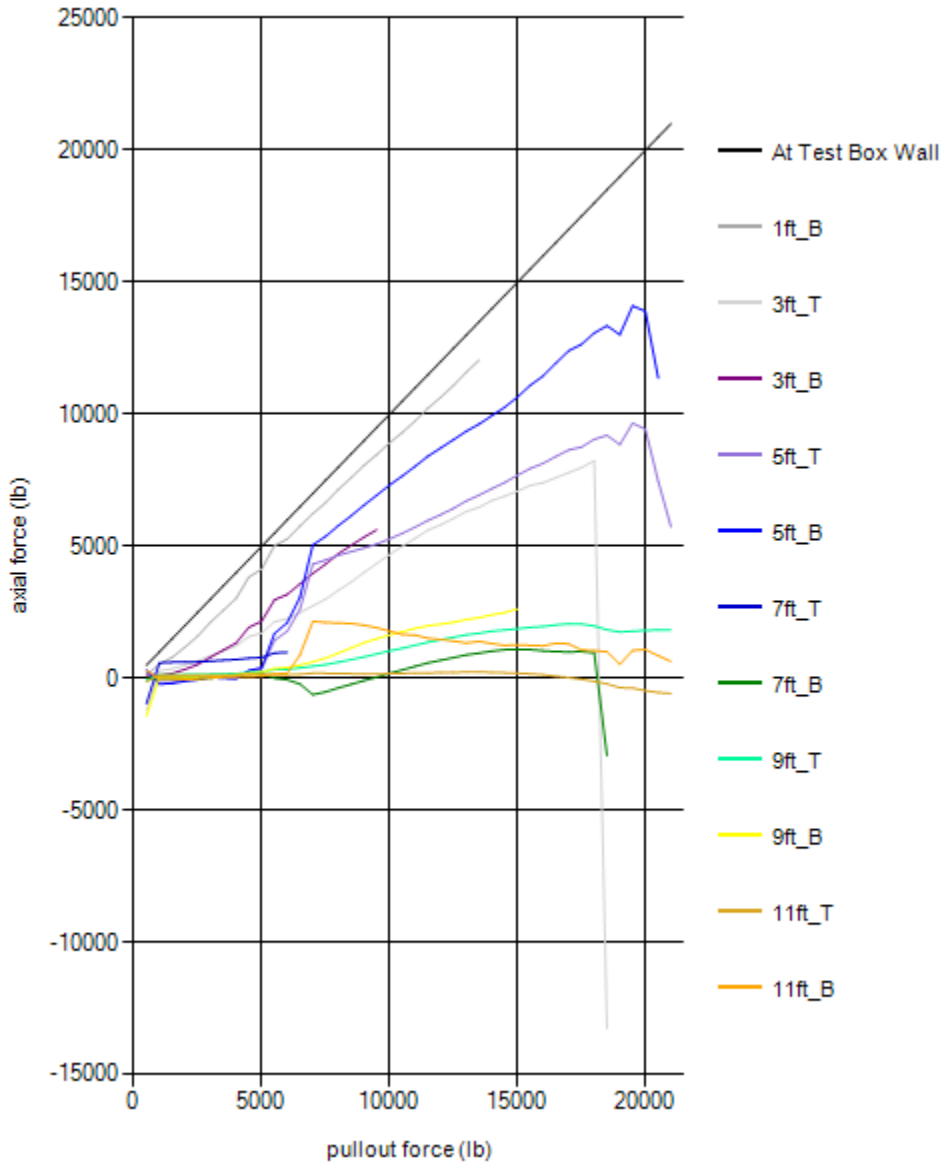
Test Information	
Test Date:	6/20/2011 3:15:00 PM
Test Identification:	TS29.04-S-L12-Z40-T
Test Facility:	12'x12'x4' MSE Test Box

Sketch

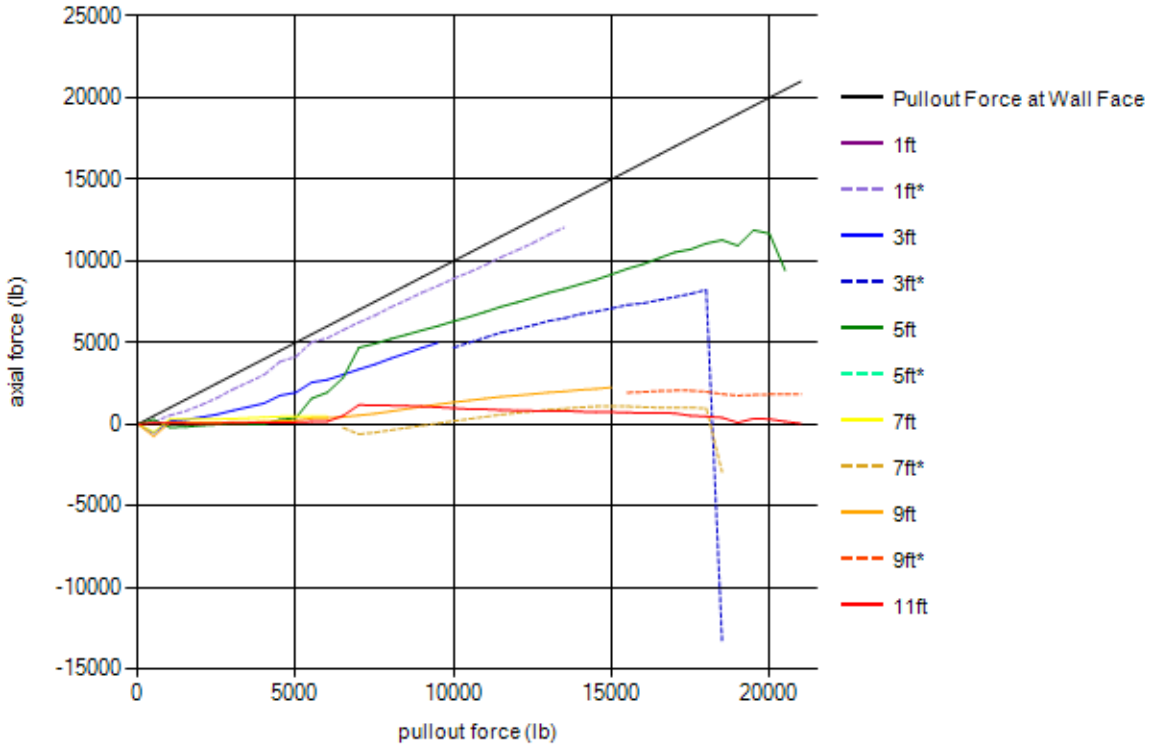


MSE Reinforcement	
Type:	Ribbed Strip
Length, L_e (ft):	12
Width, b (in.):	2
Skew Angle, β (°):	0

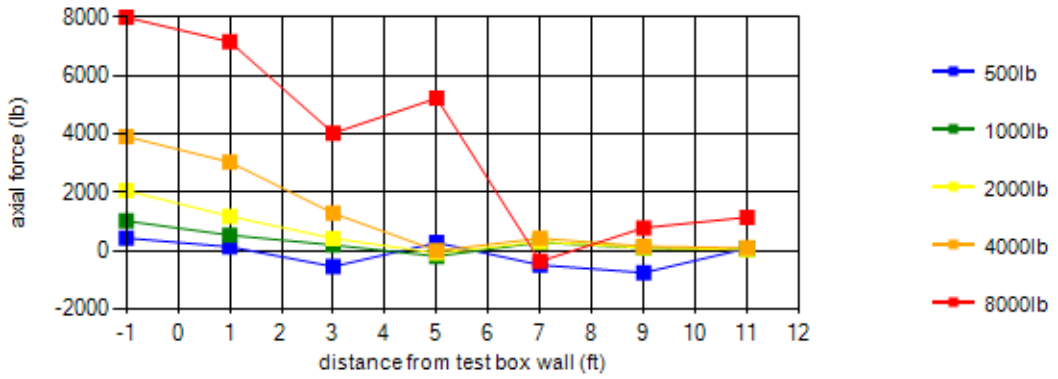
Axial Load-Pullout Load Data by Gage



Axial Load-Pullout Load And Moment-Pullout Load Data by Location



Axial Load-Distance from Test Box Wall Plot – Service Loads

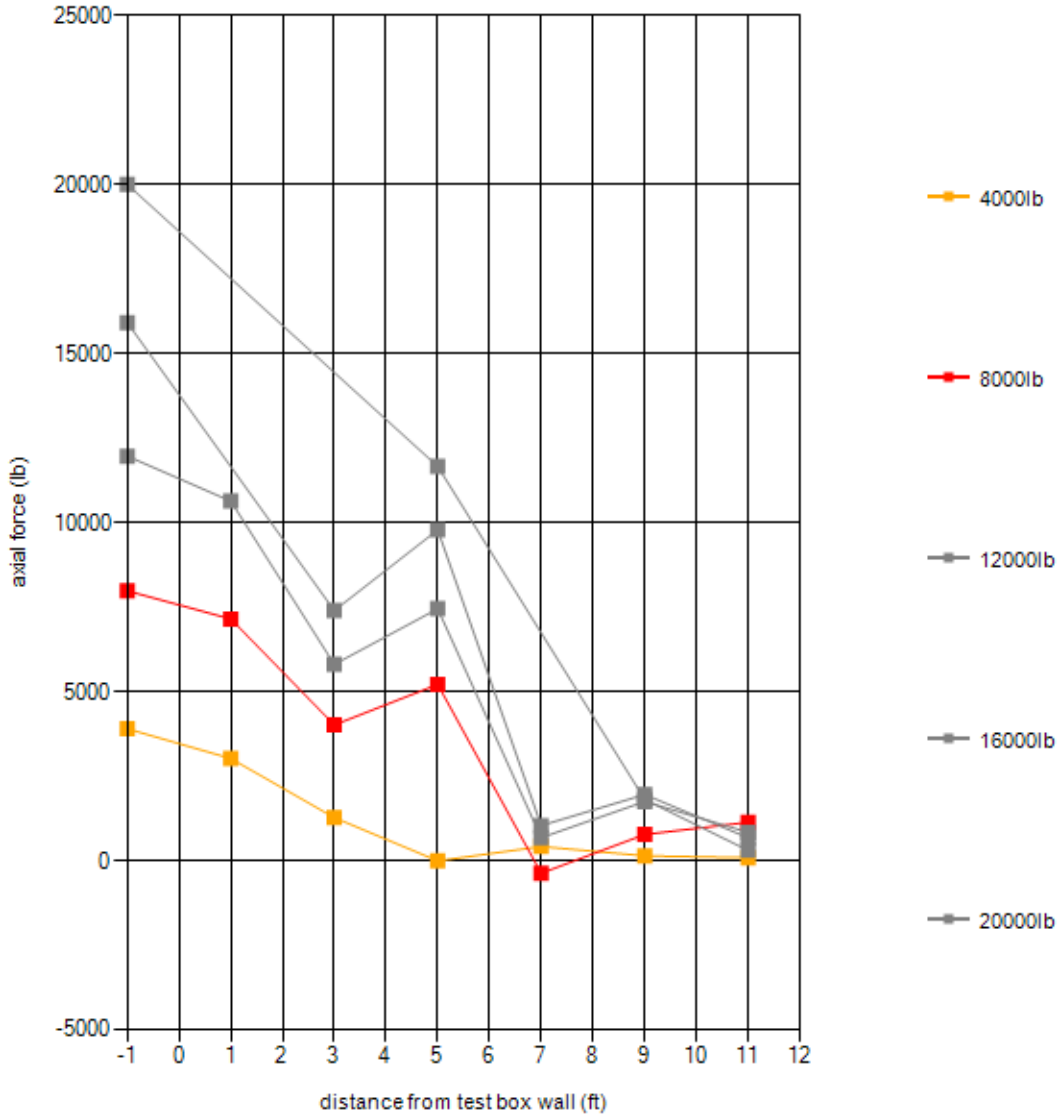


Axial Load Results

Pullout Resistance, P_r (lb)	*Axial Load, P (lb) calculated from strain data at distances from test box wall*					
	*1ft**	*3ft*	*5ft*	*7ft*	*9ft*	*11ft*
500	133*	-543	277	-489	-754	83
1000	534*	192	-189	290	86	52
2000	1178*	419	-81	304	95	33
3000	2128*	835	56	331	118	71
4000	3031*	1283	2	425	153	97
5000	4132*	1940	379	490	237	115
6000	5275*	2716	1946	468	377	162
7000	6237*	3360	4687	-618*	541	1178
8000	7157*	4025	5221	-363*	785	1144
9000	8061*	4677	5748	-86*	1082	1087
10000	8917*	4689*	6301	192*	1341	985
11000	9748*	5304*	6879	455*	1570	919
12000	10645*	5815*	7461	687*	1758	844
13000	11597*	6318*	8040	888*	1936	789
14000	ND	6737*	8566	1032*	2099	771
15000	ND	7092*	9173	1099*	2254	736
16000	ND	7407*	9796	1047*	1966*	684
17000	ND	7786*	10525	1003*	2062*	669
18000	ND	8235*	11064	967*	1983*	472
19000	ND	ND	10933	ND	1756*	92
20000	ND	ND	11672	ND	1820*	313
21000	ND	ND	5741*	ND	1825*	37

* calculated from 1 strain gage.

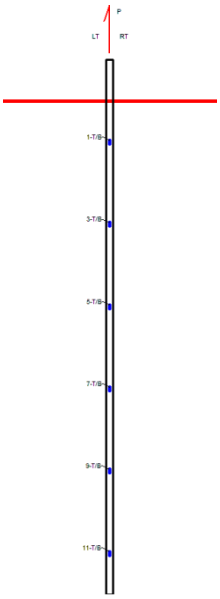
Axial Load-Distance from Test Box Wall Plot – All



STRAIN GAGE REPORT FOR MSE REINFORCEMENT PULLOUT TEST

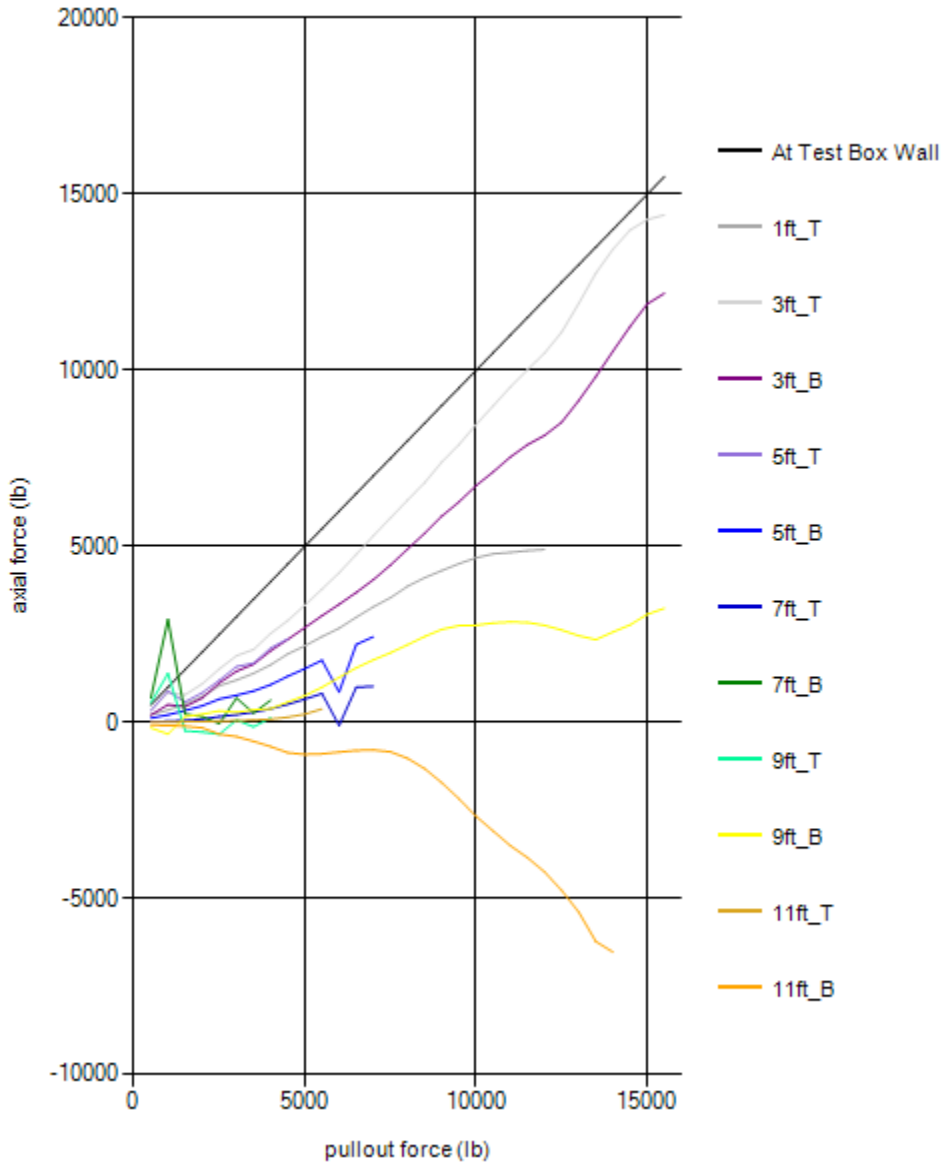
Test Information	
Test Date:	6/21/2011 4:24:00 PM
Test Identification:	TS29.05-S-L12-Z5-T
Test Facility:	12'x12'x4' MSE Test Box

Sketch

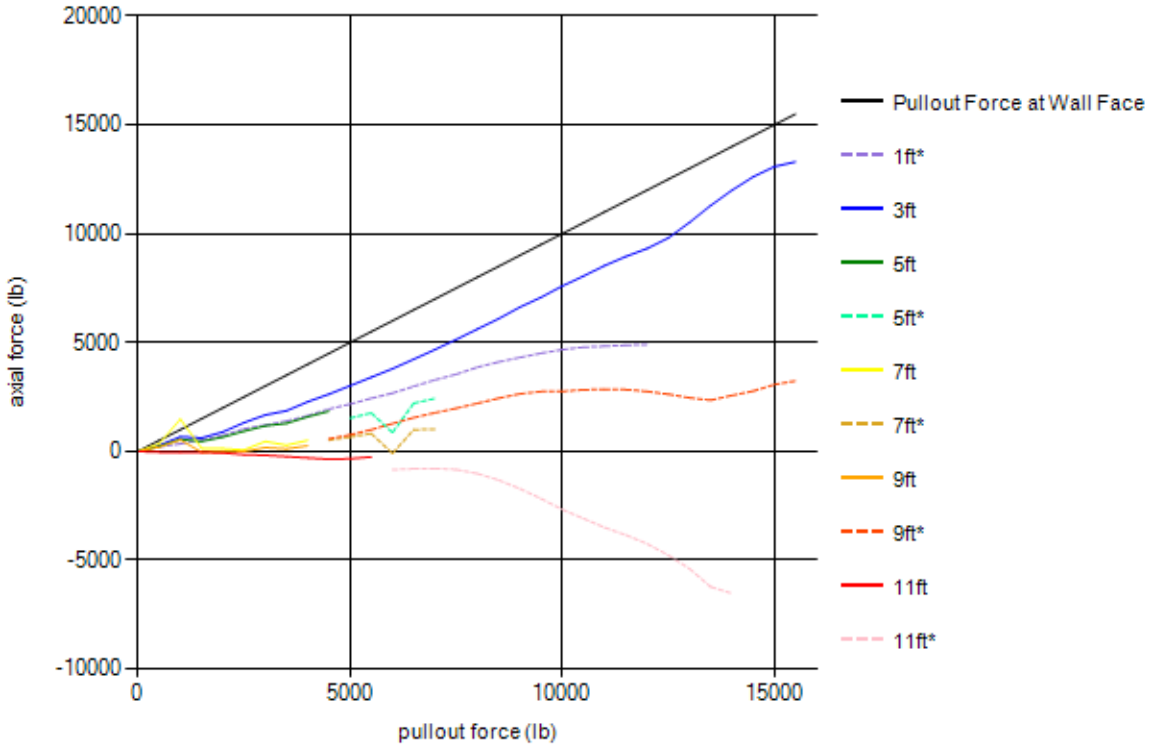


MSE Reinforcement	
Type:	Ribbed Strip
Length, L_e (ft):	12
Width, b (in.):	2
Skew Angle, β (°):	0

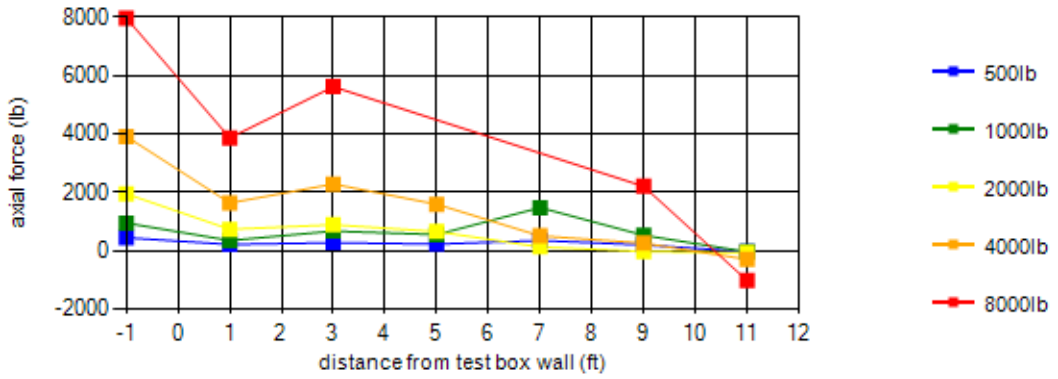
Axial Load-Pullout Load Data by Gage



Axial Load-Pullout Load And Moment-Pullout Load Data by Location



Axial Load-Distance from Test Box Wall Plot – Service Loads

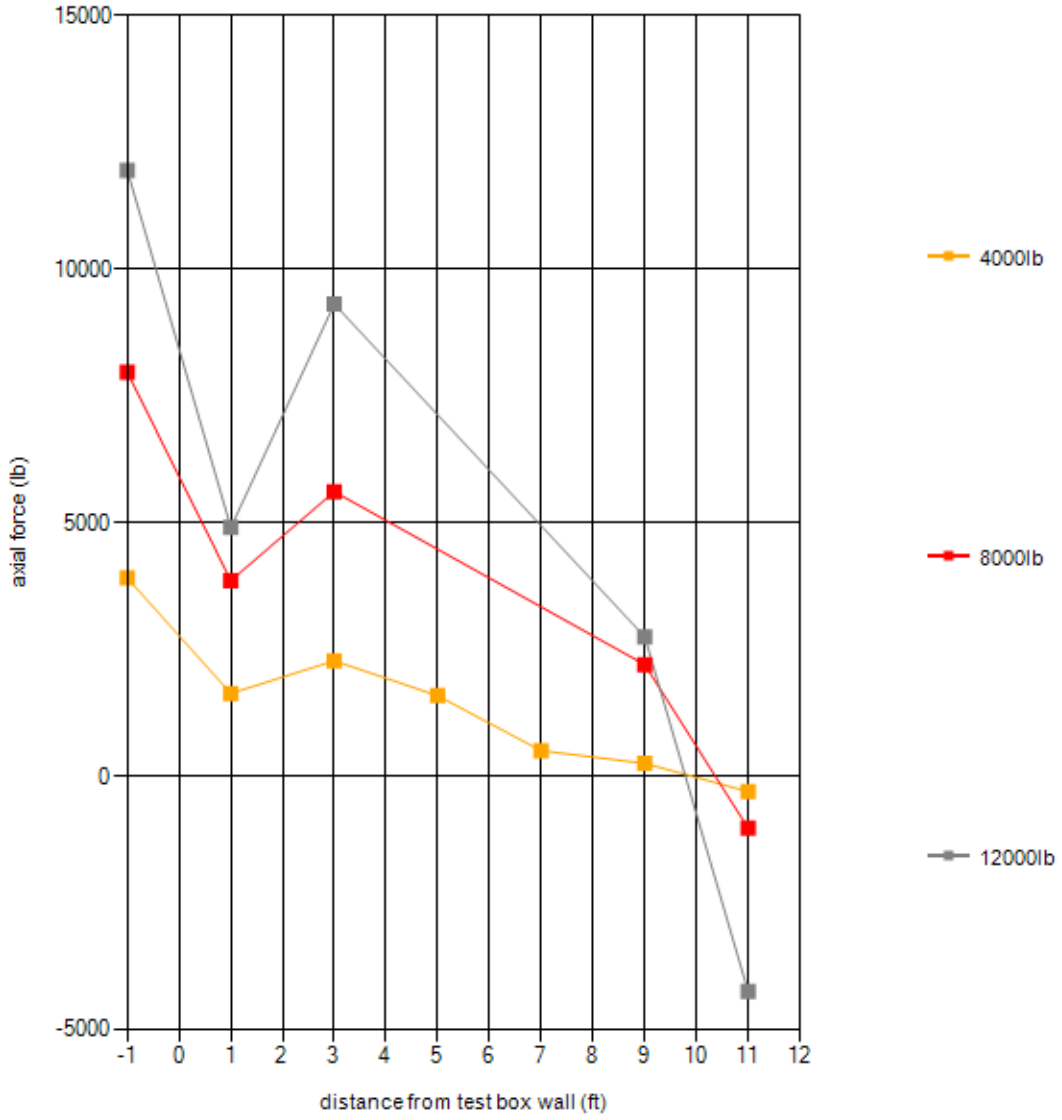


Axial Load Results

Pullout Resistance, P_r (lb)	*Axial Load, P (lb) calculated from strain data at distances from test box wall*					
	*1ft**	*3ft*	*5ft*	*7ft*	*9ft*	*11ft*
500	214*	277	226	352	198	-34
1000	349*	673	551	1477	528	-38
2000	734*	891	656	127	-23	-70
3000	1202*	1672	1176	456	176	-177
4000	1637*	2281	1591	507	258	-297
5000	2172*	3011	1526*	660*	760*	-338
6000	2673*	3799	863*	-92*	1277*	-845*
7000	3283*	4676	2432*	1025*	1774*	-783*
8000	3865*	5616	ND	ND	2206*	-1020*
9000	4312*	6625	ND	ND	2640*	-1714*
10000	4674*	7594	ND	ND	2760*	-2669*
11000	4827*	8533	ND	ND	2852*	-3500*
12000	4910*	9317	ND	ND	2754*	-4244*
13000	ND	10519	ND	ND	2460*	-5387*
14000	ND	11991	ND	ND	2569*	-6524*
15000	ND	13079	ND	ND	3069*	ND

* calculated from 1 strain gage.

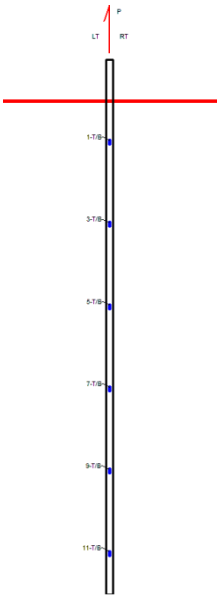
Axial Load-Distance from Test Box Wall Plot – All



STRAIN GAGE REPORT FOR MSE REINFORCEMENT PULLOUT TEST

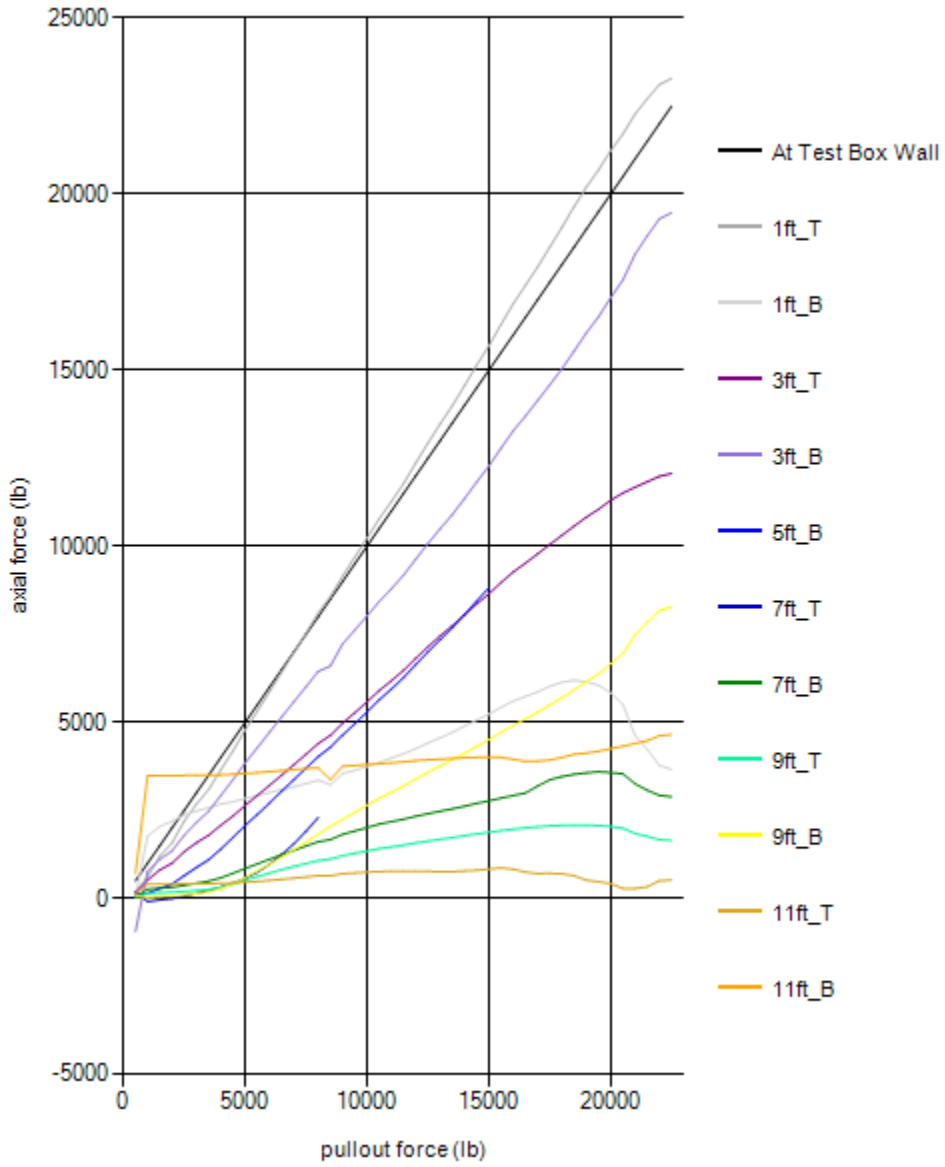
Test Information	
Test Date:	6/21/2011 12:11:00 PM
Test Identification:	TS29.06-S-L12-Z12-M
Test Facility:	12'x12'x4' MSE Test Box

Sketch

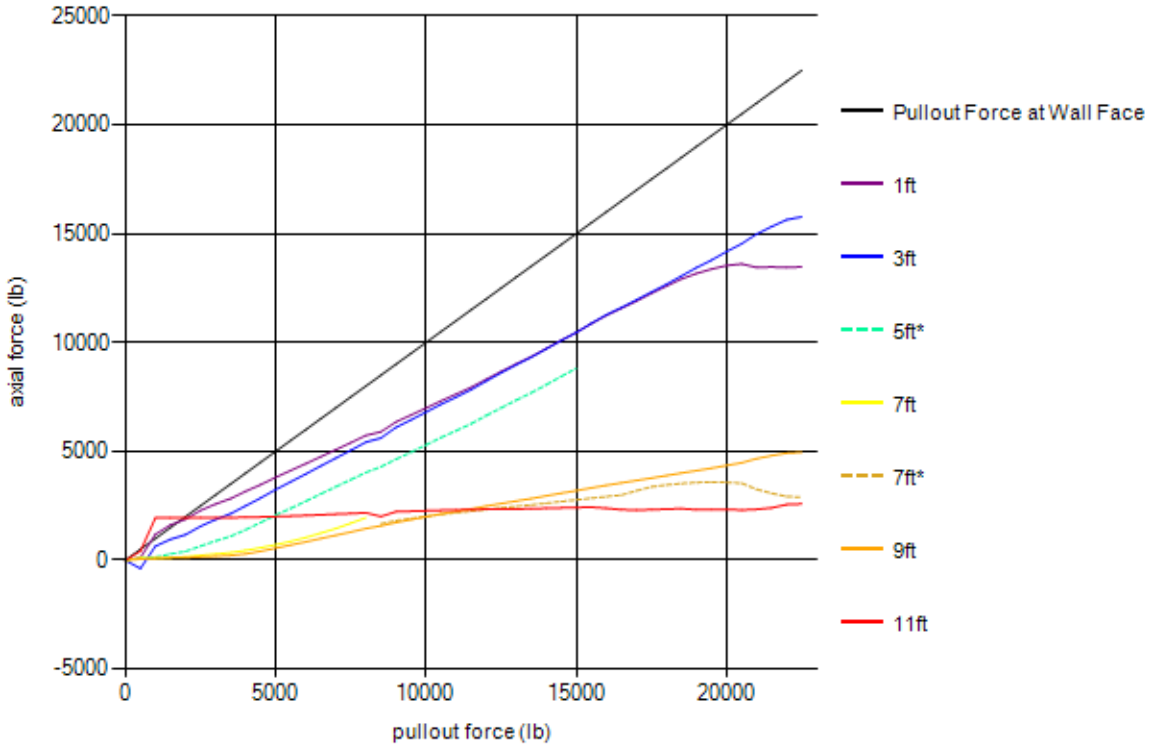


MSE Reinforcement	
Type:	Ribbed Strip
Length, L_e (ft):	12
Width, b (in.):	2
Skew Angle, β (°):	0

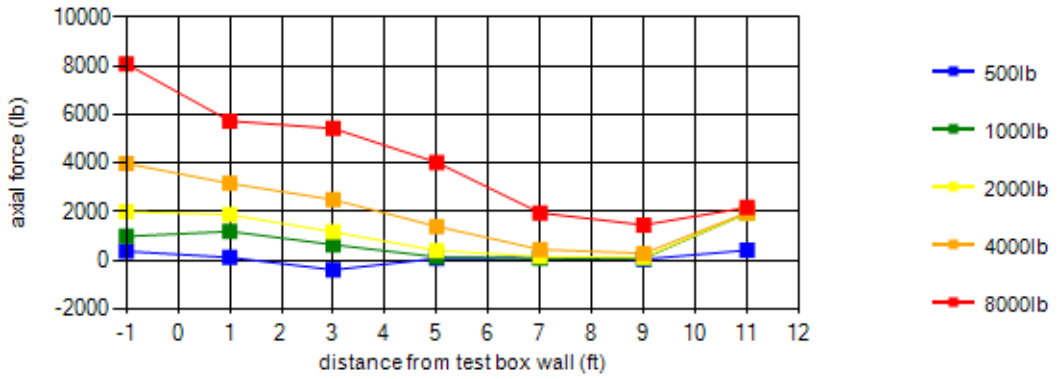
Axial Load-Pullout Load Data by Gage



Axial Load-Pullout Load And Moment-Pullout Load Data by Location



Axial Load-Distance from Test Box Wall Plot – Service Loads

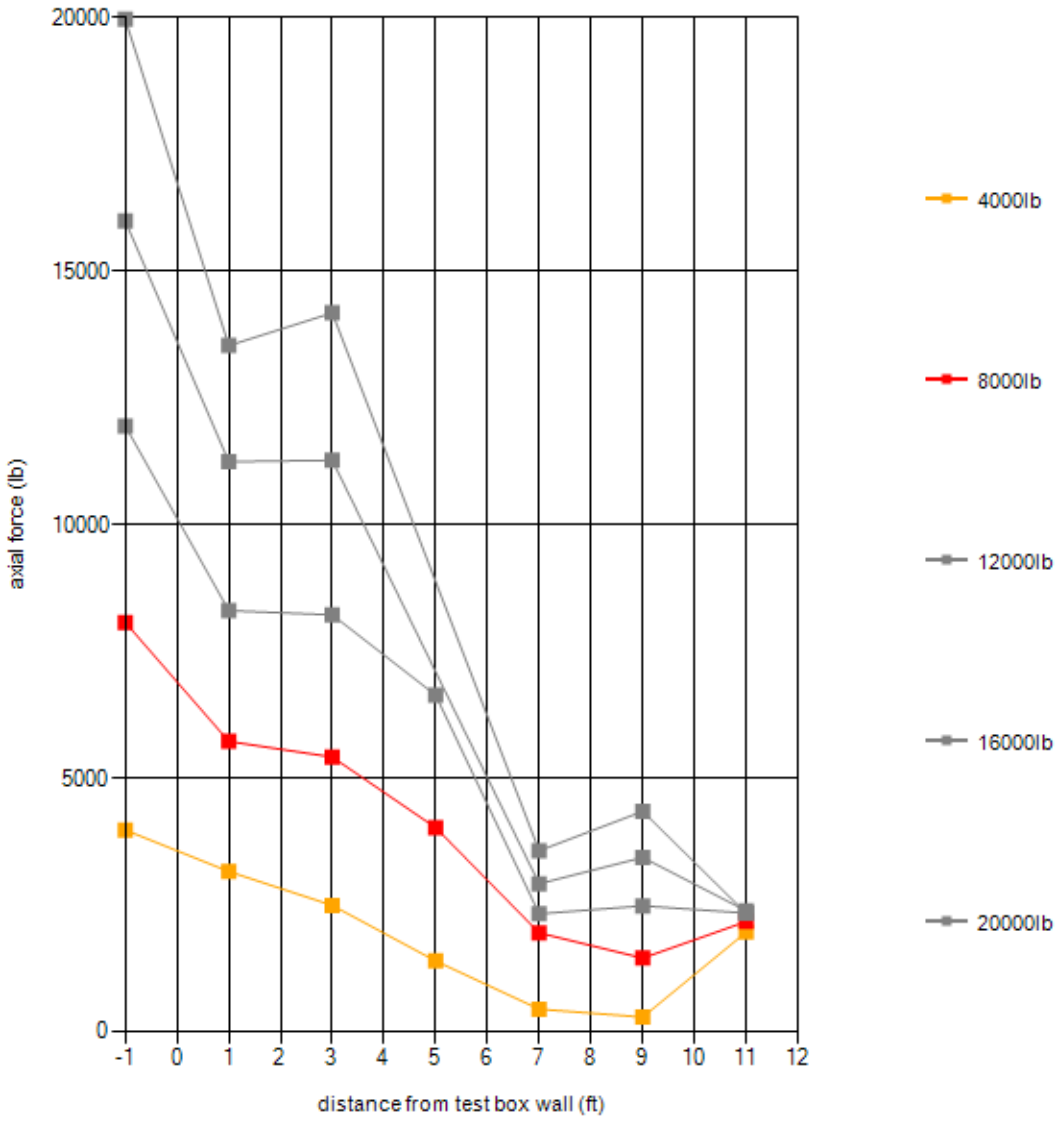


Axial Load Results

Pullout Resistance, P_r (lb)	*Axial Load, P (lb) calculated from strain data at distances from test box wall*					
	1ft	*3ft*	*5ft**	*7ft*	*9ft*	*11ft*
500	123	-384	80*	112	51	420
1000	1192	646	141*	88	88	1946
2000	1882	1173	405*	157	121	1949
3000	2581	1869	881*	288	182	1957
4000	3165	2498	1400*	450	293	1968
5000	3810	3242	2071*	713	557	2006
6000	4437	3964	2711*	1040	843	2056
7000	5077	4691	3373*	1457	1144	2118
8000	5731	5423	4029*	1954	1456	2177
9000	6350	6104	4638*	1819*	1731	2228
10000	6990	6802	5295*	2011*	1997	2275
11000	7628	7488	5946*	2181*	2239	2312
12000	8309	8226	6642*	2332*	2487	2346
13000	9019	8975	7348*	2477*	2722	2357
14000	9726	9707	8061*	2619*	2957	2389
15000	10460	10464	8818*	2771*	3194	2421
16000	11247	11274	ND	2923*	3443	2391
17000	11901	11961	ND	3192*	3662	2305
18000	12596	12675	ND	3461*	3888	2352
19000	13176	13439	ND	3568*	4119	2323
20000	13537	14181	ND	3575*	4352	2340
21000	13450	14984	ND	3257*	4666	2341
22000	13445	15643	ND	2926*	4923	2561

* calculated from 1 strain gage.

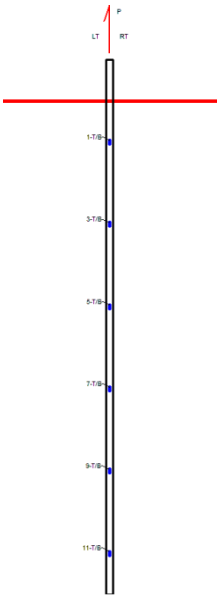
Axial Load-Distance from Test Box Wall Plot – All



STRAIN GAGE REPORT FOR MSE REINFORCEMENT PULLOUT TEST

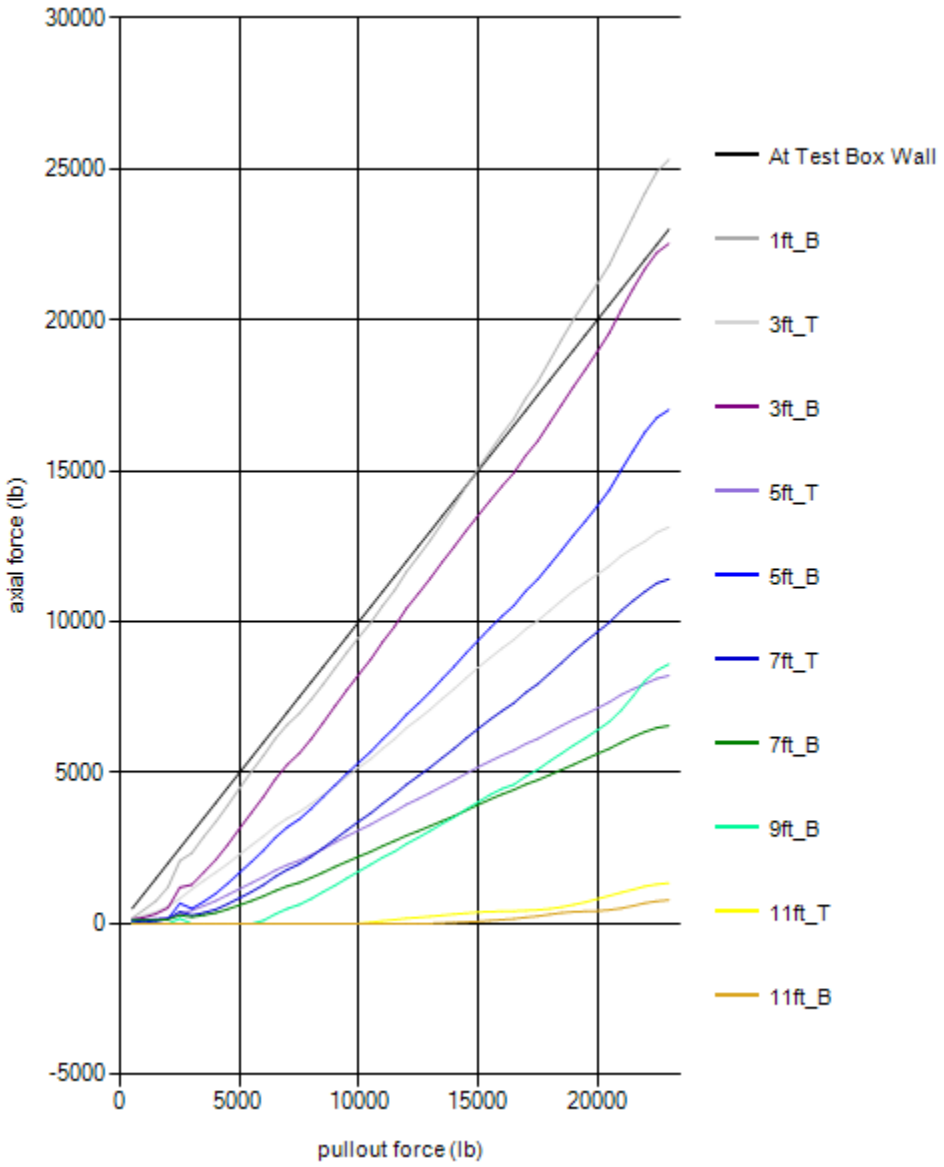
Test Information	
Test Date:	6/21/2011 10:48:00 AM
Test Identification:	TS29.07-S-L12-Z20-M
Test Facility:	12'x12'x4' MSE Test Box

Sketch

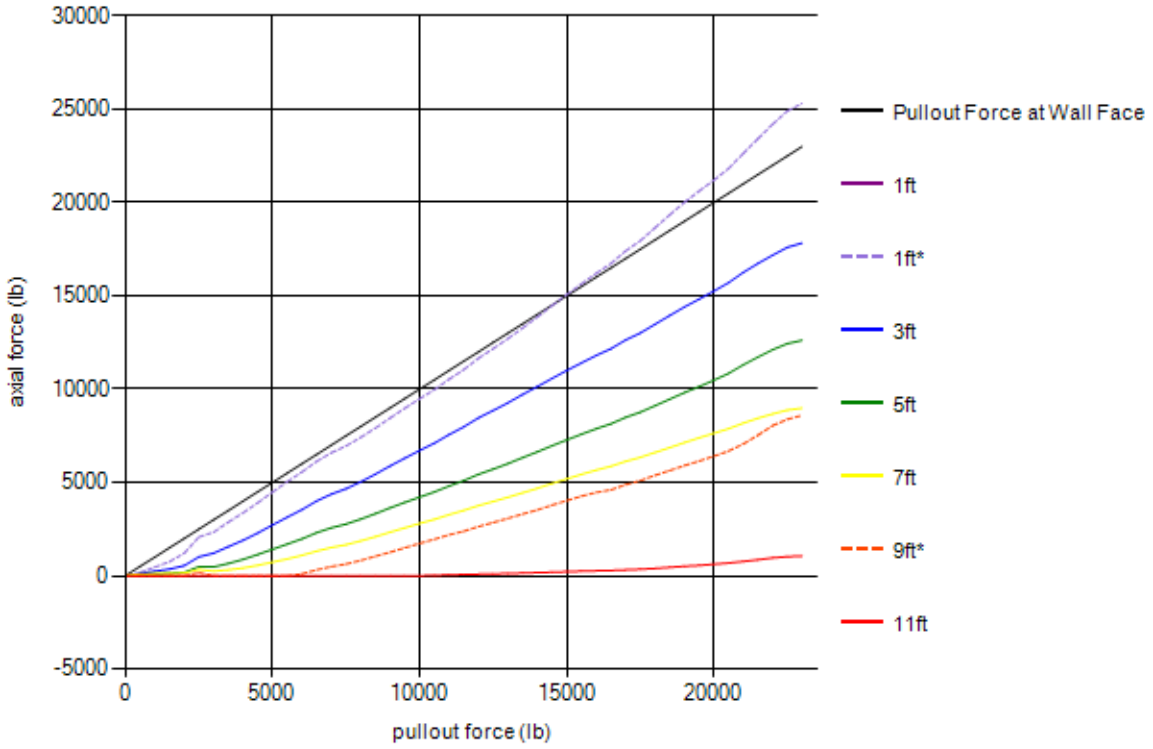


MSE Reinforcement	
Type:	Ribbed Strip
Length, L_e (ft):	12
Width, b (in.):	2
Skew Angle, β (°):	0

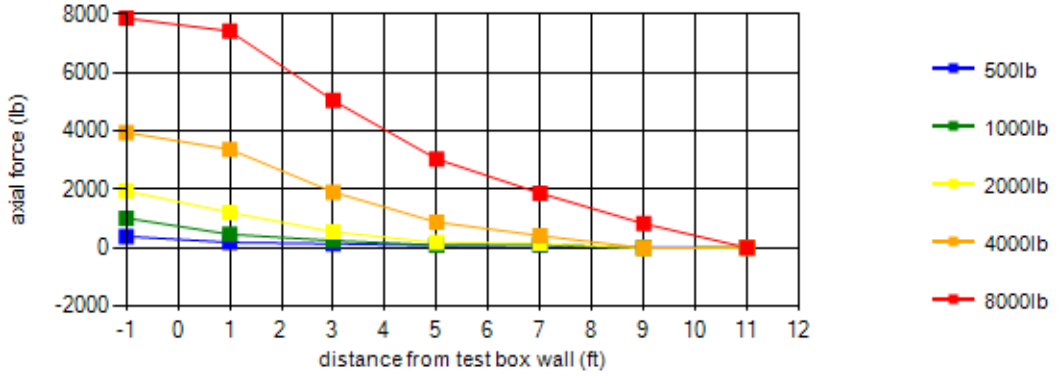
Axial Load-Pullout Load Data by Gage



Axial Load-Pullout Load And Moment-Pullout Load Data by Location



Axial Load-Distance from Test Box Wall Plot – Service Loads

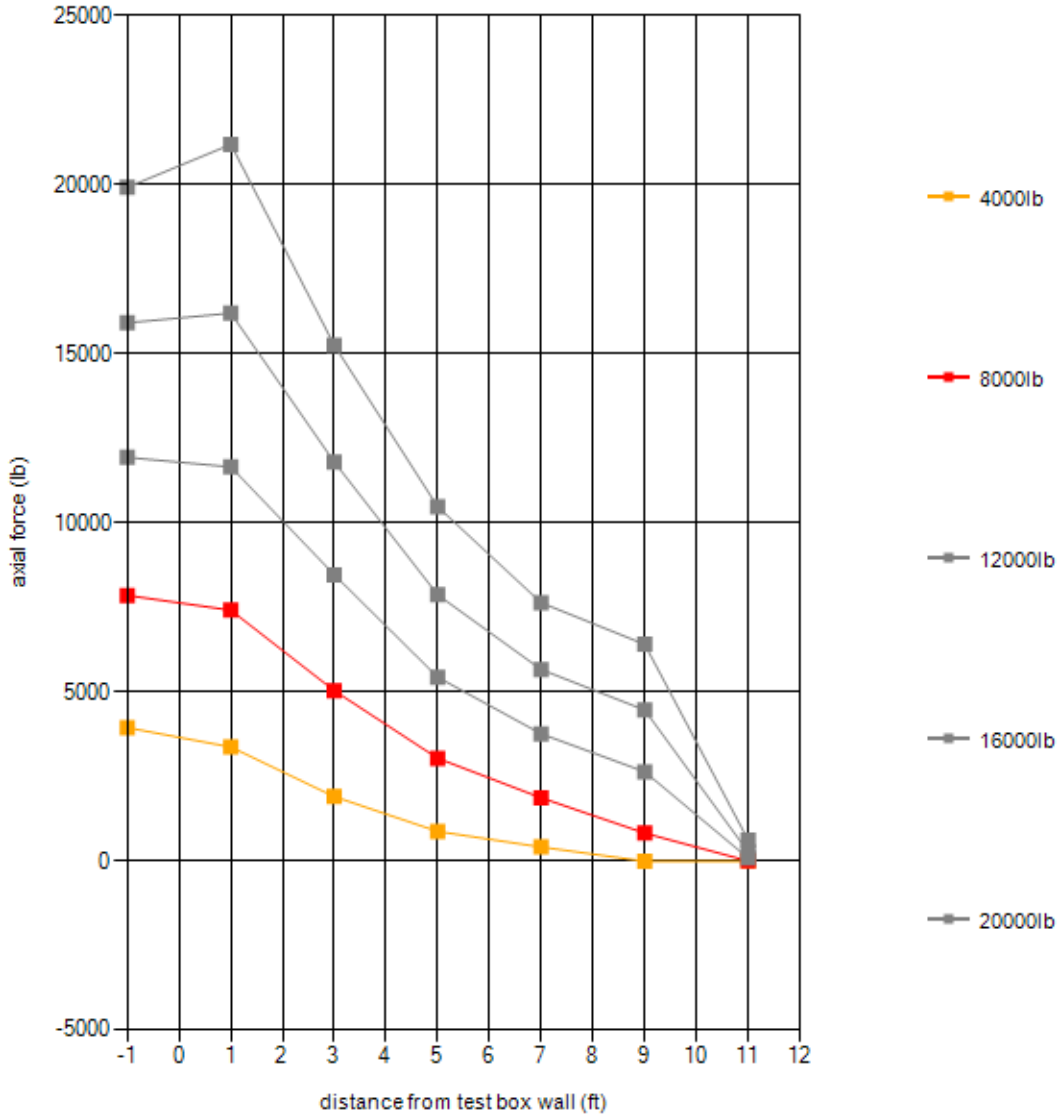


Axial Load Results

Pullout Resistance, P_r (lb)	*Axial Load, P (lb) calculated from strain data at distances from test box wall*					
	*1ft**	*3ft*	*5ft*	*7ft*	*9ft**	*11ft*
500	181*	137	78	103	8*	0
1000	459*	241	90	112	-7*	0
2000	1206*	544	176	143	-7*	0
3000	2337*	1213	470	247	-7*	0
4000	3369*	1903	874	411	-7*	0
5000	4481*	2717	1419	729	-7*	0
6000	5560*	3544	1981	1093	99*	0
7000	6591*	4375	2568	1514	491*	0
8000	7417*	5038	3036	1867	822*	0
9000	8456*	5884	3637	2339	1264*	0
10000	9483*	6710	4215	2804	1734*	1
11000	10530*	7564	4808	3271	2192*	44
12000	11656*	8465	5436	3760	2640*	86
13000	12704*	9270	6008	4204	3074*	117
14000	13861*	10136	6637	4683	3526*	172
15000	15074*	10998	7280	5192	4025*	222
16000	16204*	11803	7874	5663	4464*	267
17000	17404*	12635	8488	6132	4880*	319
18000	18645*	13478	9112	6607	5381*	394
19000	20014*	14409	9816	7137	5905*	507
20000	21197*	15256	10479	7637	6409*	618
21000	22630*	16252	11301	8179	7061*	766
22000	24203*	17179	12113	8678	8047*	959
23000	25312*	17831	12617	8983	8595*	1062

* calculated from 1 strain gage.

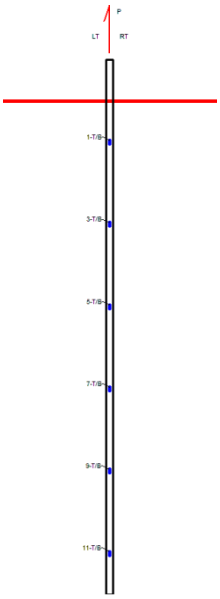
Axial Load-Distance from Test Box Wall Plot – All



STRAIN GAGE REPORT FOR MSE REINFORCEMENT PULLOUT TEST

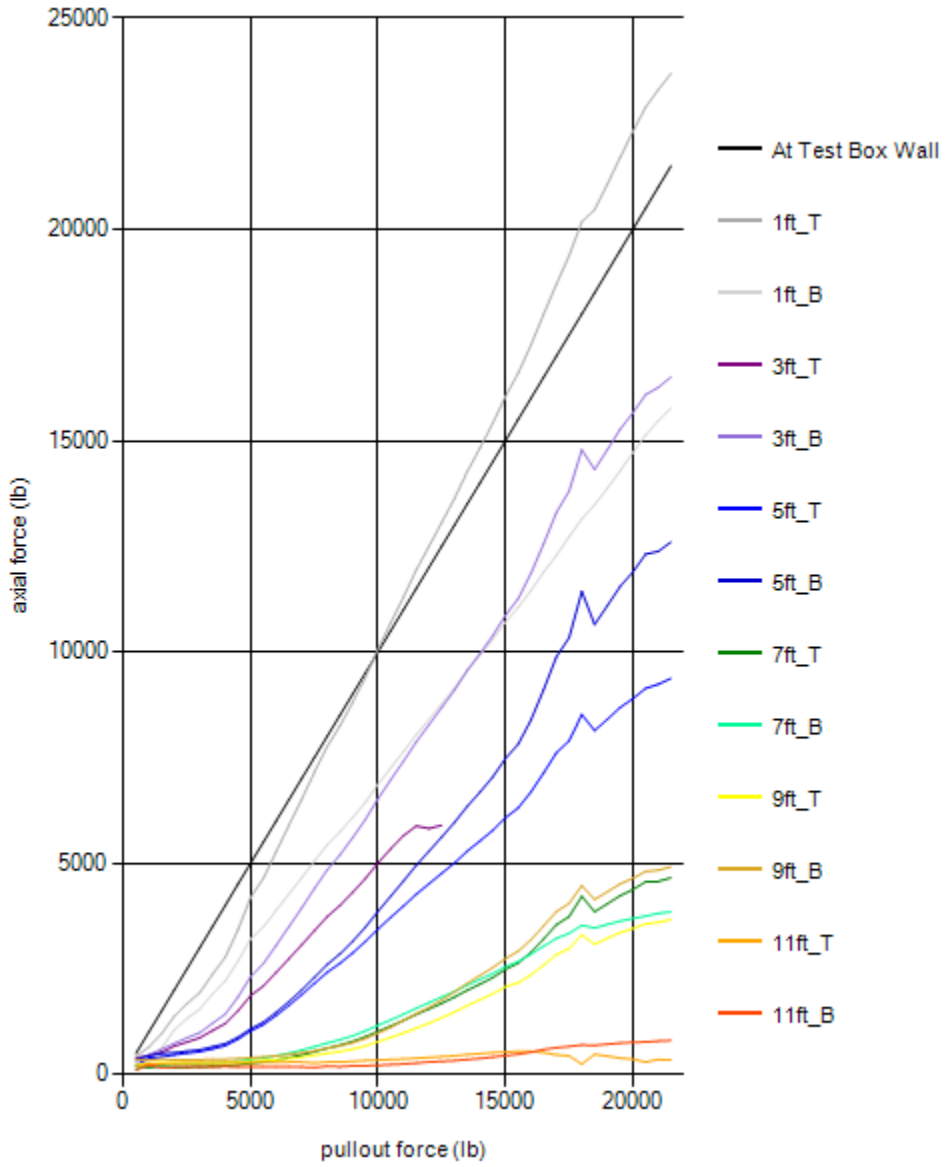
Test Information	
Test Date:	6/21/2011 10:22:00 AM
Test Identification:	TS29.08-S-L12-Z40-M
Test Facility:	12'x12'x4' MSE Test Box

Sketch

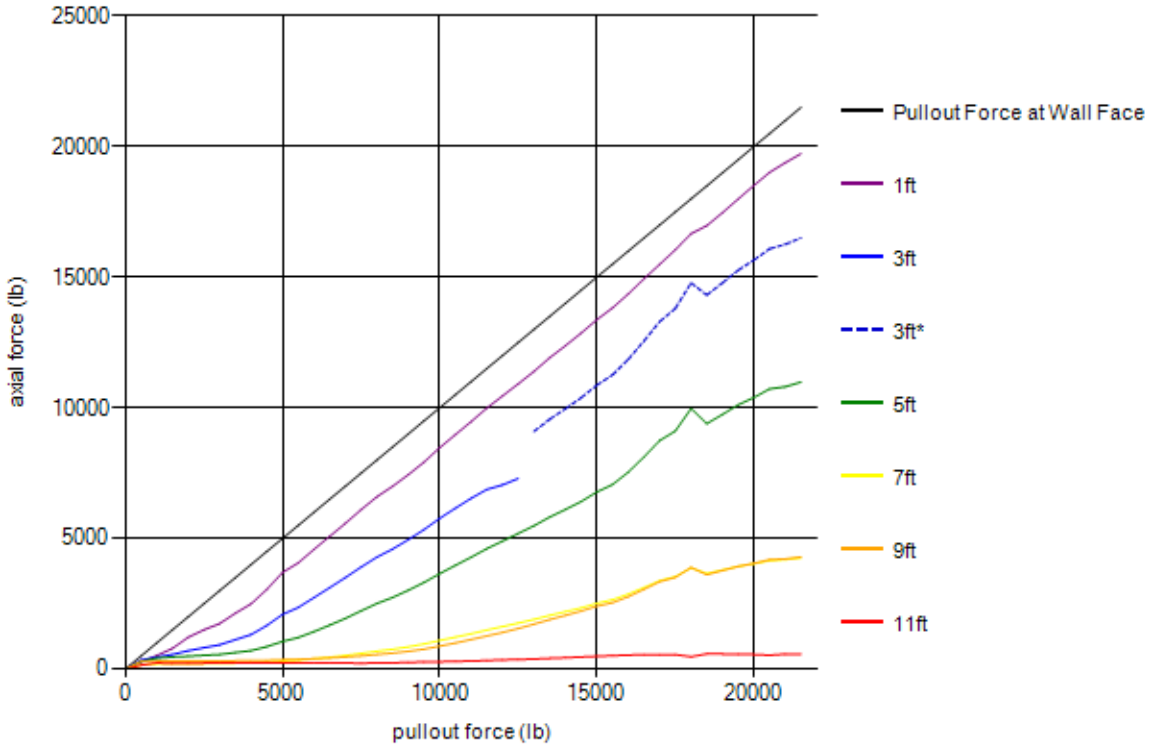


MSE Reinforcement	
Type:	Ribbed Strip
Length, L_e (ft):	12
Width, b (in.):	2
Skew Angle, β (°):	0

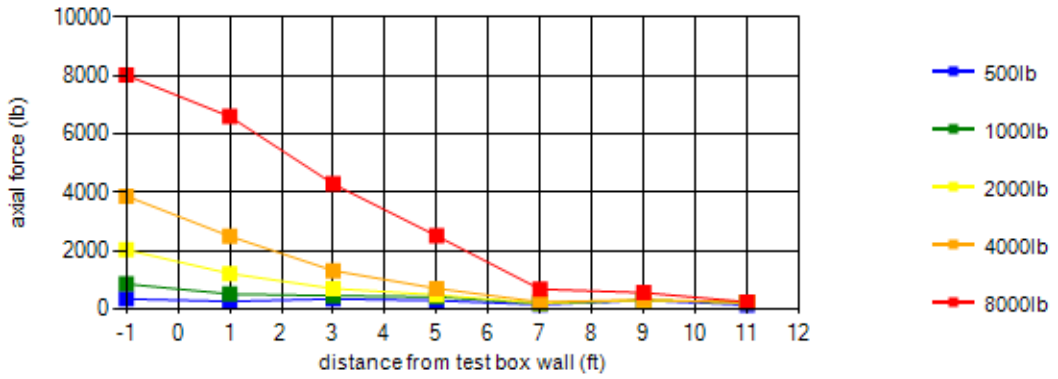
Axial Load-Pullout Load Data by Gage



Axial Load-Pullout Load And Moment-Pullout Load Data by Location



Axial Load-Distance from Test Box Wall Plot – Service Loads

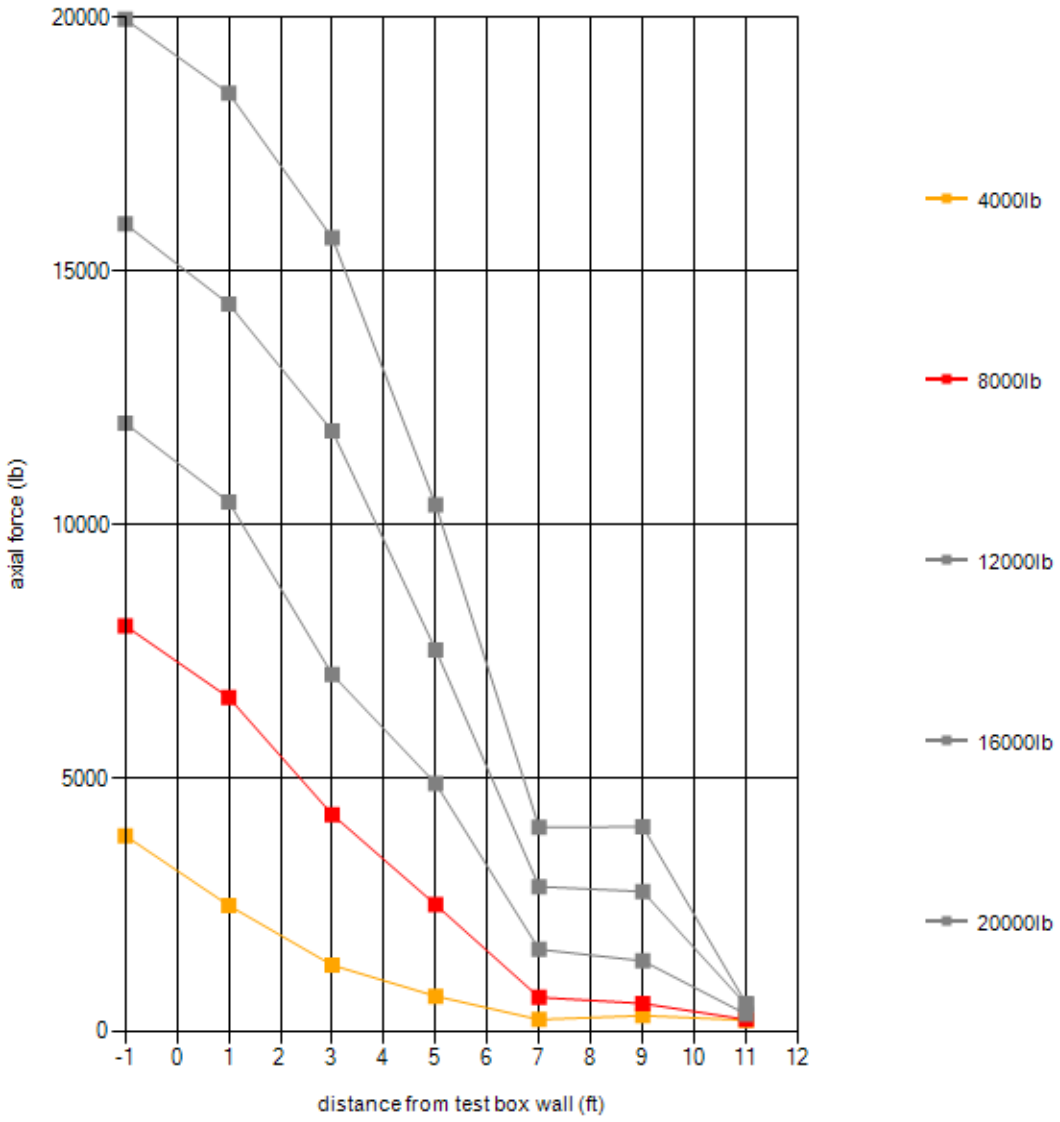


Axial Load Results

Pullout Resistance, P_r (lb)	*Axial Load, P (lb) calculated from strain data at distances from test box wall*					
	1ft	*3ft*	*5ft*	*7ft*	*9ft*	*11ft*
500	266	348	293	154	297	148
1000	516	458	418	196	300	239
2000	1218	703	490	205	307	220
3000	1743	927	561	219	312	227
4000	2495	1318	706	243	323	233
5000	3699	2090	1057	310	357	234
6000	4578	2734	1432	392	396	236
7000	5579	3502	1941	518	462	236
8000	6595	4287	2508	682	561	244
9000	7442	4954	3013	849	677	260
10000	8471	5767	3652	1091	877	279
11000	9470	6533	4282	1353	1130	309
12000	10452	7050	4899	1627	1402	350
13000	11390	9096*	5487	1900	1717	385
14000	12377	9964*	6106	2195	2054	437
15000	13376	10868*	6778	2519	2410	490
16000	14356	11852*	7535	2867	2770	537
17000	15493	13300*	8748	3384	3346	550
18000	16666	14784*	9975	3873	3888	474
19000	17471	14785*	9751	3795	3773	577
20000	18514	15658*	10392	4034	4047	562
21000	19387	16259*	10807	4191	4218	573

* calculated from 1 strain gage.

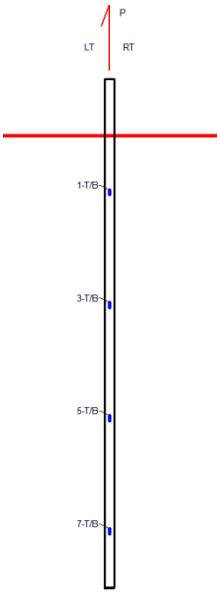
Axial Load-Distance from Test Box Wall Plot – All



STRAIN GAGE REPORT FOR MSE REINFORCEMENT PULLOUT TEST

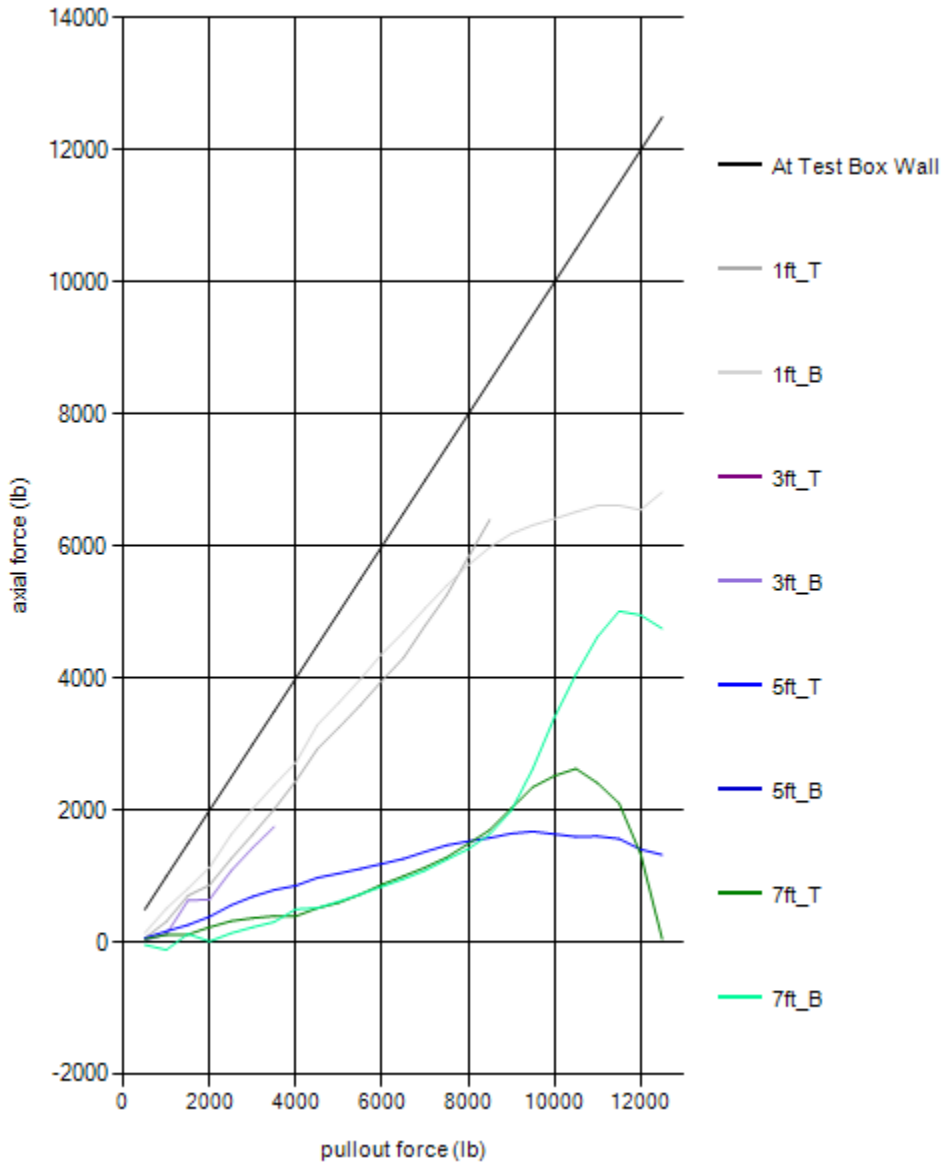
Test Information	
Test Date:	6/21/2011 9:15:00 AM
Test Identification:	TS29.09-S-L8-Z5-M
Test Facility:	12'x12'x4' MSE Test Box

Sketch

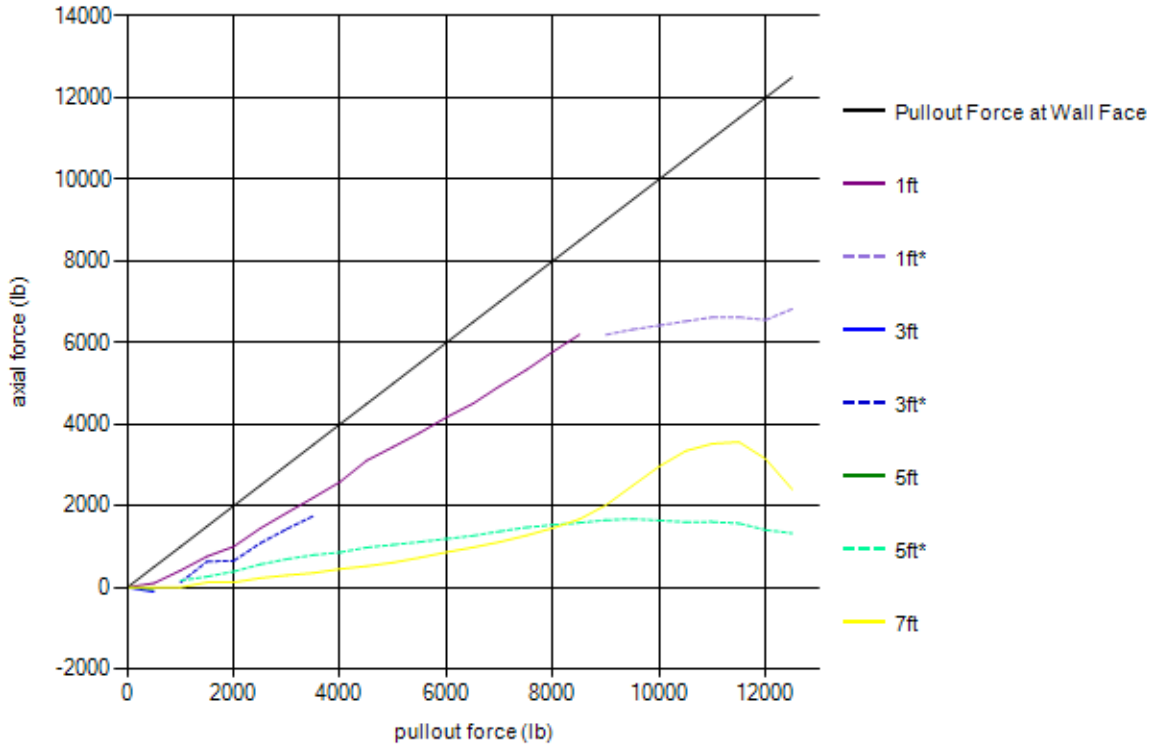


MSE Reinforcement	
Type:	Ribbed Strip
Length, L_e (ft):	8
Width, b (in.):	2
Skew Angle, β (°):	0

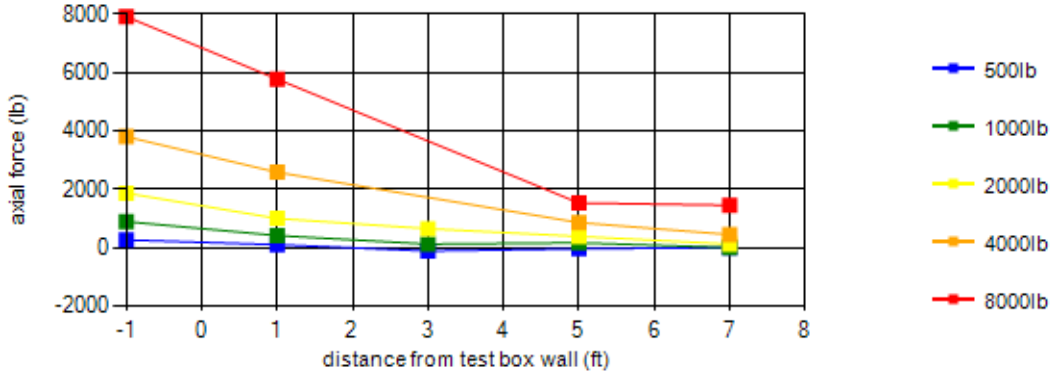
Axial Load-Pullout Load Data by Gage



Axial Load-Pullout Load And Moment-Pullout Load Data by Location



Axial Load-Distance from Test Box Wall Plot – Service Loads

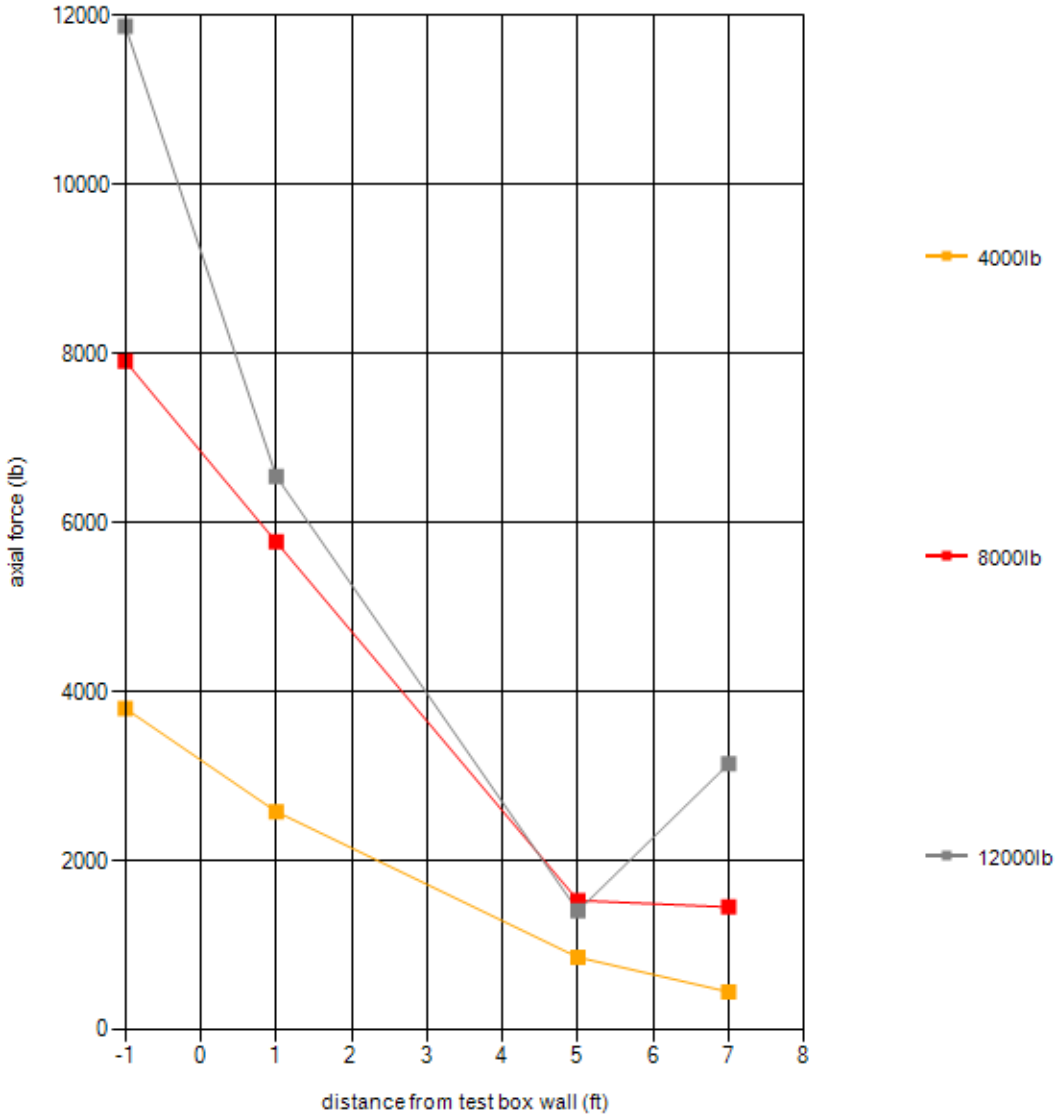


Axial Load Results

Pullout Resistance, P_r (lb)	*Axial Load, P (lb) calculated from strain data at distances from test box wall*			
	1ft	*3ft*	*5ft*	*7ft*
500	105	-111	-37	7
1000	415	124*	170*	2
2000	1003	652*	389*	123
3000	1829	1434*	695*	299
4000	2584	ND	860*	450
5000	3443	ND	1045*	611
6000	4170	ND	1190*	862
7000	4930	ND	1374*	1113
8000	5774	ND	1532*	1455
9000	6192*	ND	1650*	2016
10000	6417*	ND	1640*	2966
11000	6617*	ND	1608*	3522
12000	6552*	ND	1409*	3150

* calculated from 1 strain gage.

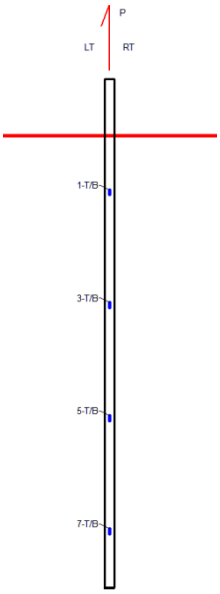
Axial Load-Distance from Test Box Wall Plot – All



STRAIN GAGE REPORT FOR MSE REINFORCEMENT PULLOUT TEST

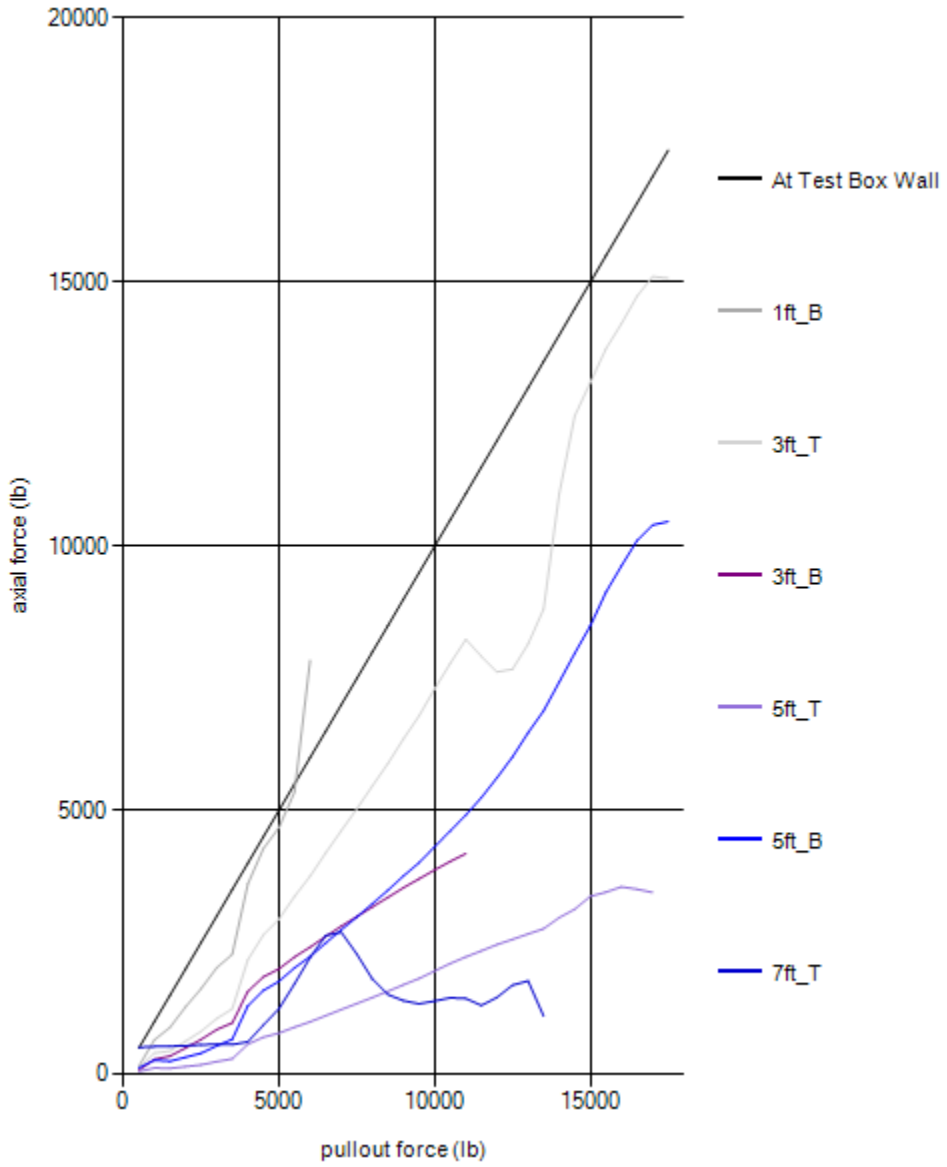
Test Information	
Test Date:	6/21/2011 8:53:00 AM
Test Identification:	TS29.10-S-L8-Z12-M
Test Facility:	12'x12'x4' MSE Test Box

Sketch

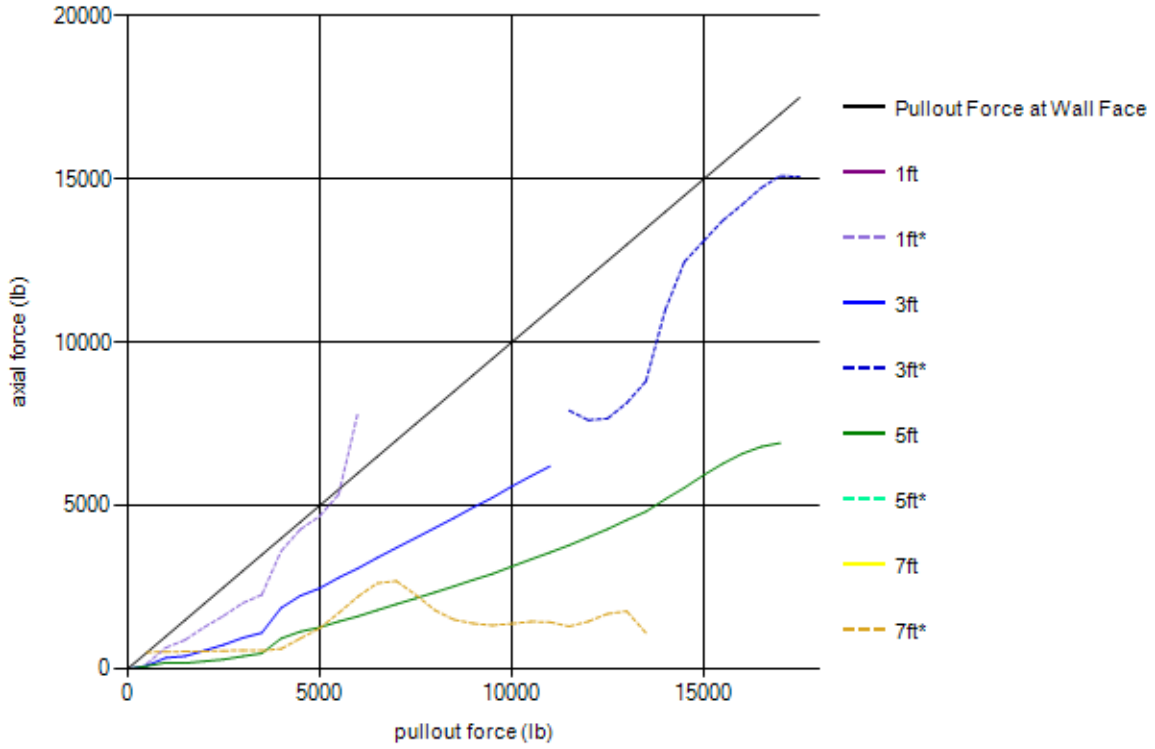


MSE Reinforcement	
Type:	Ribbed Strip
Length, L_e (ft):	8
Width, b (in.):	2
Skew Angle, β (°):	0

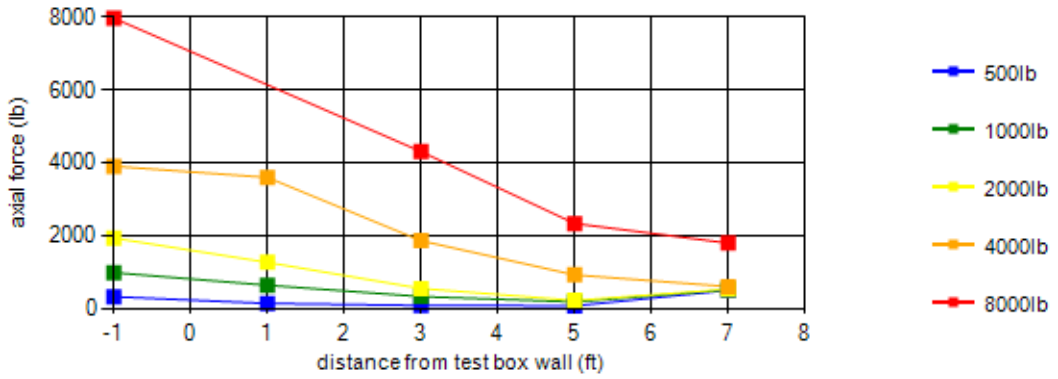
Axial Load-Pullout Load Data by Gage



Axial Load-Pullout Load And Moment-Pullout Load Data by Location



Axial Load-Distance from Test Box Wall Plot – Service Loads

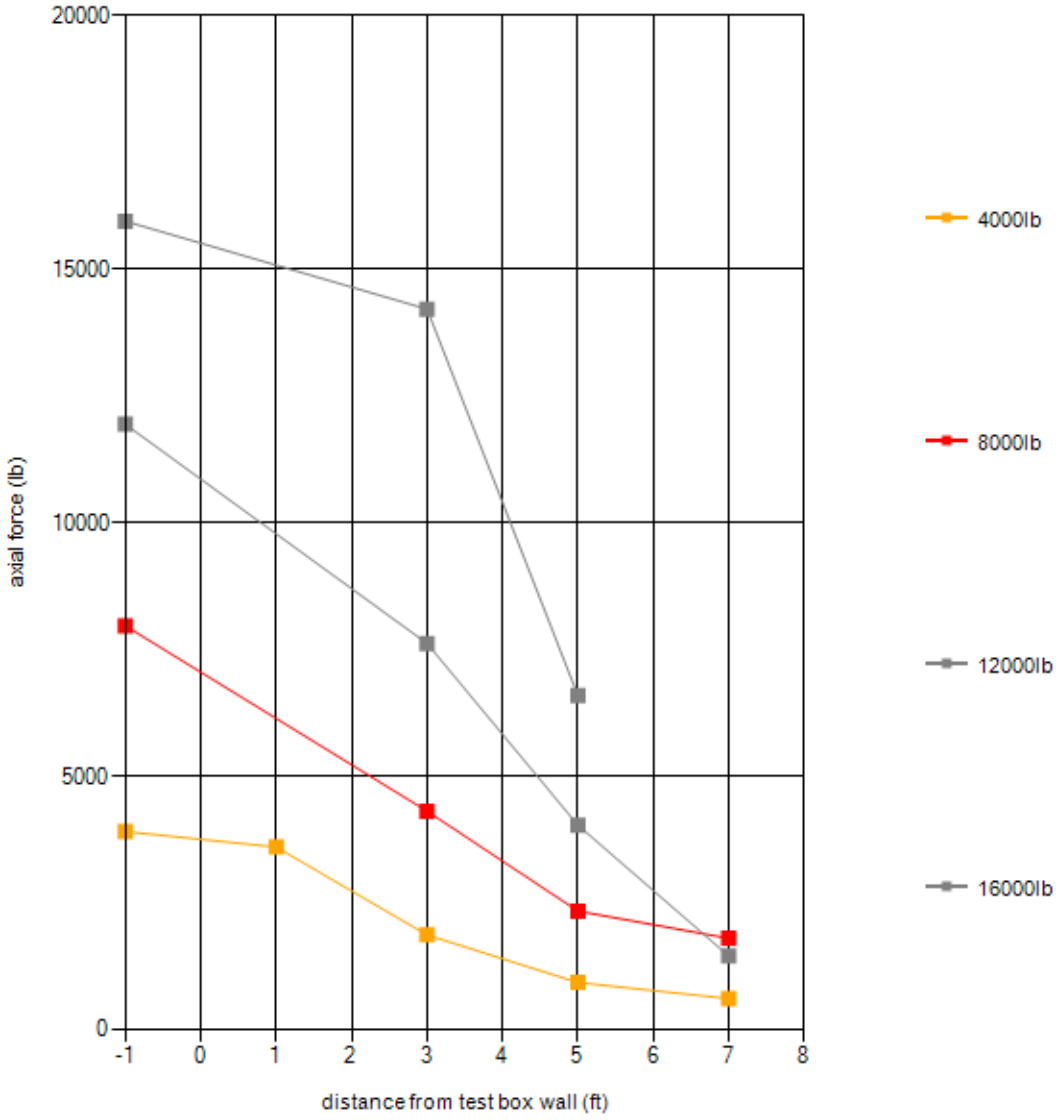


Axial Load Results

Pullout Resistance, P_r (lb)	*Axial Load, P (lb) calculated from strain data at distances from test box wall*			
	*1ft**	*3ft*	*5ft*	*7ft**
500	156*	102	90	514*
1000	653*	346	199	528*
2000	1281*	566	238	545*
3000	2020*	955	394	574*
4000	3608*	1873	937	618*
5000	4676*	2471	1275	1246*
6000	7844*	3083	1615	2218*
7000	ND	3711	1984	2696*
8000	ND	4317	2346	1808*
9000	ND	4946	2729	1397*
10000	ND	5587	3136	1391*
11000	ND	6211	3570	1438*
12000	ND	7622*	4039	1458*
13000	ND	8150*	4566	1772*
14000	ND	10990*	5200	ND
15000	ND	13104*	5936	ND
16000	ND	14217*	6593	ND
17000	ND	15107*	6925	ND

* calculated from 1 strain gage.

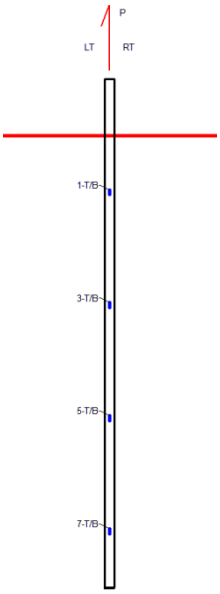
Axial Load-Distance from Test Box Wall Plot – All



STRAIN GAGE REPORT FOR MSE REINFORCEMENT PULLOUT TEST

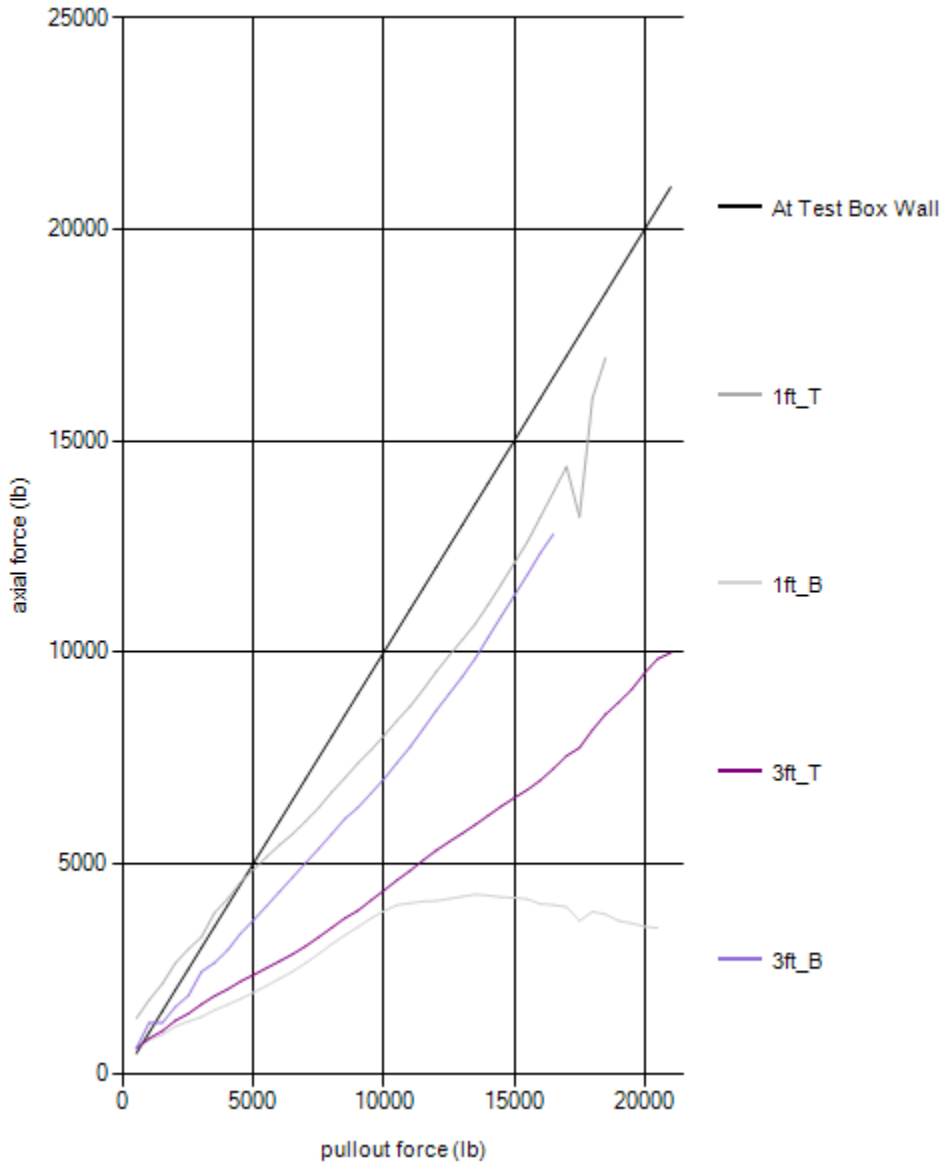
Test Information	
Test Date:	6/21/2011 12:47:00 PM
Test Identification:	TS29.11-S-L8-Z20-B
Test Facility:	12'x12'x4' MSE Test Box

Sketch

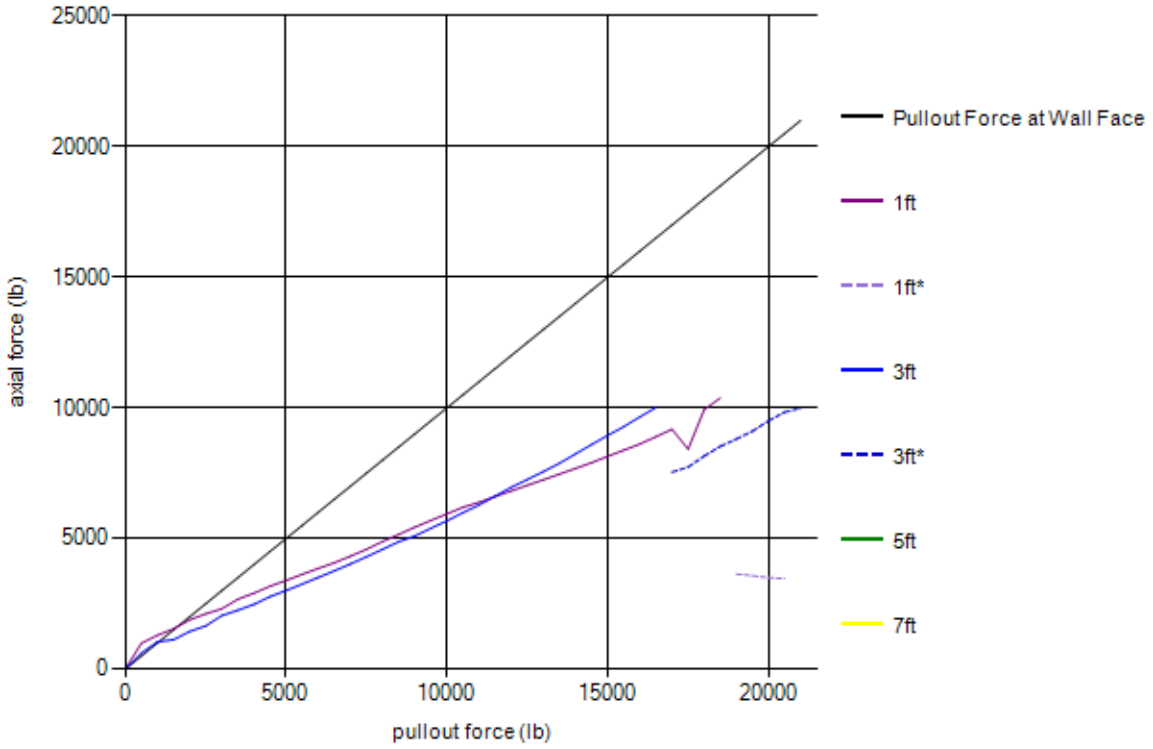


MSE Reinforcement	
Type:	Ribbed Strip
Length, L_e (ft):	8
Width, b (in.):	2
Skew Angle, β (°):	0

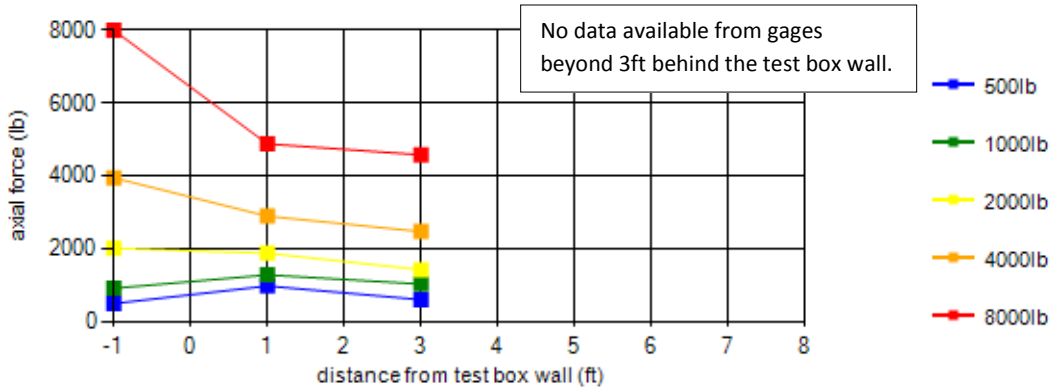
Axial Load-Pullout Load Data by Gage



Axial Load-Pullout Load And Moment-Pullout Load Data by Location



Axial Load-Distance from Test Box Wall Plot – Service Loads

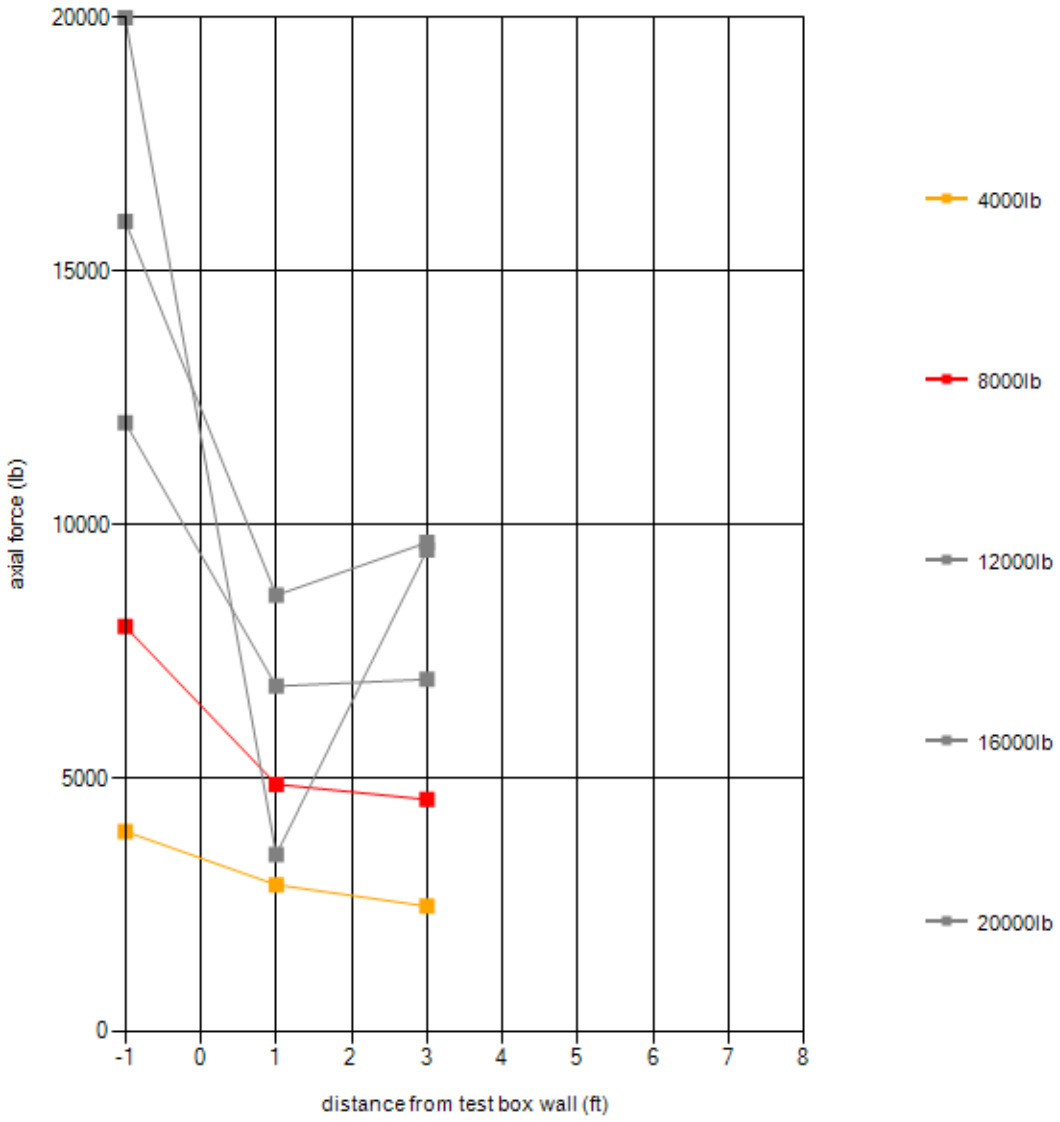


Axial Load Results

Pullout Resistance, P_r (lb)	*Axial Load, P (lb) calculated from strain data at distances from test box wall*	
	1ft	*3ft*
500	989	615
1000	1294	1043
2000	1886	1437
3000	2308	2047
4000	2903	2479
5000	3394	3005
6000	3853	3507
7000	4320	4024
8000	4885	4585
9000	5429	5095
10000	5943	5674
11000	6382	6283
12000	6819	6955
13000	7248	7560
14000	7679	8238
15000	8144	8943
16000	8613	9652
17000	9177	7538*
18000	9930	8156*
19000	3636*	8805*
20000	3500*	9502*
21000	ND	9982*

* calculated from 1 strain gage.

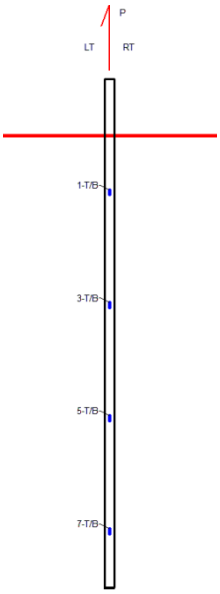
Axial Load-Distance from Test Box Wall Plot – All



STRAIN GAGE REPORT FOR MSE REINFORCEMENT PULLOUT TEST

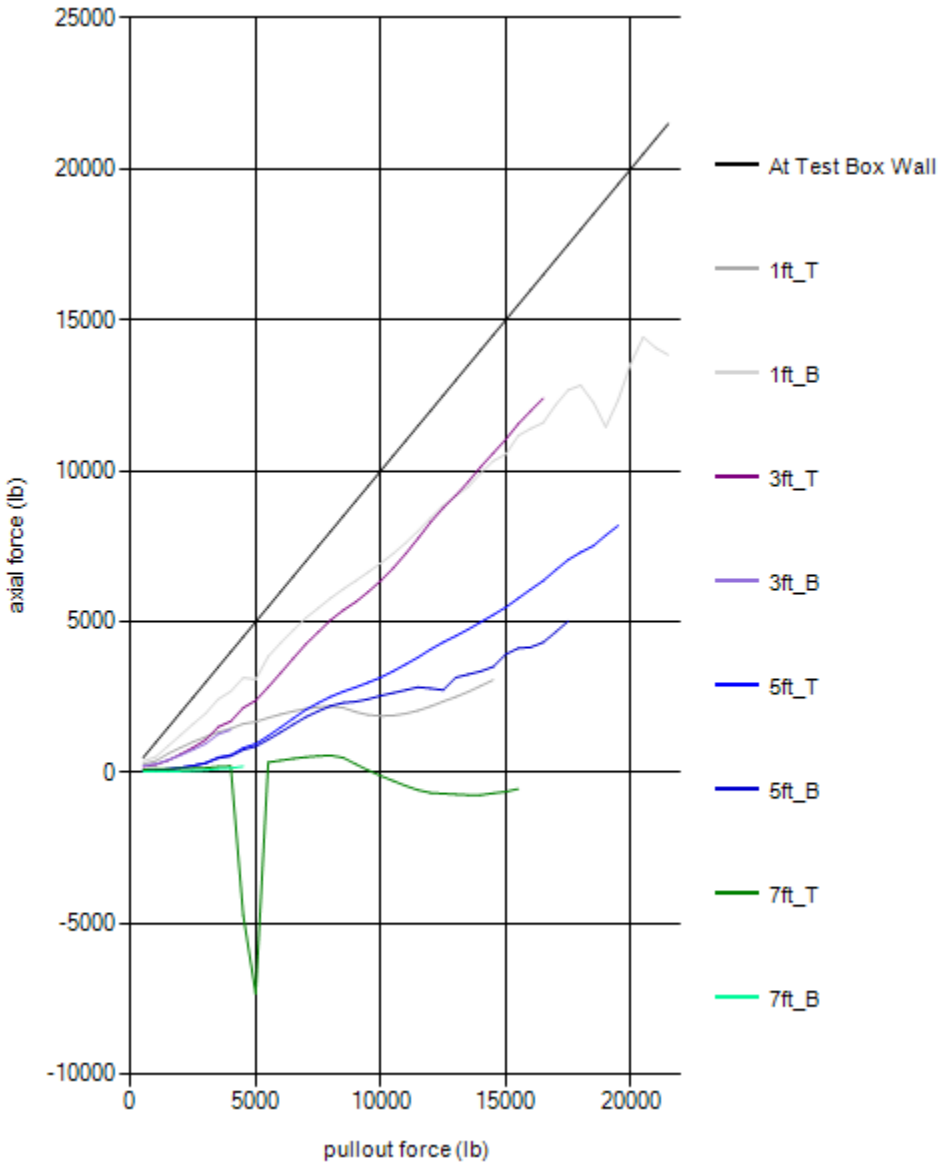
Test Information	
Test Date:	6/21/2011 1:17:00 PM
Test Identification:	TS29.12-S-L8-Z40-B
Test Facility:	12'x12'x4' MSE Test Box

Sketch

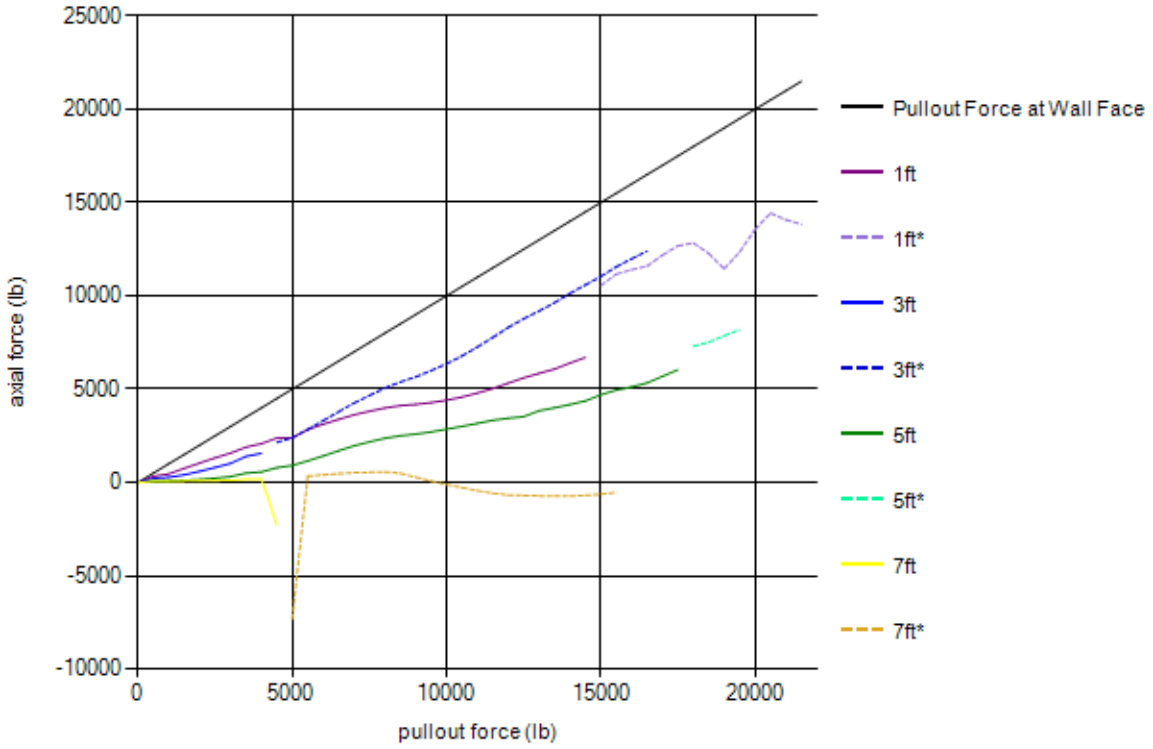


MSE Reinforcement	
Type:	Ribbed Strip
Length, L_e (ft):	8
Width, b (in.):	2
Skew Angle, β (°):	0

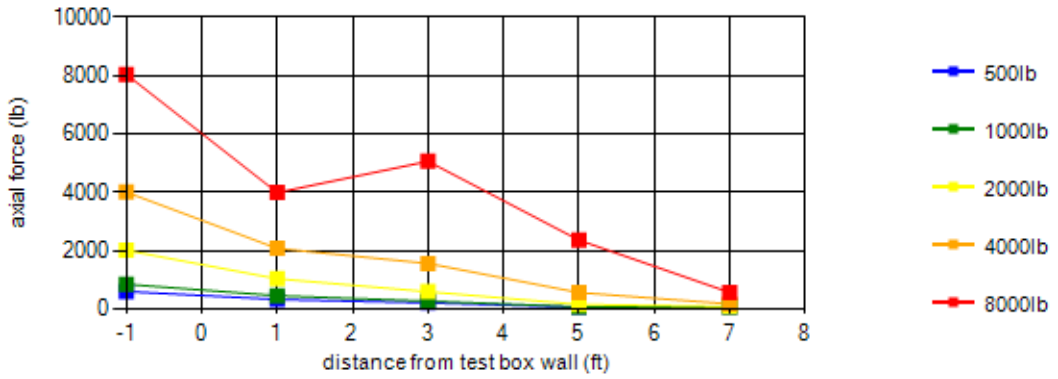
Axial Load-Pullout Load Data by Gage



Axial Load-Pullout Load And Moment-Pullout Load Data by Location



Axial Load-Distance from Test Box Wall Plot – Service Loads

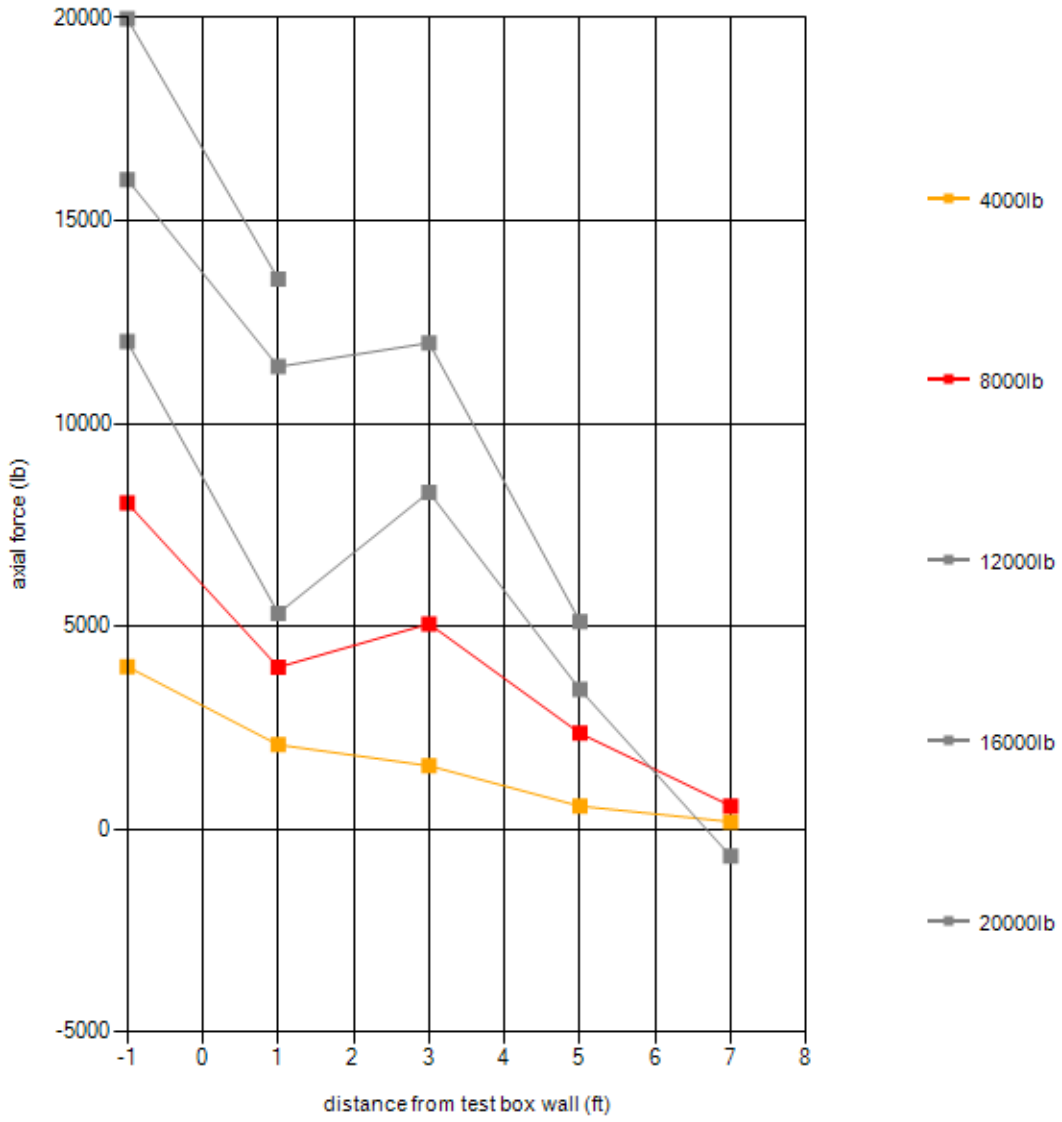


Axial Load Results

Pullout Resistance, P_r (lb)	*Axial Load, P (lb) calculated from strain data at distances from test box wall*			
	1ft	*3ft*	*5ft*	*7ft*
500	332	217	67	67
1000	458	275	82	74
2000	1041	596	162	87
3000	1576	1024	316	121
4000	2078	1562	568	180
5000	2391	2389*	915	-7328*
6000	3119	3308*	1423	406*
7000	3622	4254*	1963	517*
8000	3992	5060*	2364	572*
9000	4185	5655*	2590	285*
10000	4411	6359*	2854	-105*
11000	4787	7257*	3164	-437*
12000	5320	8306*	3440	-668*
13000	5842	9184*	3841	-720*
14000	6401	10132*	4176	-741*
15000	10551*	11039*	4700	-630*
16000	11400*	11987*	5117	ND
17000	12189*	ND	5690	ND
18000	12835*	ND	7301*	ND
19000	11450*	ND	7868*	ND
20000	13558*	ND	ND	ND
21000	14074*	ND	ND	ND

* calculated from 1 strain gage.

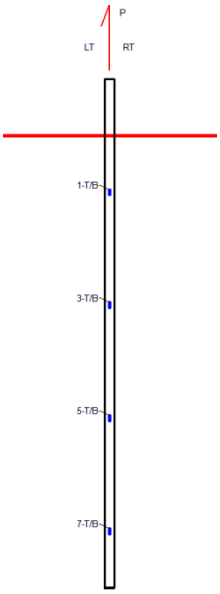
Axial Load-Distance from Test Box Wall Plot – All



STRAIN GAGE REPORT FOR MSE REINFORCEMENT PULLOUT TEST

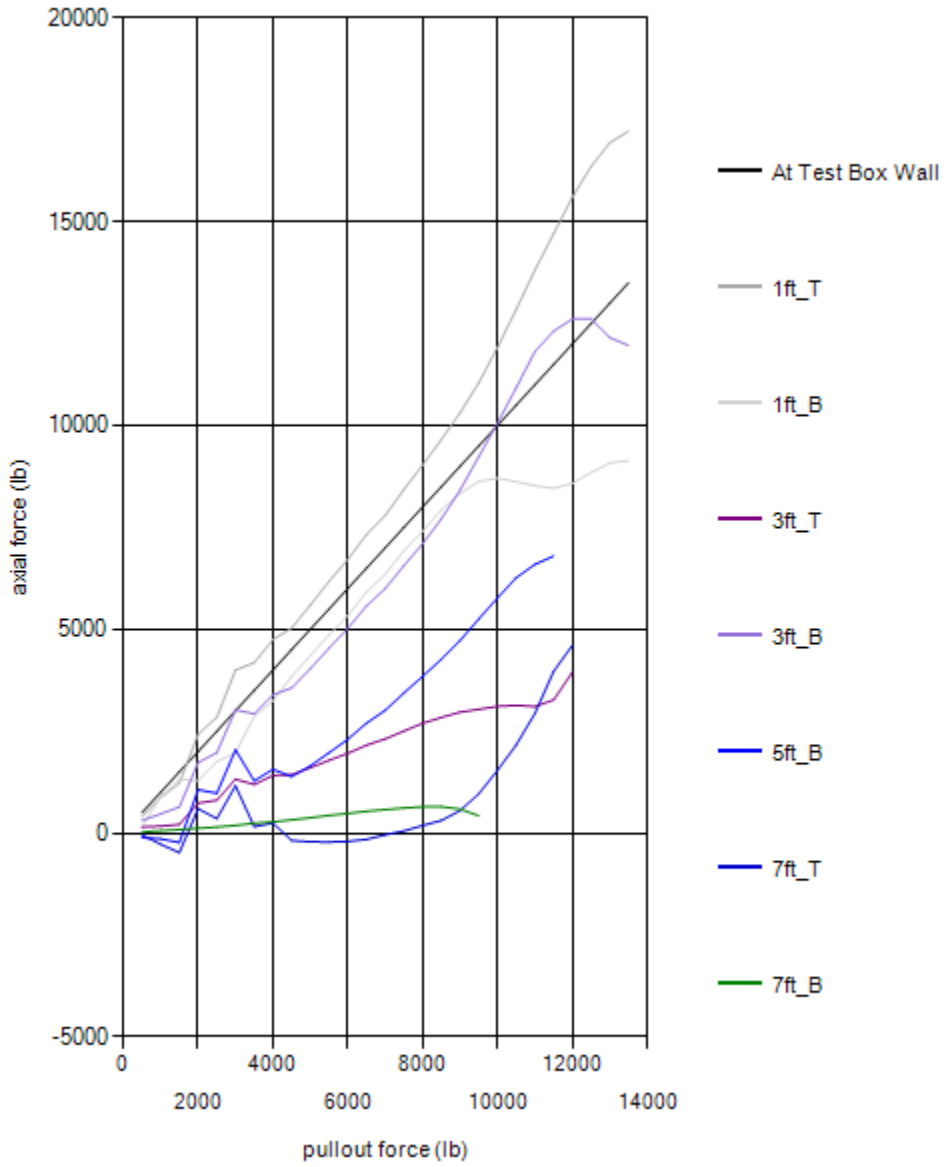
Test Information	
Test Date:	6/21/2011 2:32:00 PM
Test Identification:	TS29.13-S-L8-Z5-B
Test Facility:	12'x12'x4' MSE Test Box

Sketch

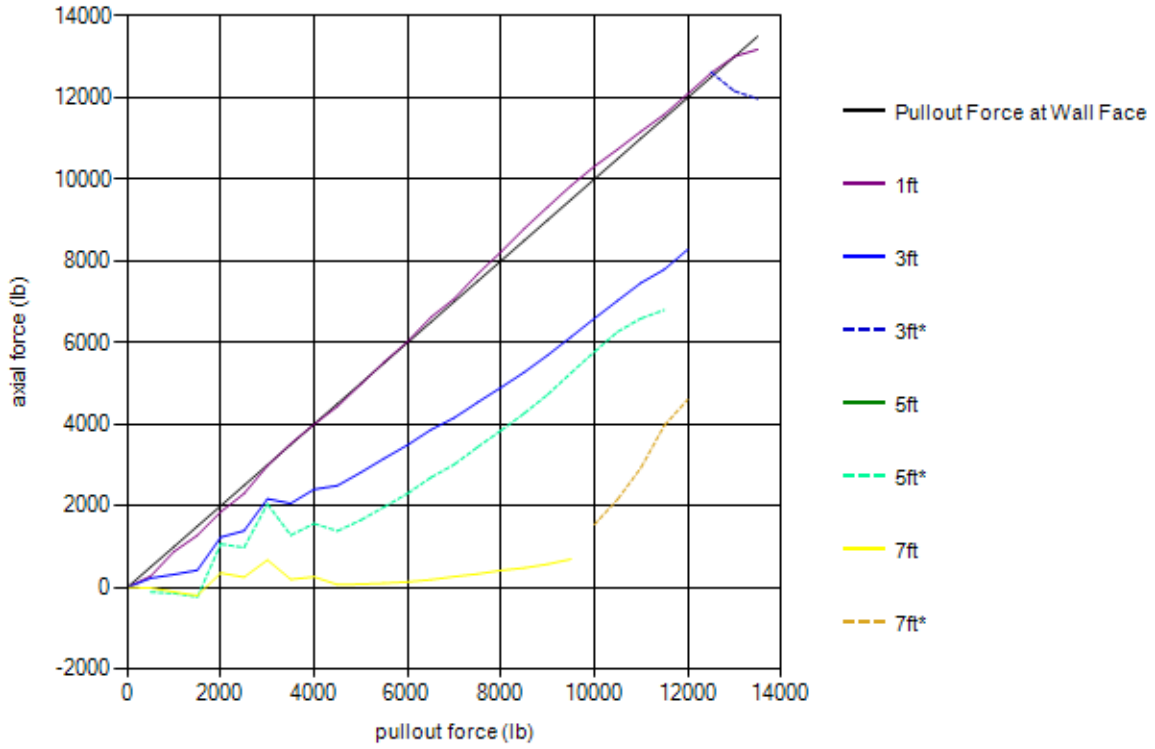


MSE Reinforcement	
Type:	Ribbed Strip
Length, L_e (ft):	8
Width, b (in.):	2
Skew Angle, β (°):	0

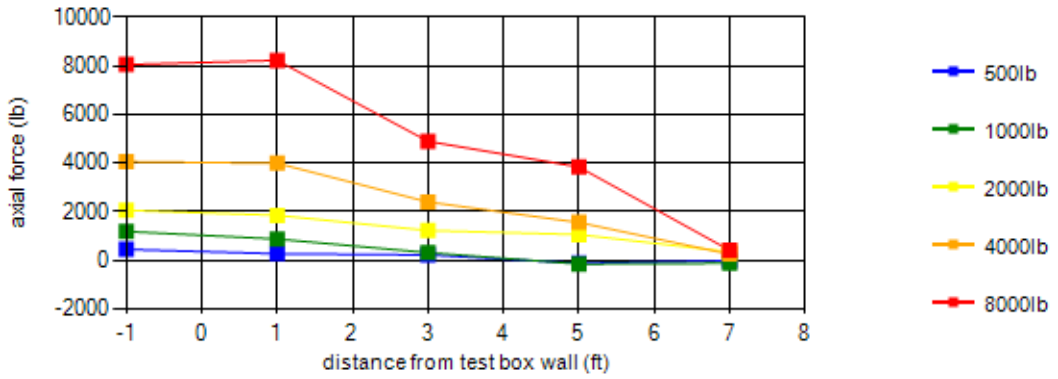
Axial Load-Pullout Load Data by Gage



Axial Load-Pullout Load And Moment-Pullout Load Data by Location



Axial Load-Distance from Test Box Wall Plot – Service Loads

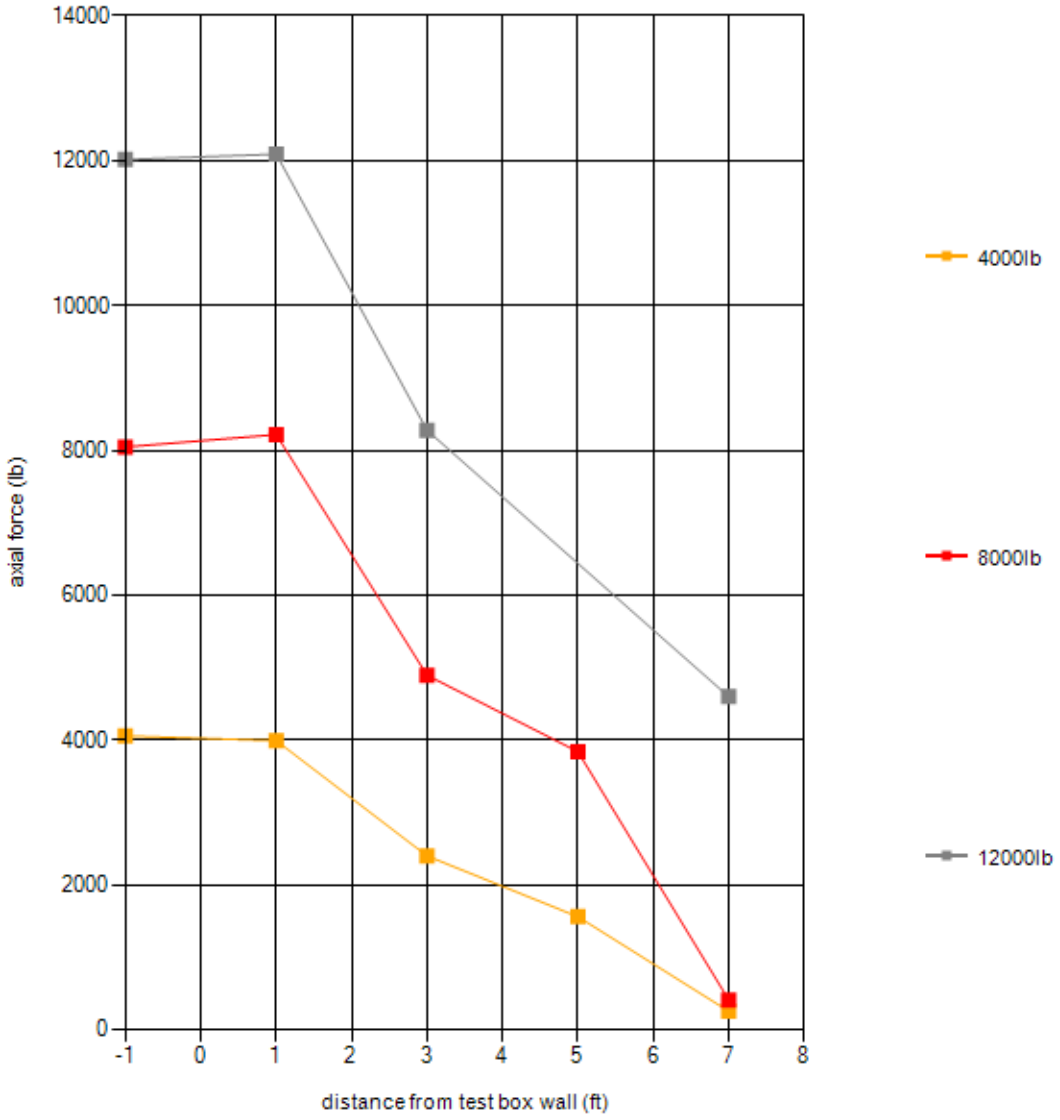


Axial Load Results

Pullout Resistance, P_r (lb)	*Axial Load, P (lb) calculated from strain data at distances from test box wall*			
	1ft	*3ft*	*5ft**	*7ft*
500	279	227	-113*	-12
1000	881	319	-145*	-112
2000	1852	1230	1063*	355
3000	2979	2169	2043*	673
4000	3995	2402	1564*	258
5000	4976	2819	1649*	79
6000	6022	3488	2299*	136
7000	7072	4153	3012*	265
8000	8219	4897	3842*	415
9000	9320	5688	4723*	567
10000	10311	6585	5769*	1537*
11000	11169	7459	6591*	2932*
12000	12090	8279	ND	4602*
13000	13009	12160*	ND	ND

* calculated from 1 strain gage.

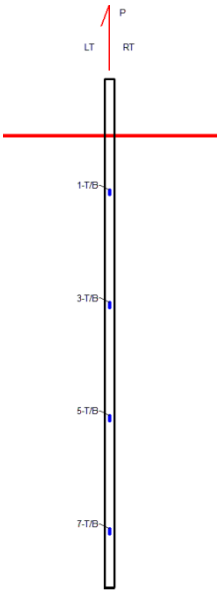
Axial Load-Distance from Test Box Wall Plot – All



STRAIN GAGE REPORT FOR MSE REINFORCEMENT PULLOUT TEST

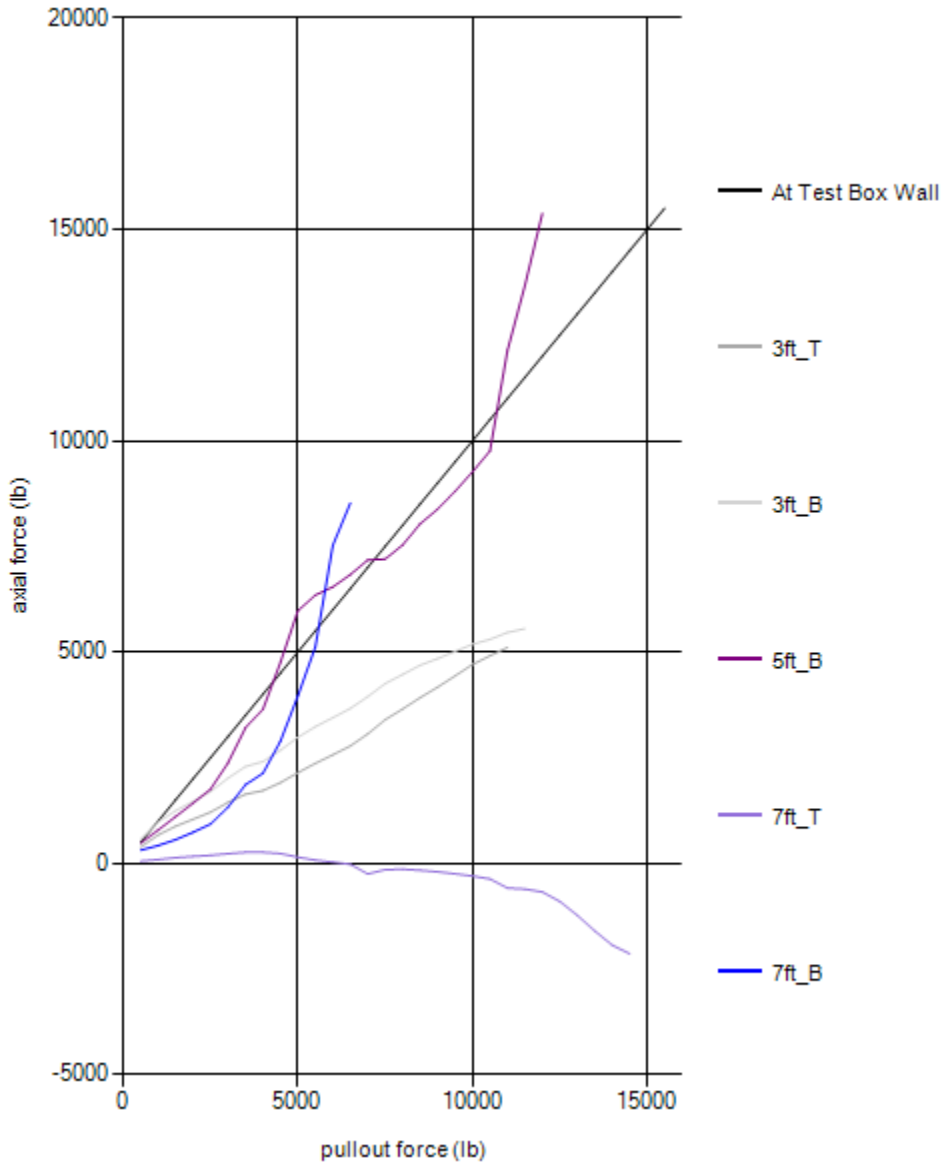
Test Information	
Test Date:	6/21/2011 2:57:00 PM
Test Identification:	TS29.14-S-L8-Z12-B
Test Facility:	12'x12'x4' MSE Test Box

Sketch

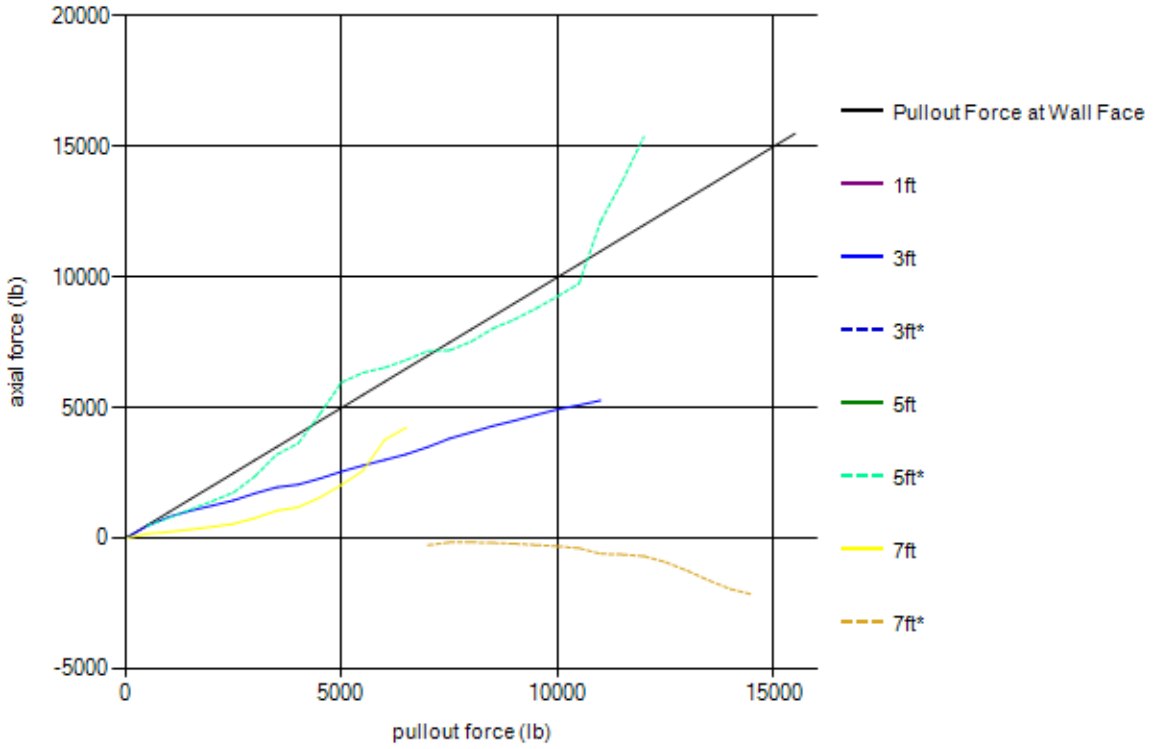


MSE Reinforcement	
Type:	Ribbed Strip
Length, L_e (ft):	8
Width, b (in.):	2
Skew Angle, β (°):	0

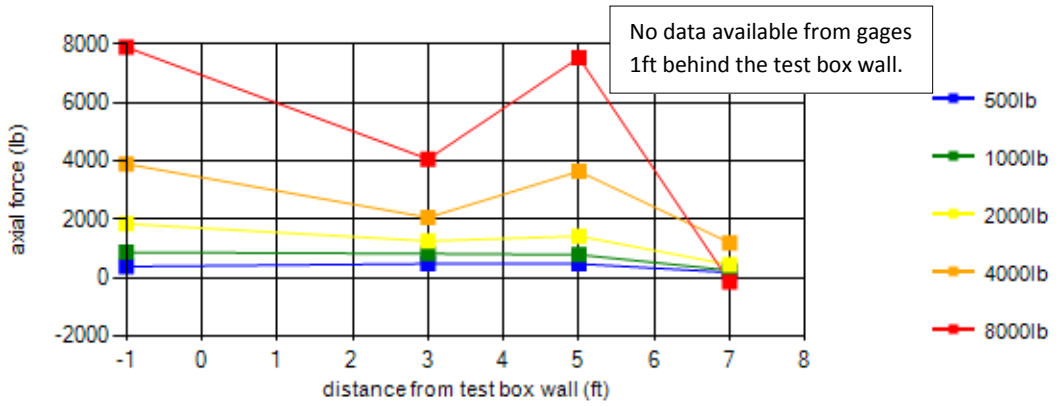
Axial Load-Pullout Load Data by Gage



Axial Load-Pullout Load And Moment-Pullout Load Data by Location



Axial Load-Distance from Test Box Wall Plot – Service Loads

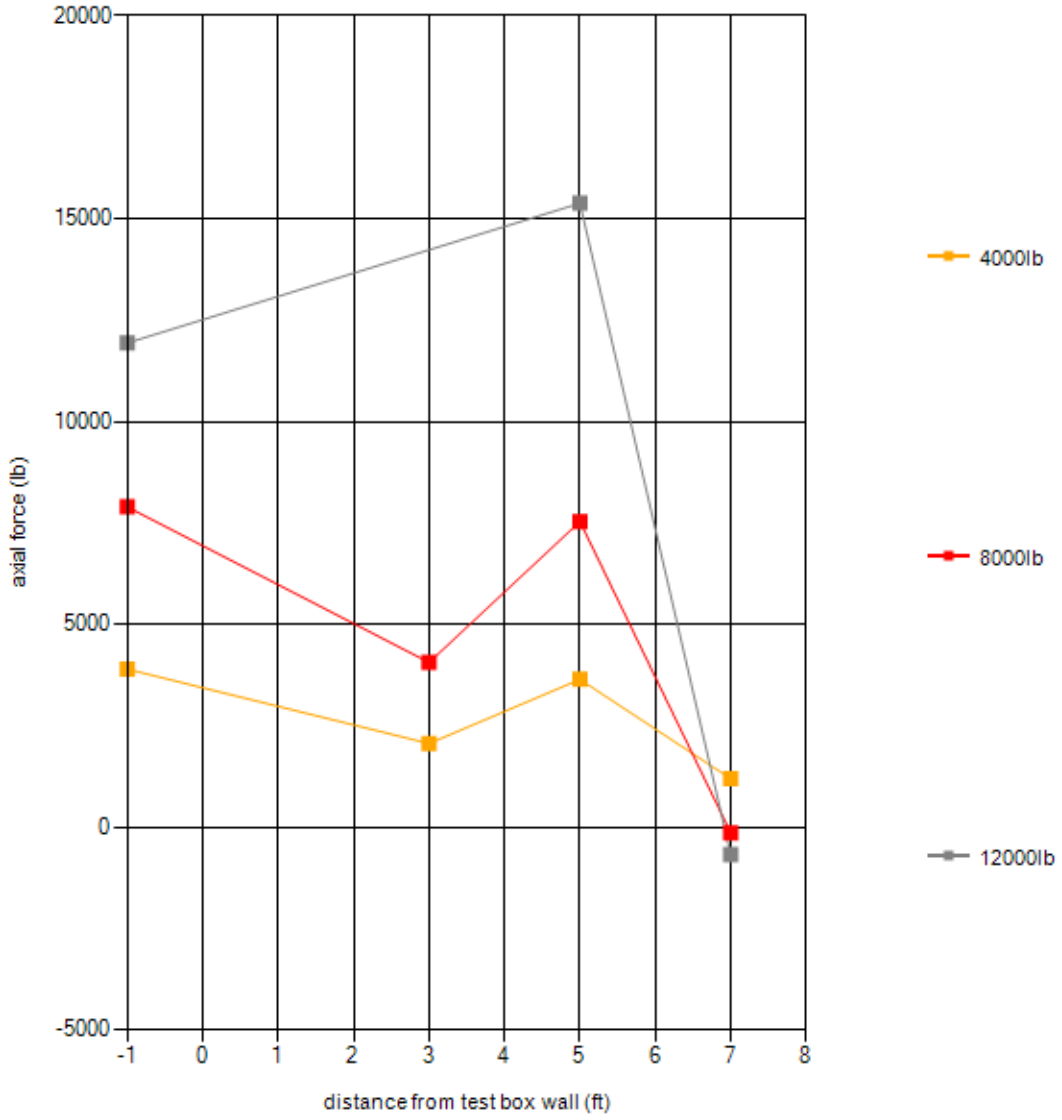


Axial Load Results

Pullout Resistance, P_r (lb)	*Axial Load, P (lb) calculated from strain data at distances from test box wall*		
	3ft	*5ft**	*7ft*
500	477	476*	180
1000	822	786*	253
2000	1252	1421*	446
3000	1728	2380*	778
4000	2062	3642*	1194
5000	2560	5972*	2050
6000	3005	6538*	3775
7000	3500	7174*	-253*
8000	4061	7534*	-142*
9000	4504	8380*	-203*
10000	4944	9265*	-304*
11000	5283	12137*	-588*
12000	ND	15379*	-679*
13000	ND	ND	-1233*
14000	ND	ND	-1938*
15000	ND	ND	ND

* calculated from 1 strain gage.

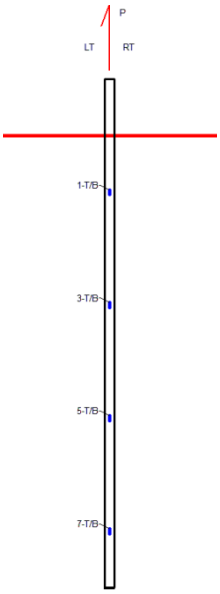
Axial Load-Distance from Test Box Wall Plot – All



STRAIN GAGE REPORT FOR MSE REINFORCEMENT PULLOUT TEST

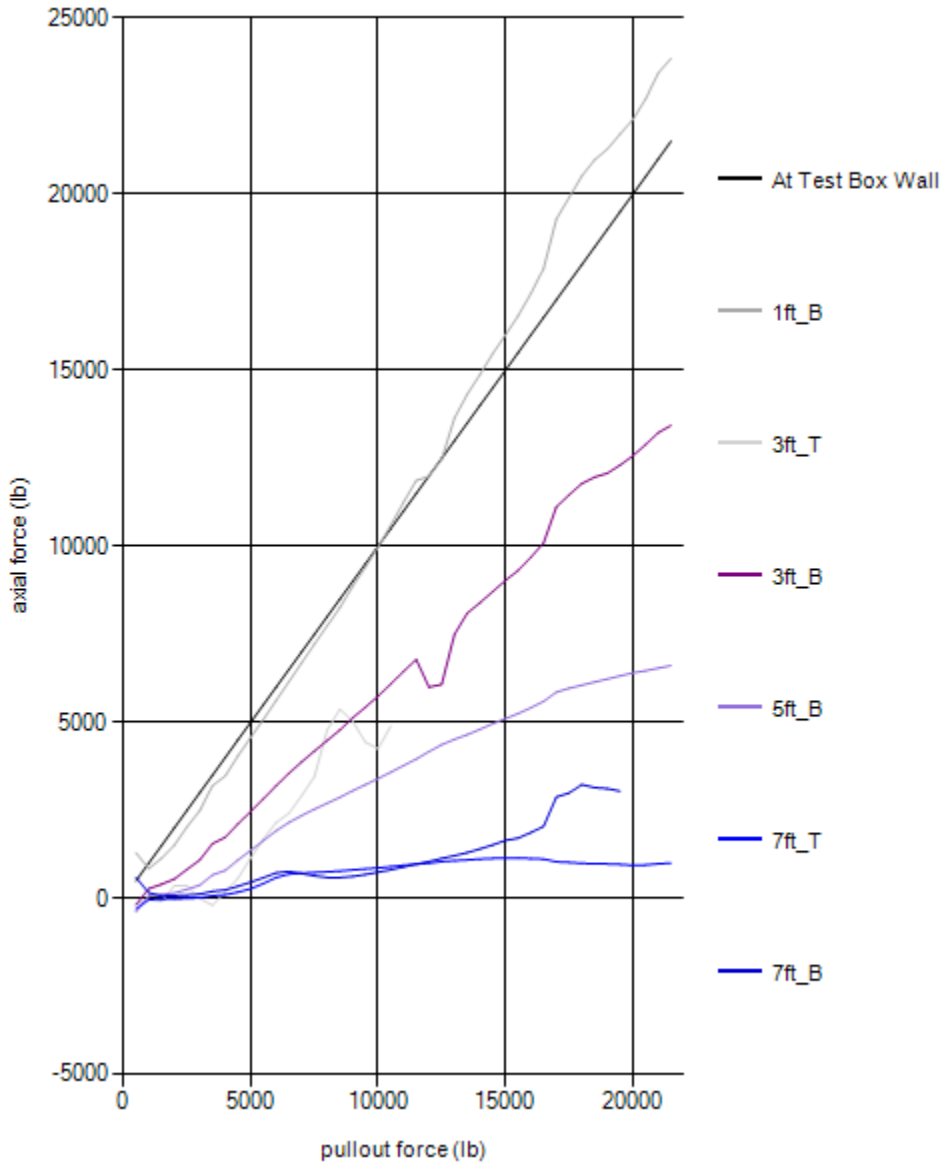
Test Information	
Test Date:	6/21/2011 12:00:00 PM
Test Identification:	TS29.16-S-L8-Z40-B
Test Facility:	12'x12'x4' MSE Test Box

Sketch

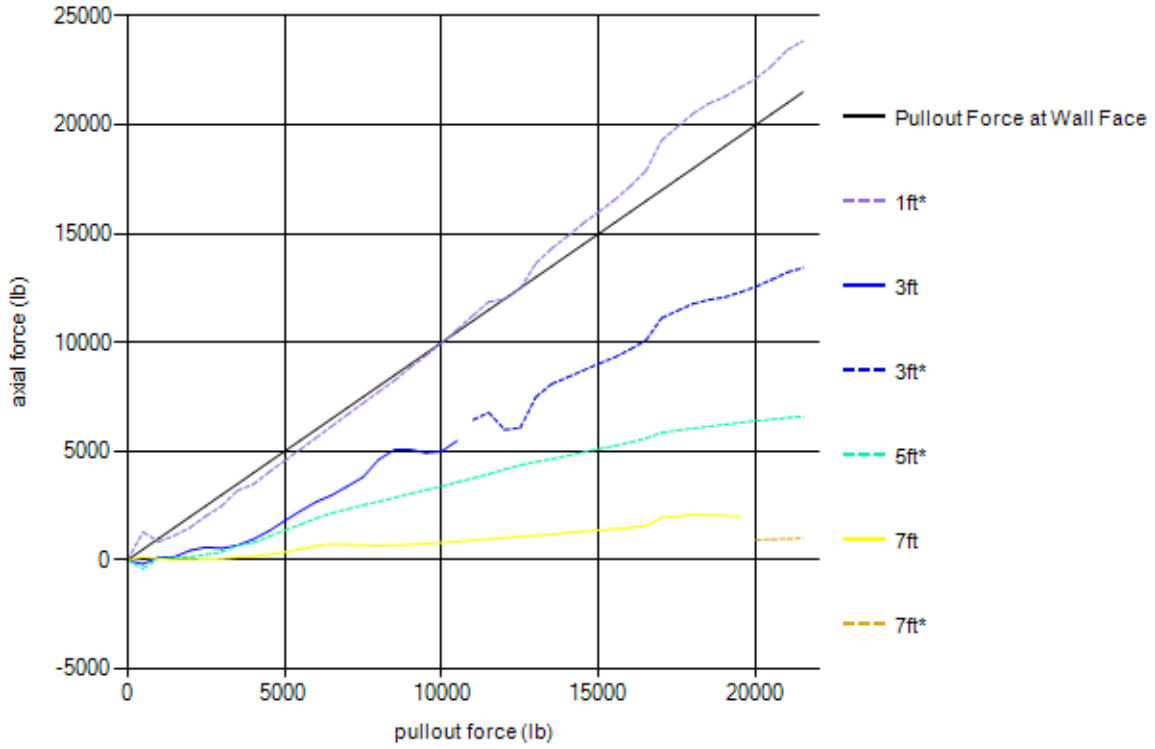


MSE Reinforcement	
Type:	Ribbed Strip
Length, L_e (ft):	8
Width, b (in.):	2
Skew Angle, β (°):	0

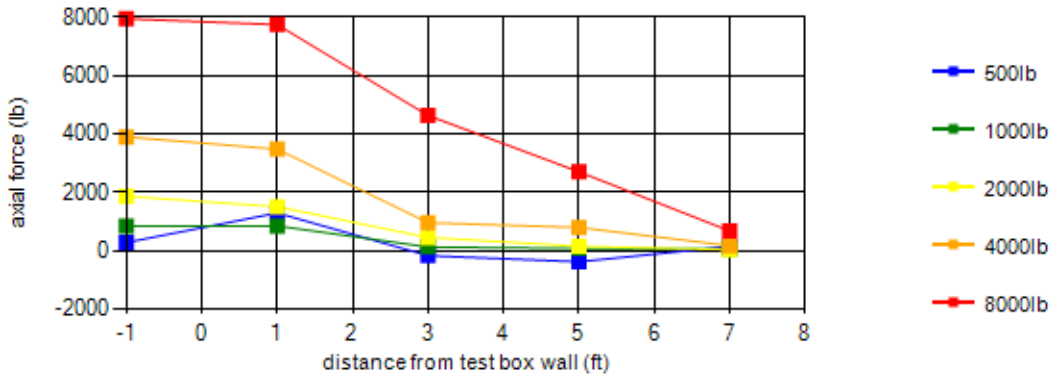
Axial Load-Pullout Load Data by Gage



Axial Load-Pullout Load And Moment-Pullout Load Data by Location



Axial Load-Distance from Test Box Wall Plot – Service Loads

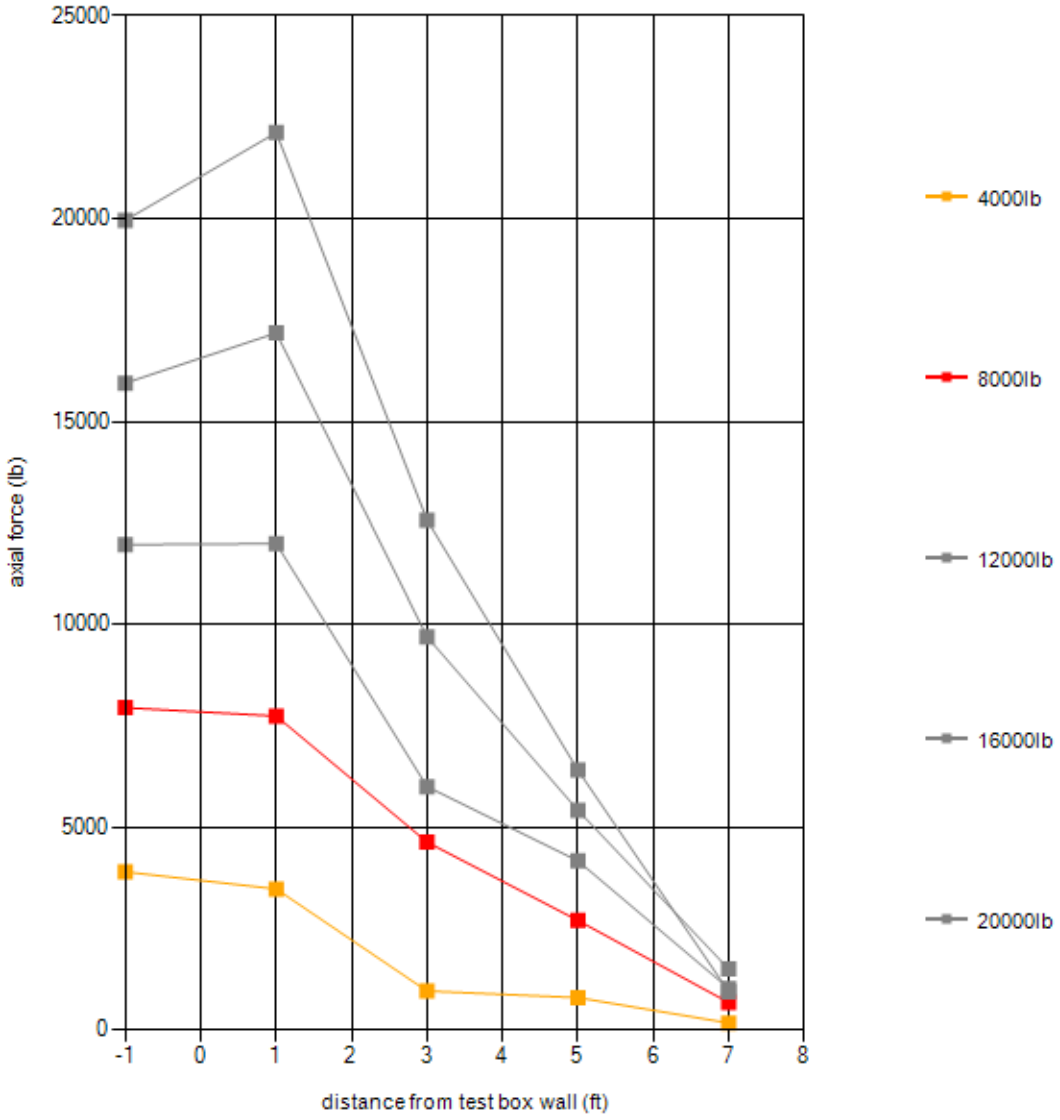


Axial Load Results

Pullout Resistance, P_r (lb)	*Axial Load, P (lb) calculated from strain data at distances from test box wall*			
	*1ft**	*3ft*	*5ft**	*7ft*
500	1295*	-169	-380*	148
1000	848*	128	78*	63
2000	1508*	452	154*	35
3000	2494*	545	375*	70
4000	3477*	961	796*	173
5000	4567*	1806	1365*	367
6000	5622*	2677	1921*	658
7000	6688*	3394	2352*	713
8000	7741*	4630	2702*	676
9000	8859*	5081	3060*	718
10000	9973*	4999	3402*	805
11000	11249*	6445*	3774*	918
12000	11987*	5999*	4169*	1025
13000	13643*	7500*	4520*	1143
14000	14877*	8400*	4804*	1262
15000	16006*	9030*	5108*	1392
16000	17181*	9690*	5415*	1503
17000	19291*	11120*	5857*	1961
18000	20517*	11779*	6058*	2115
19000	21280*	12077*	6230*	2050
20000	22120*	12568*	6405*	943*
21000	23442*	13226*	6542*	983*

* calculated from 1 strain gage.

Axial Load-Distance from Test Box Wall Plot – All



Appendix K

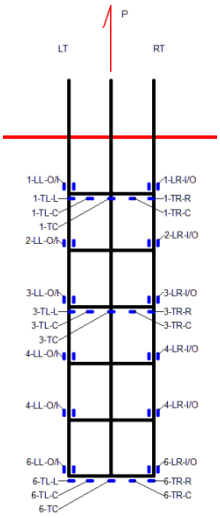
MSE Reinforcement Pullout Test Strain Gage Reports: Welded Steel Grids in Type B Backfill

STRAIN GAGE REPORT FOR MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	4/12/2011 3:52:00 PM
Test Identification:	TS24.01-G-6x12-W9.5xW11-L6-Z5-T
Test Facility:	12'x12'x4' MSE Test Box

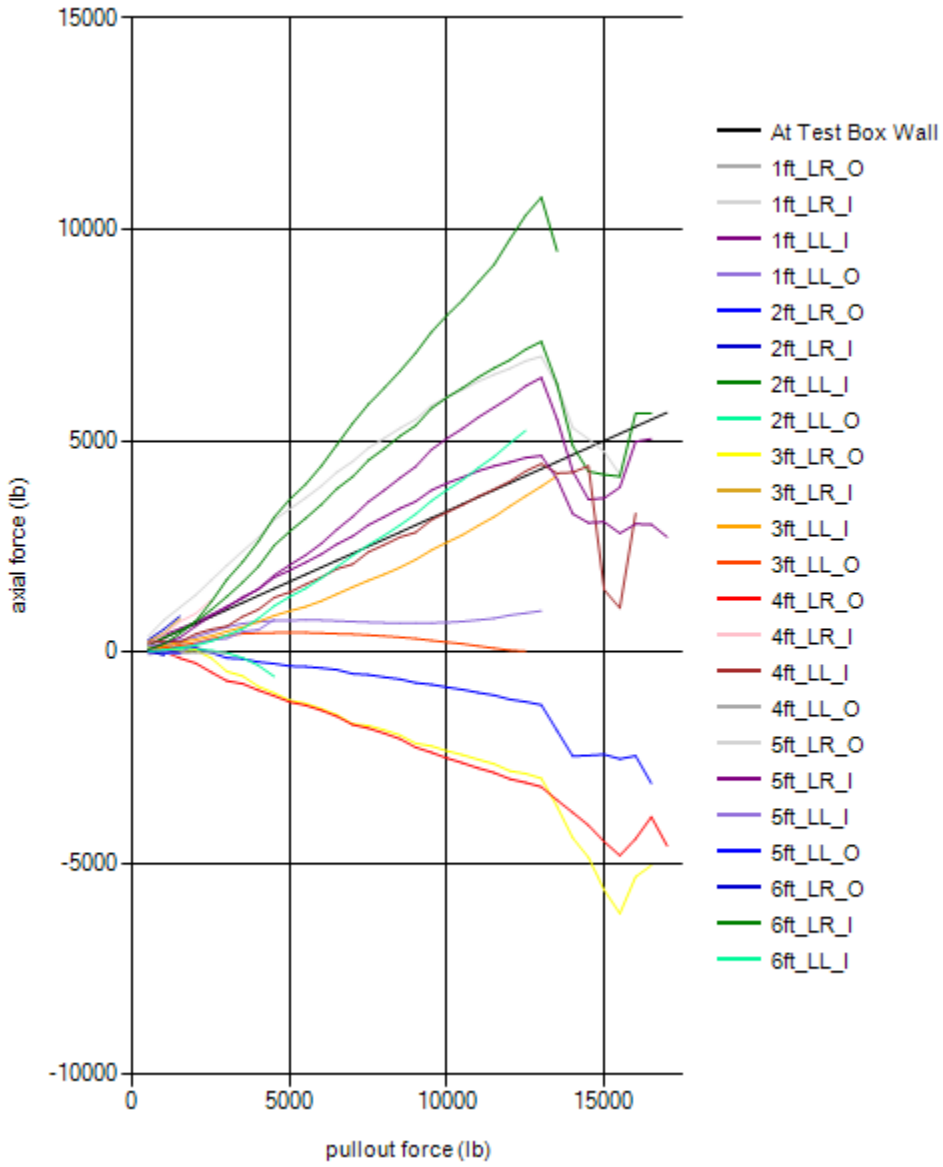
Sketch



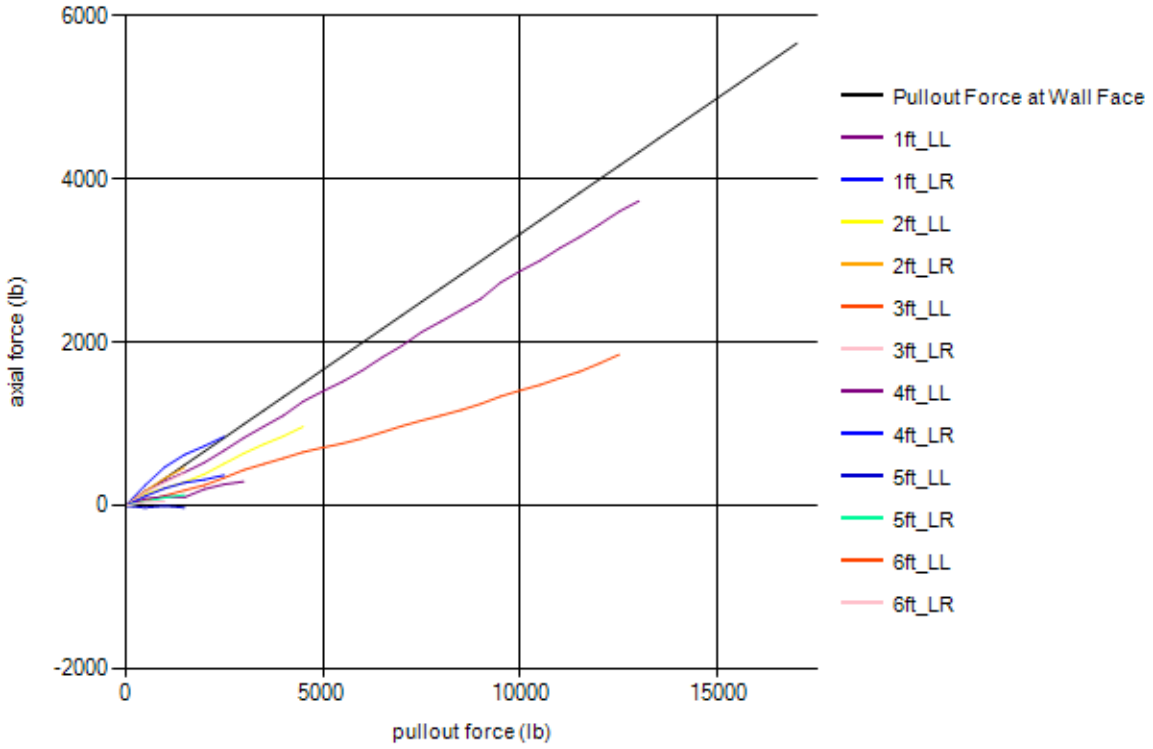
MSE Reinforcement

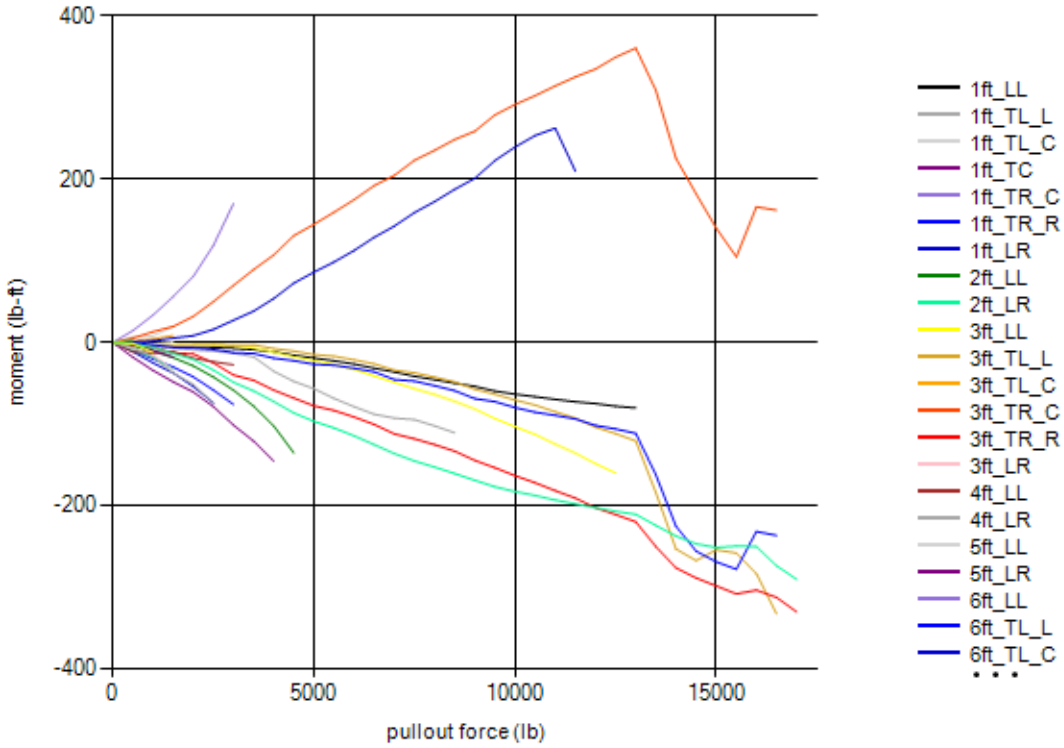
Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	12	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.35
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	6

Axial Load-Pullout Load Data by Gage

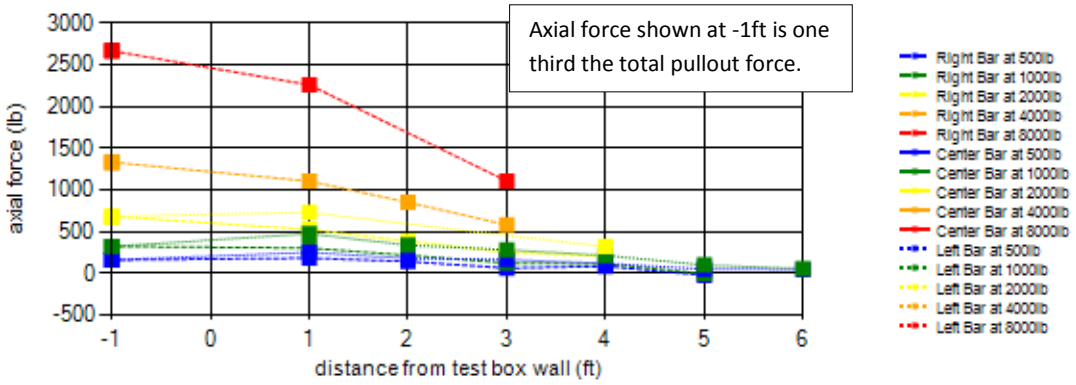


Axial Load-Pullout Load And Moment-Pullout Load Data by Location





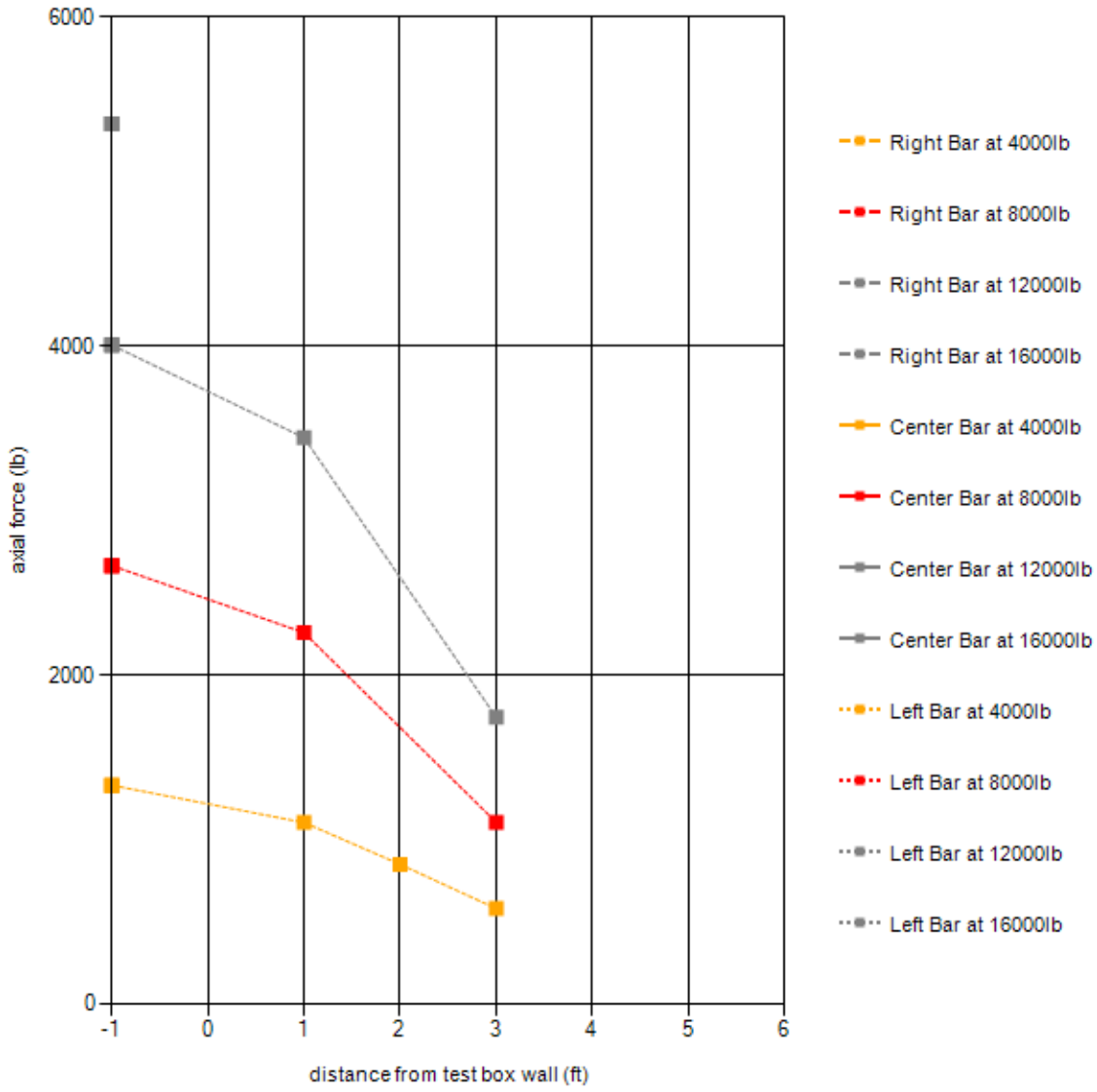
Axial Load-Distance from Test Box Wall Plot – Service Loads



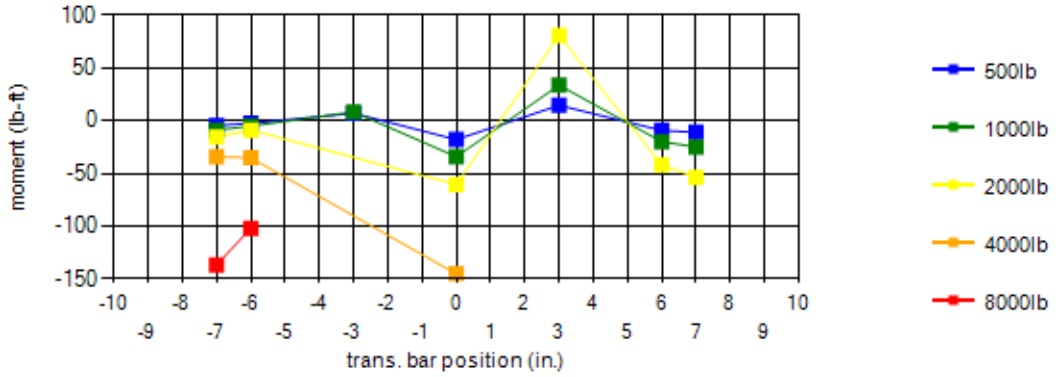
Axial Load Results

Pullout Resistance, P_r (lb)	*Axial Load, P (lb) calculated from strain data at distances from test box wall*										
	1ft_LL	*1ft_LR*	*2ft_LL*	*2ft_LR*	*3ft_LL*	*3ft_LR*	*4ft_LL*	*4ft_LR*	*5ft_LL*	*5ft_LR*	*6ft_LR*
500	184	252	144	181	63	166	85	117	-22	52	46
1000	304	475	217	338	124	283	113	215	-2	100	56
2000	529	731	387	ND	253	ND	205	321	ND	ND	ND
3000	832	ND	644	ND	440	ND	296	ND	ND	ND	ND
4000	1106	ND	851	ND	582	ND	ND	ND	ND	ND	ND
5000	1404	ND	ND	ND	714	ND	ND	ND	ND	ND	ND
6000	1658	ND	ND	ND	826	ND	ND	ND	ND	ND	ND
7000	1960	ND	ND	ND	977	ND	ND	ND	ND	ND	ND
8000	2260	ND	ND	ND	1106	ND	ND	ND	ND	ND	ND
9000	2537	ND	ND	ND	1249	ND	ND	ND	ND	ND	ND
10000	2877	ND	ND	ND	1414	ND	ND	ND	ND	ND	ND
11000	3157	ND	ND	ND	1566	ND	ND	ND	ND	ND	ND
12000	3445	ND	ND	ND	1744	ND	ND	ND	ND	ND	ND
13000	3734	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
14000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
15000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
16000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
17000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Axial Load-Distance from Test Box Wall Plot – All



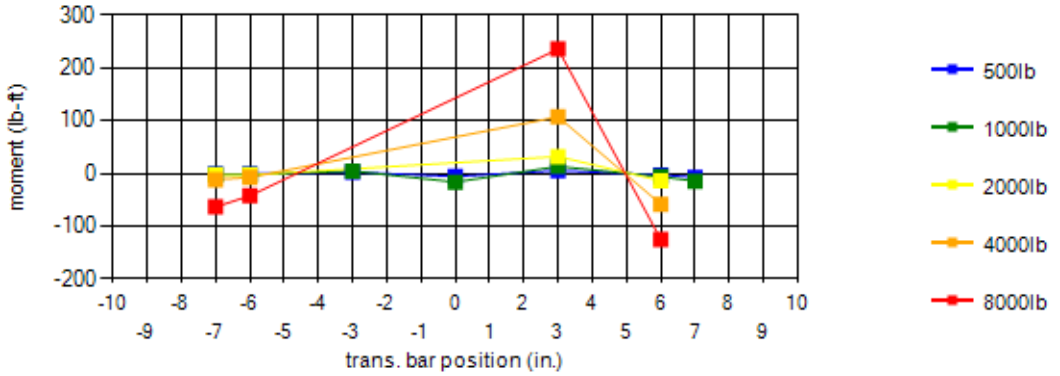
Moment Results along Transverse Bar at 1ft from Test Box Wall – Plot – Service Loads



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	-5	-2	7	-18	15	-9	-11
1000	-9	-5	8	-34	34	-20	-25
2000	-15	-9	ND	-61	81	-42	-54
3000	-21	-13	ND	-101	170	-76	ND
4000	-34	-35	ND	-145	ND	ND	ND
5000	-57	-56	ND	ND	ND	ND	ND
6000	-79	-79	ND	ND	ND	ND	ND
7000	-108	-93	ND	ND	ND	ND	ND
8000	-137	-102	ND	ND	ND	ND	ND
9000	-161	ND	ND	ND	ND	ND	ND
10000	-190	ND	ND	ND	ND	ND	ND
11000	-209	ND	ND	ND	ND	ND	ND
12000	-224	ND	ND	ND	ND	ND	ND
13000	-240	ND	ND	ND	ND	ND	ND

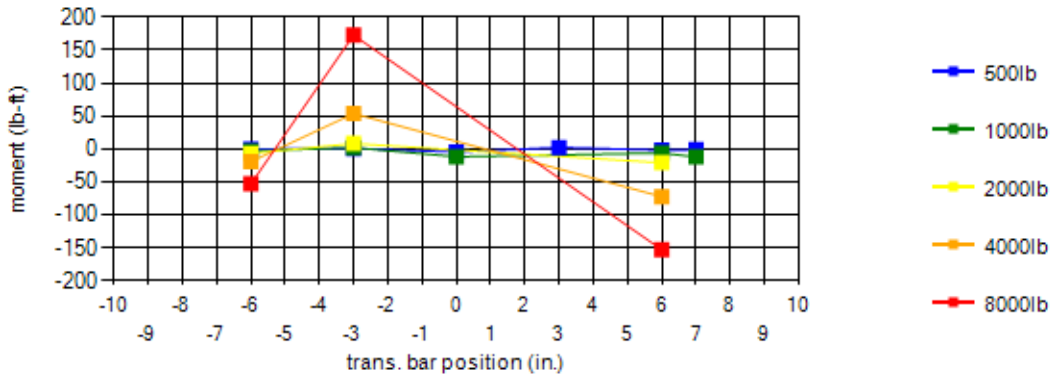
Moment Results along Transverse Bar at 3ft from Test Box Wall – Plot – Service Loads



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	-1	-1	2	6	-3	-7
1000	-2	-2	5	13	-6	-14
2000	-3	-3	ND	32	-14	ND
3000	-4	-3	ND	70	-40	ND
4000	-12	-7	ND	107	-58	ND
5000	-22	-15	ND	145	-78	ND
6000	-33	-21	ND	175	-91	ND
7000	-49	-34	ND	205	-112	ND
8000	-64	-42	ND	236	-125	ND
9000	-81	-57	ND	259	-144	ND
10000	-103	-70	ND	292	-163	ND
11000	-124	-85	ND	314	-182	ND
12000	-148	-104	ND	335	-202	ND
13000	ND	-121	ND	361	-220	ND
14000	ND	-253	ND	226	-276	ND
15000	ND	-254	ND	140	-298	ND
16000	ND	-283	ND	166	-303	ND
17000	ND	ND	ND	ND	-330	ND

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, (lb)	*Moment (lb-ft) calculated from strain data at distances from test box wall*				
	6ft_TL_L	*6ft_TL_C*	*6ft_TR_C*	*6ft_TR_R*	*6ft_LR*
500	0	1	2	-2	-1
1000	-3	2	ND	-6	-12
2000	-6	8	ND	-21	ND
3000	-12	27	ND	-49	ND
4000	-19	54	ND	-72	ND
5000	-27	86	ND	-97	ND
6000	-32	113	ND	-114	ND
7000	-45	143	ND	-136	ND
8000	-53	173	ND	-153	ND
9000	-69	201	ND	-169	ND
10000	-80	239	ND	-183	ND
11000	-89	263	ND	-193	ND
12000	-102	ND	ND	-202	ND
13000	-111	ND	ND	-211	ND
14000	-225	ND	ND	-237	ND
15000	-269	ND	ND	-251	ND
16000	-232	ND	ND	-250	ND
17000	ND	ND	ND	-290	ND

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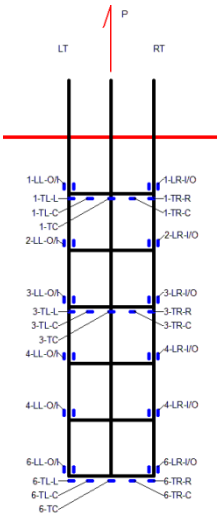
STRAIN GAGE REPORT FOR MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	4/12/2011 1:39:00 PM
Test Identification:	TS24.02-G-9x12-W9.5xW11-L6-Z5-T
Test Facility:	12'x12'x4' MSE Test Box

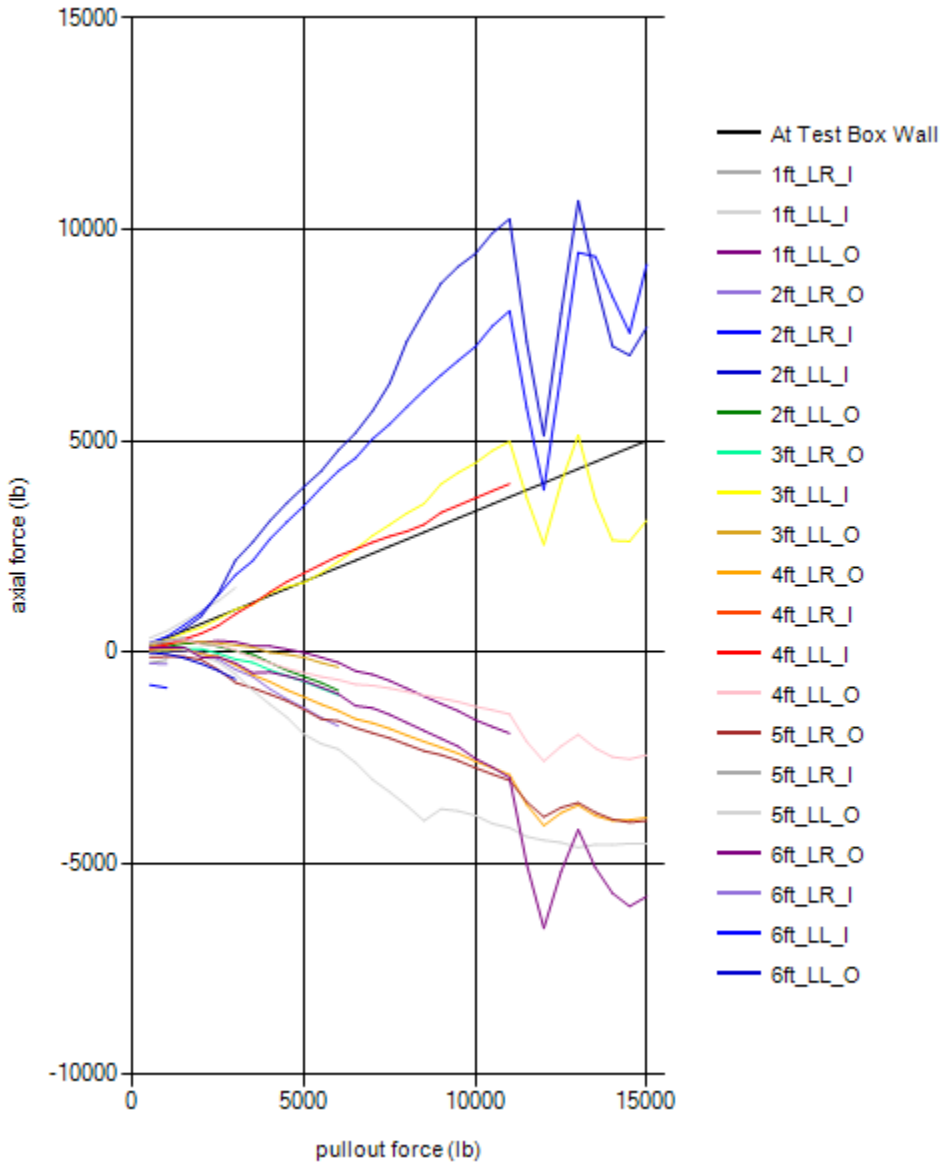
Sketch



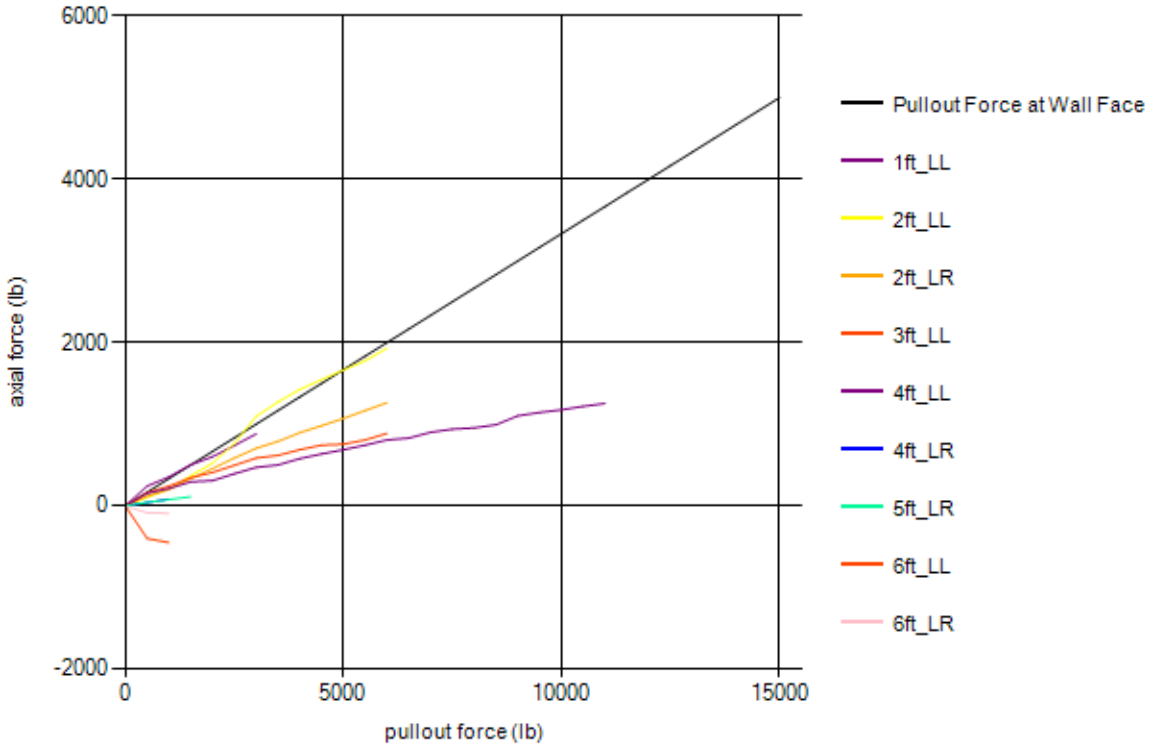
MSE Reinforcement

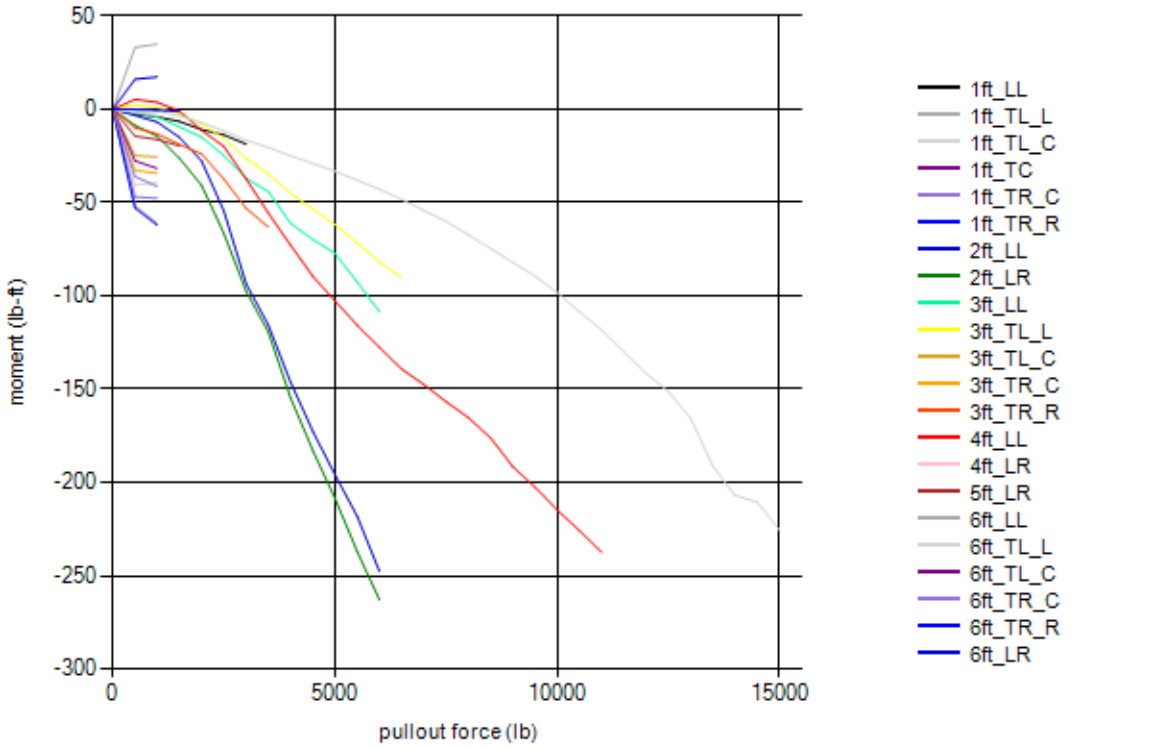
Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.35
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

Axial Load-Pullout Load Data by Gage

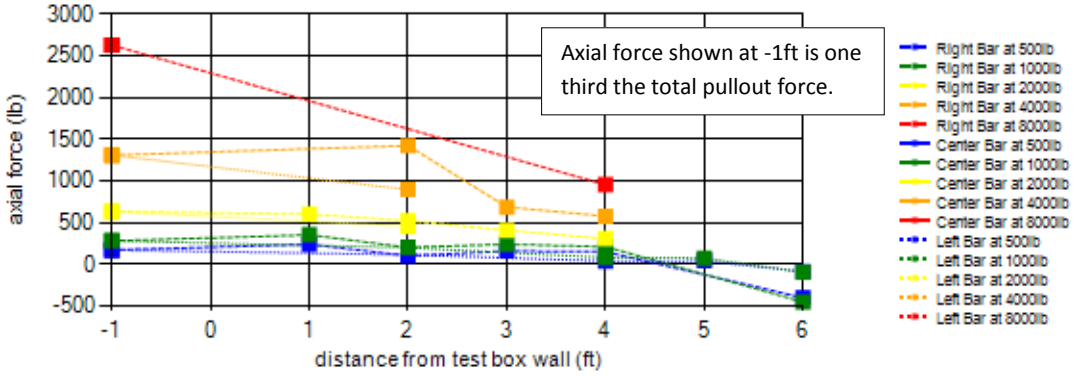


Axial Load-Pullout Load And Moment-Pullout Load Data by Location





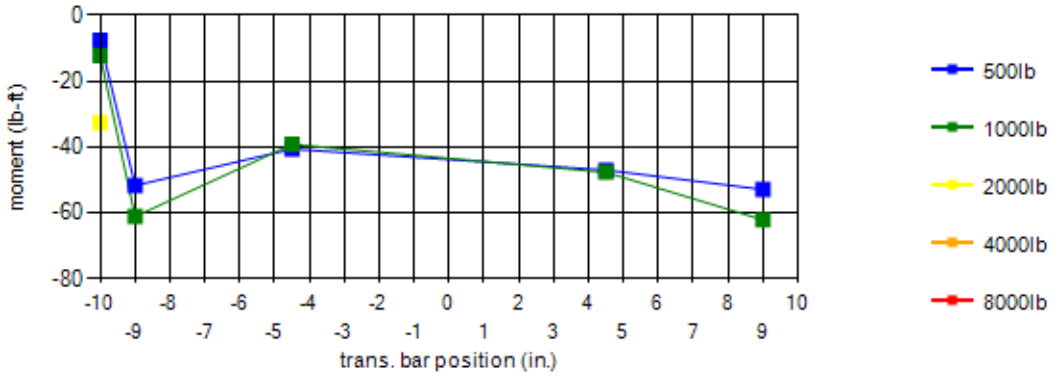
Axial Load-Distance from Test Box Wall Plot – Service Loads



Axial Load Results

Pullout Resistance, P_r (lb)	*Axial Load, P (lb) calculated from strain data at distances from test box wall*								
	1ft_LL	*2ft_LL*	*2ft_LR*	*3ft_LL*	*4ft_LL*	*4ft_LR*	*5ft_LR*	*6ft_LL*	*6ft_LR*
500	241	103	116	161	152	40	43	-400	-86
1000	354	204	201	241	212	82	76	-451	-92
2000	602	523	456	408	308	ND	ND	ND	ND
3000	881	1096	705	585	470	ND	ND	ND	ND
4000	ND	1424	897	687	578	ND	ND	ND	ND
5000	ND	1664	1069	755	687	ND	ND	ND	ND
6000	ND	1930	1265	888	807	ND	ND	ND	ND
7000	ND	ND	ND	ND	900	ND	ND	ND	ND
8000	ND	ND	ND	ND	955	ND	ND	ND	ND
9000	ND	ND	ND	ND	1102	ND	ND	ND	ND
10000	ND	ND	ND	ND	1175	ND	ND	ND	ND
11000	ND	ND	ND	ND	1253	ND	ND	ND	ND
12000	ND	ND	ND	ND	ND	ND	ND	ND	ND
13000	ND	ND	ND	ND	ND	ND	ND	ND	ND
14000	ND	ND	ND	ND	ND	ND	ND	ND	ND
15000	ND	ND	ND	ND	ND	ND	ND	ND	ND

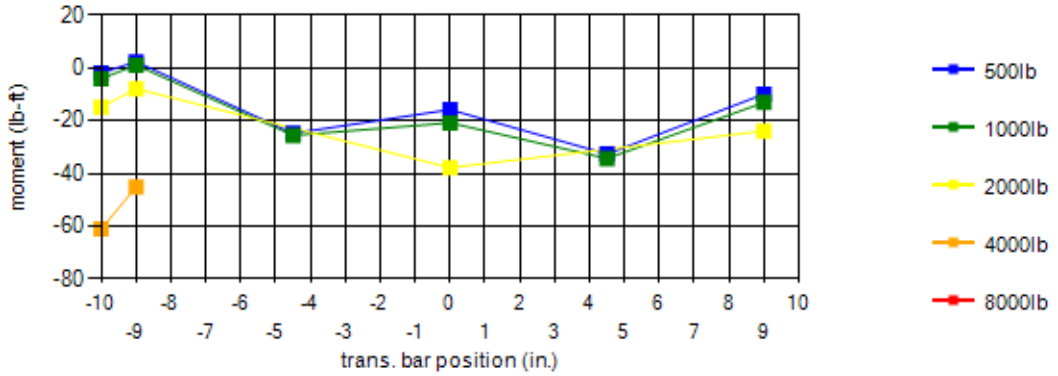
Moment Results along Transverse Bar at 1ft from Test Box Wall – Plot – Service Loads



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_TR_C*	*1ft_TR_R*
500	-8	-52	-41	-47	-53
1000	-12	-61	-39	-48	-62
2000	-33	ND	ND	ND	ND
3000	-56	ND	ND	ND	ND

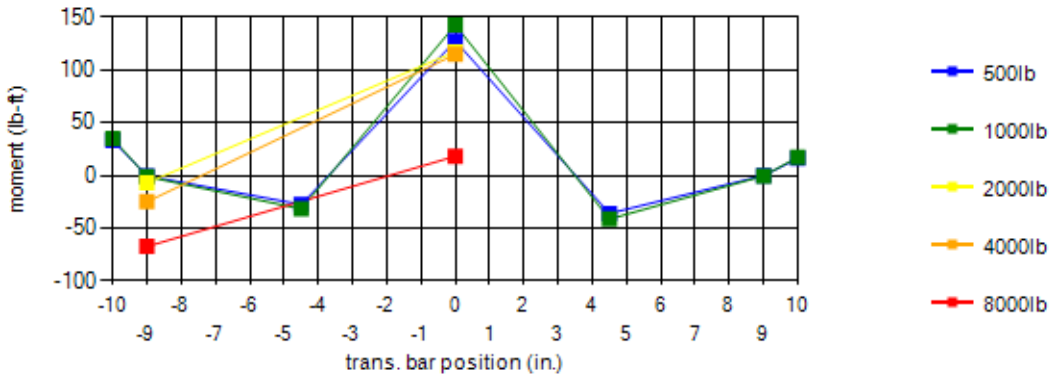
Moment Results along Transverse Bar at 3ft from Test Box Wall – Plot – Service Loads



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*
500	-2	2	-25	-33	-10
1000	-4	1	-26	-34	-13
2000	-15	-8	ND	ND	-24
3000	-37	-26	ND	ND	-53
4000	-61	-45	ND	ND	ND
5000	-77	-62	ND	ND	ND
6000	-109	-82	ND	ND	ND

Moment Results along Transverse Bar at 6ft from Test Box Wall – Plot – Service Loads



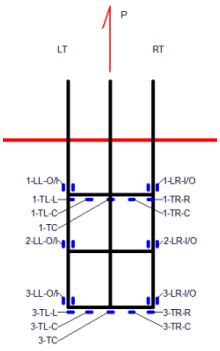
Moment Results along Transverse Bar at 6ft from Test Box Wall – Data

Pullout Resistance, P, (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	33	0	-28	-36	0	16
1000	35	-1	-32	-41	0	17
2000	ND	-7	ND	ND	ND	ND
3000	ND	-17	ND	ND	ND	ND
4000	ND	-25	ND	ND	ND	ND
5000	ND	-33	ND	ND	ND	ND
6000	ND	-43	ND	ND	ND	ND
7000	ND	-54	ND	ND	ND	ND
8000	ND	-67	ND	ND	ND	ND
9000	ND	-82	ND	ND	ND	ND
10000	ND	-98	ND	ND	ND	ND
11000	ND	-118	ND	ND	ND	ND
12000	ND	-142	ND	ND	ND	ND
13000	ND	-166	ND	ND	ND	ND
14000	ND	-207	ND	ND	ND	ND
15000	ND	-226	ND	ND	ND	ND

STRAIN GAGE REPORT FOR MSE REINFORCEMENT PULLOUT TEST

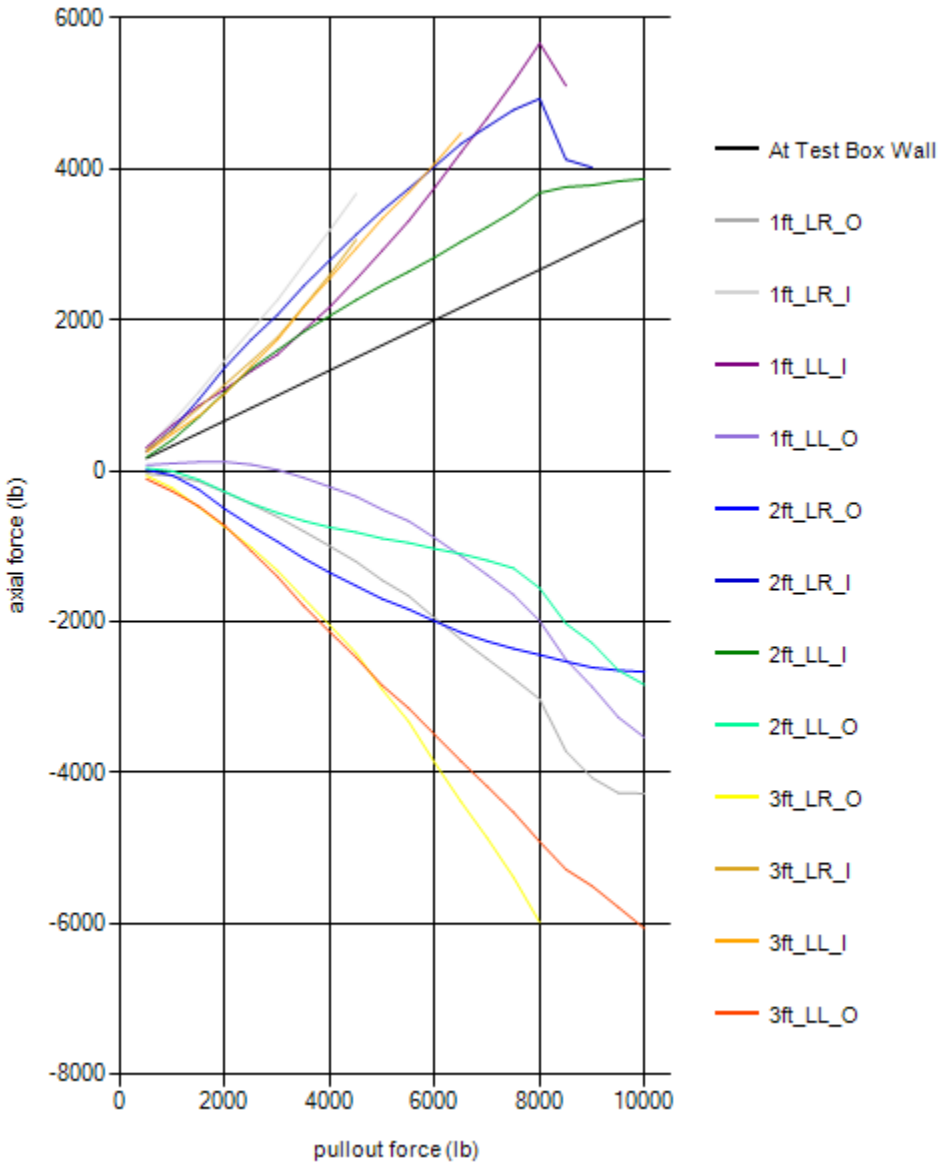
Test Information	
Test Date:	4/12/2011 10:07:00 AM
Test Identification:	TS24.03-G-6x12-W9.5xW11-L3-Z12-T
Test Facility:	12'x12'x4' MSE Test Box

Sketch

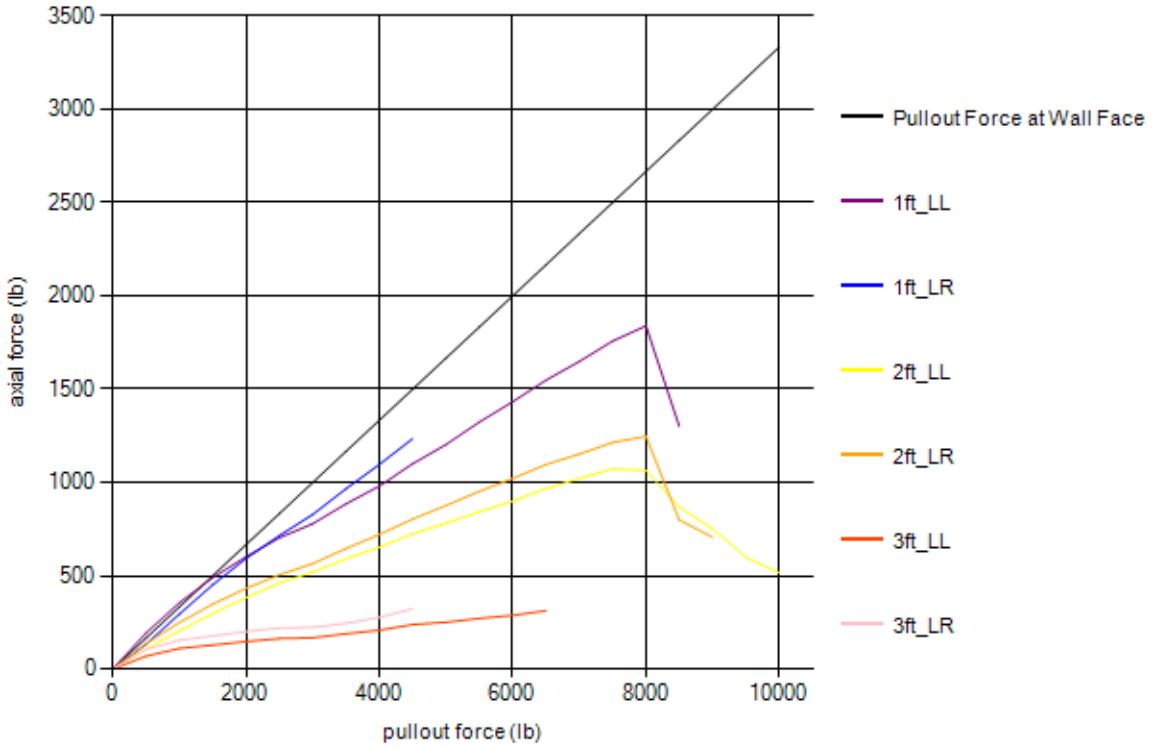


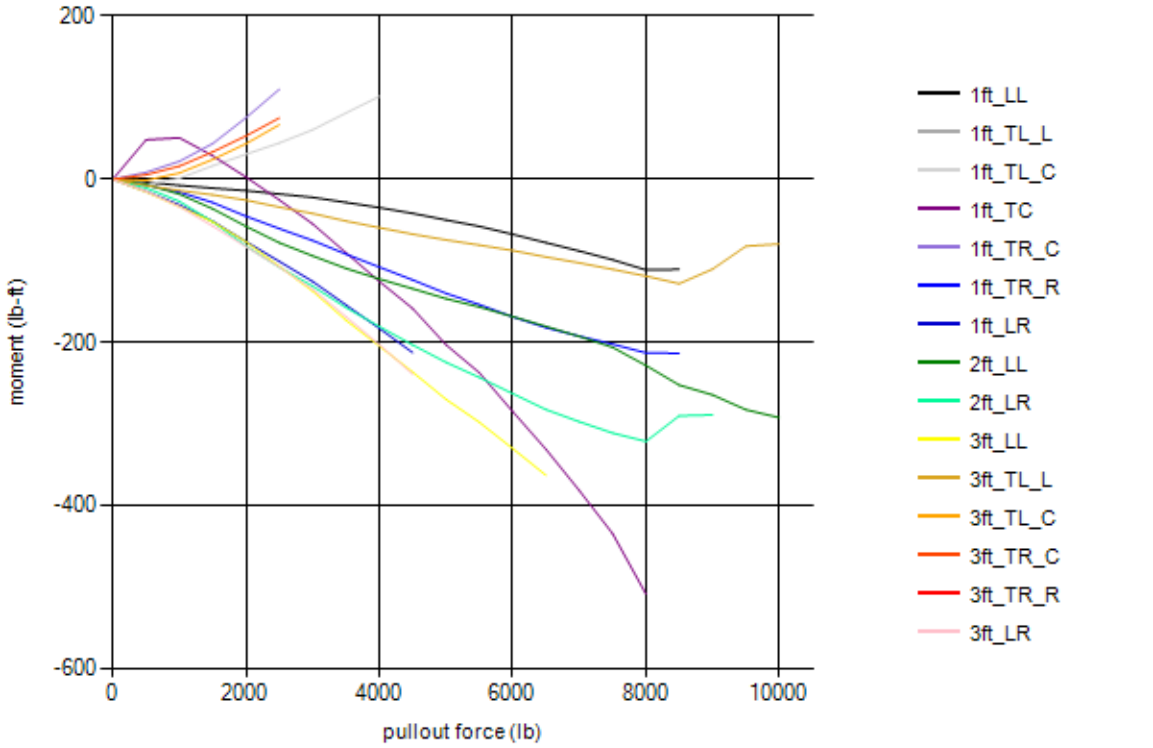
MSE Reinforcement					
Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	3	*Number, N_t:*	3	*Number, N_l:*	3
Width, b (in.):	12	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.35
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	6

Axial Load-Pullout Load Data by Gage

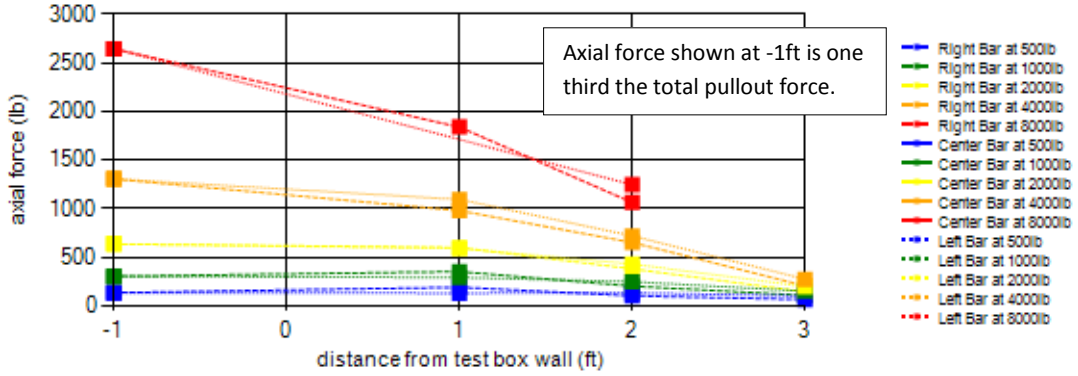


Axial Load-Pullout Load And Moment-Pullout Load Data by Location





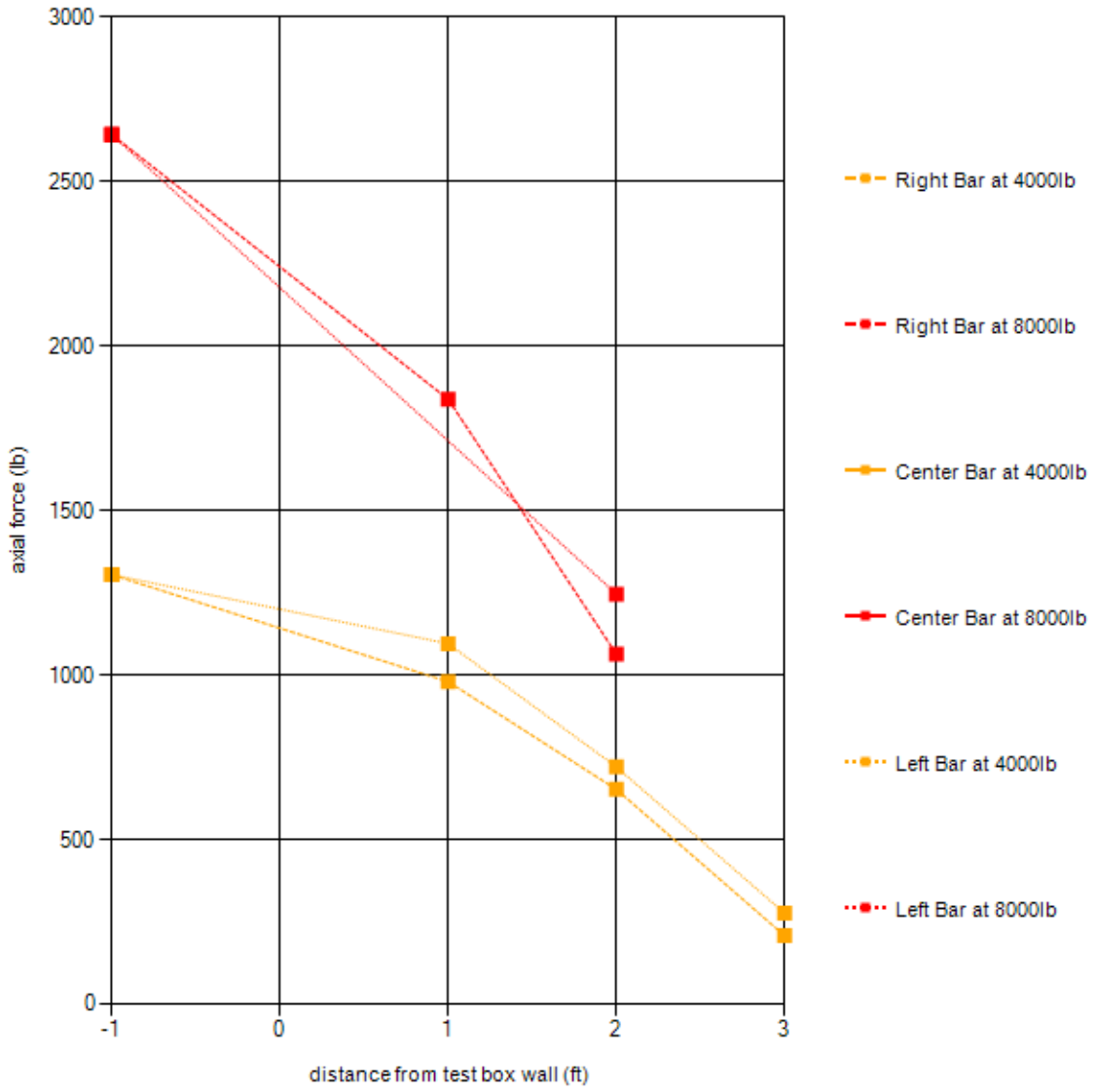
Axial Load-Distance from Test Box Wall Plot – Service Loads



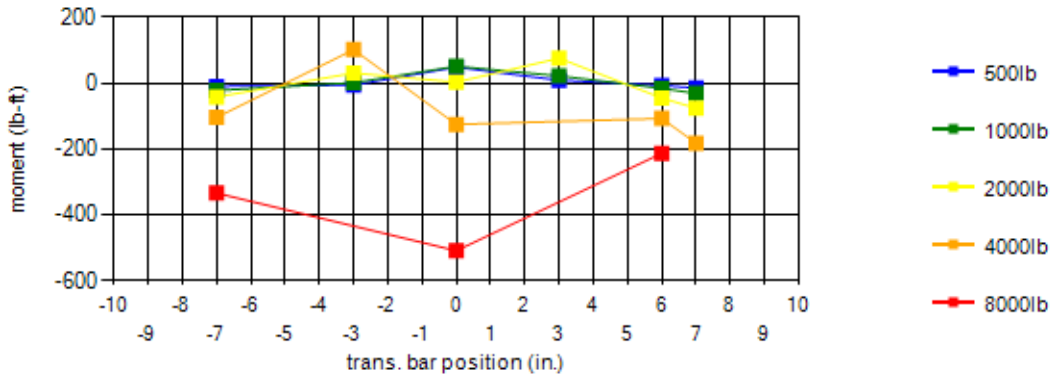
Axial Load Results

Pullout Resistance, P_r (lb)	*Axial Load, P (lb) calculated from strain data at distances from test box wall*					
	1ft_LL	*1ft_LR*	*2ft_LL*	*2ft_LR*	*3ft_LL*	*3ft_LR*
500	194	133	107	136	69	105
1000	355	295	205	250	111	155
2000	602	593	383	433	147	201
3000	779	828	520	565	168	224
4000	981	1096	653	722	209	277
5000	1203	ND	782	877	251	ND
6000	1432	ND	899	1022	288	ND
7000	1648	ND	1022	1152	ND	ND
8000	1839	ND	1064	1247	ND	ND
9000	ND	ND	752	707	ND	ND
10000	ND	ND	517	ND	ND	ND

Axial Load-Distance from Test Box Wall Plot – All



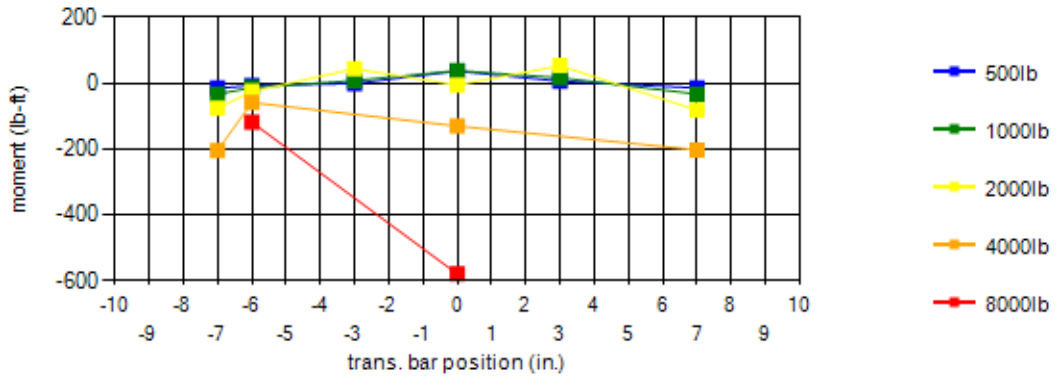
Moment Results along Transverse Bar at 1ft from Test Box Wall – Plot – Service Loads



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_C*	*1ft_TC*	*1ft_TR_C*	*1ft_TR_R*	*1ft_LR*
500	-10	-6	48	8	-7	-15
1000	-22	1	51	22	-16	-31
2000	-42	31	3	75	-45	-76
3000	-67	61	-55	ND	-75	-125
4000	-104	101	-125	ND	-108	-183
5000	-150	ND	-203	ND	-140	ND
6000	-202	ND	-284	ND	-169	ND
7000	-264	ND	-381	ND	-192	ND
8000	-333	ND	-508	ND	-213	ND

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

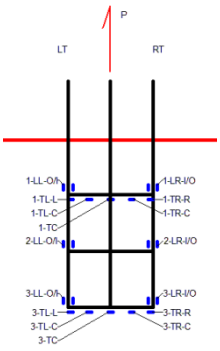
Pullout Resistance, P_r (lb)	*Moment (lb-ft) calculated from strain data at distances from test box wall*				
	3ft_LL	*3ft_TL_L*	*3ft_TL_C*	*3ft_TR_C*	*3ft_LR*
500	-15	-8	-1	6	-15
1000	-33	-14	8	16	-34
2000	-77	-26	44	53	-82
3000	-137	-42	ND	ND	-135
4000	-204	-59	ND	ND	-202
5000	-270	-74	ND	ND	ND
6000	-330	-87	ND	ND	ND
7000	ND	-102	ND	ND	ND
8000	ND	-119	ND	ND	ND
9000	ND	-110	ND	ND	ND
10000	ND	-79	ND	ND	ND

STRAIN GAGE REPORT FOR MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	4/11/2011 1:10:00 PM
Test Identification:	TS24.04-G-9x12-W9.5xW11-L3-Z12-T
Test Facility:	12'x12'x4' MSE Test Box

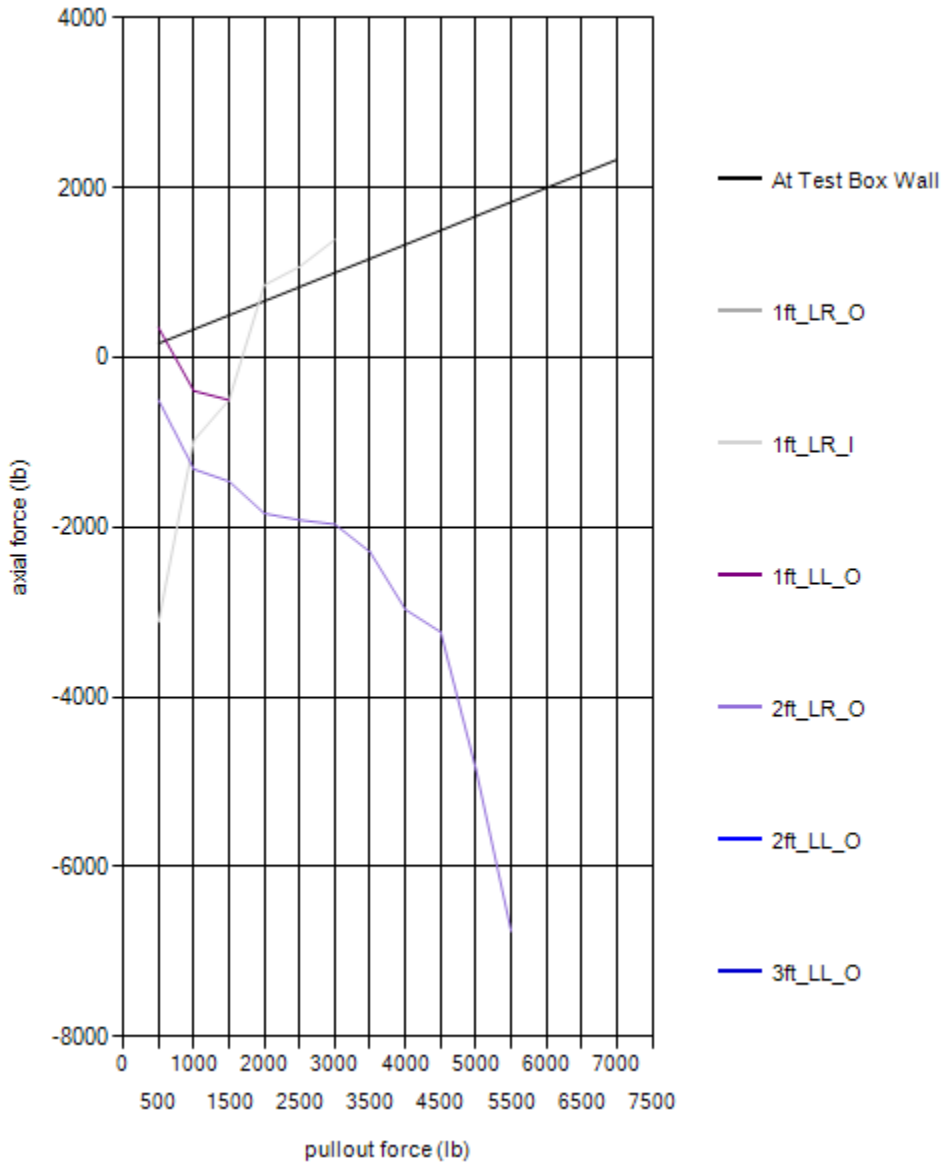
Sketch



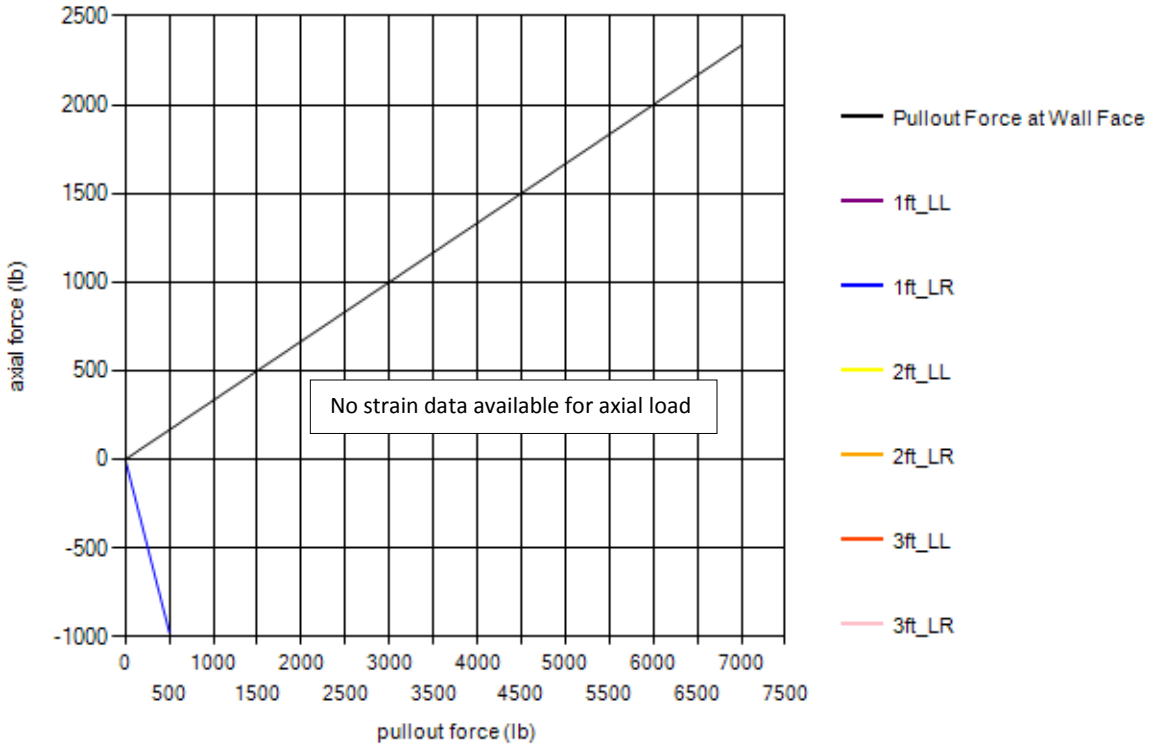
MSE Reinforcement

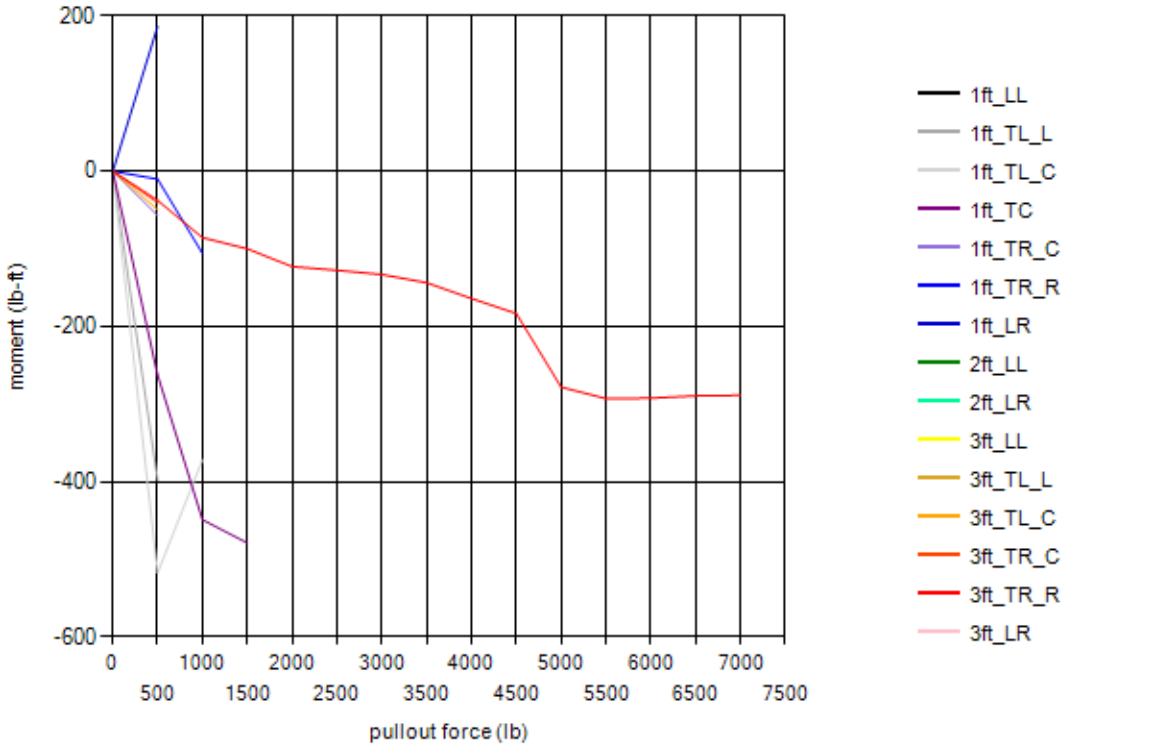
Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	3	*Number, N_t:*	3	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.35
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

Axial Load-Pullout Load Data by Gage

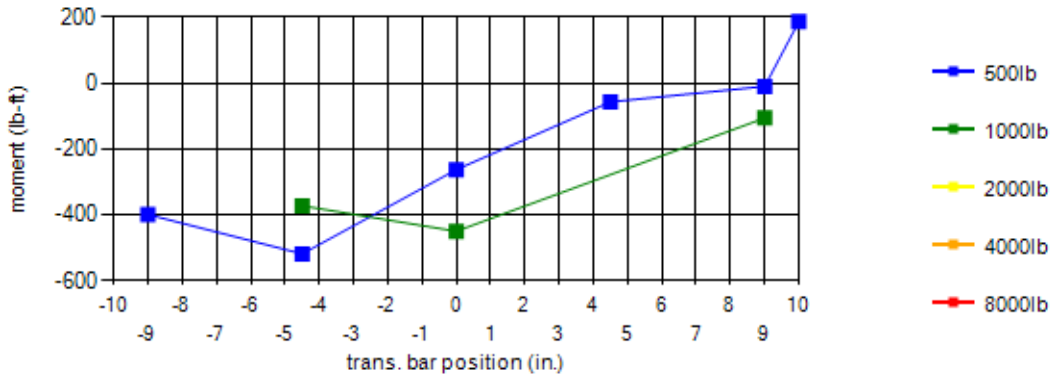


Axial Load-Pullout Load And Moment-Pullout Load Data by Location





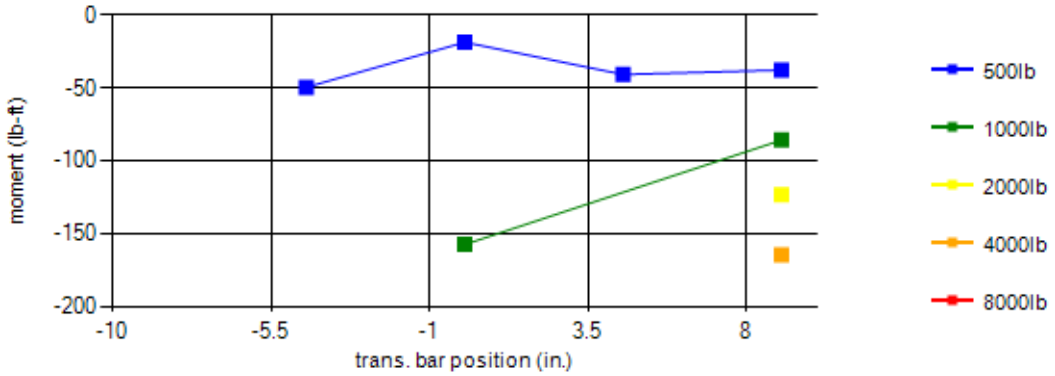
Moment Results along Transverse Bar at 1ft from Test Box Wall – Plot – Service Loads



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_TL_L	*1ft_TL_C*	*1ft_TC*	*1ft_TR_C*	*1ft_TR_R*	*1ft_LR*
500	-398	-518	-263	-57	-10	186
1000	ND	-372	-449	ND	-106	ND

Moment Results along Transverse Bar at 3ft from Test Box Wall – Plot – Service Loads



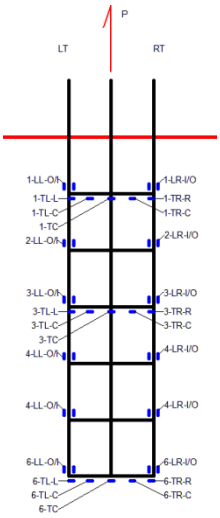
Moment Results along Transverse Bar at 3ft from Test Box Wall – Data

Pullout Resistance, P_r (lb)	*Moment (lb-ft) calculated from strain data at distances from test box wall*		
	3ft_TL_C	*3ft_TR_C*	*3ft_TR_R*
500	-49	-41	-38
1000	ND	ND	-86
2000	ND	ND	-123
3000	ND	ND	-133
4000	ND	ND	-164
5000	ND	ND	-278
6000	ND	ND	-292
7000	ND	ND	-289

STRAIN GAGE REPORT FOR MSE REINFORCEMENT PULLOUT TEST

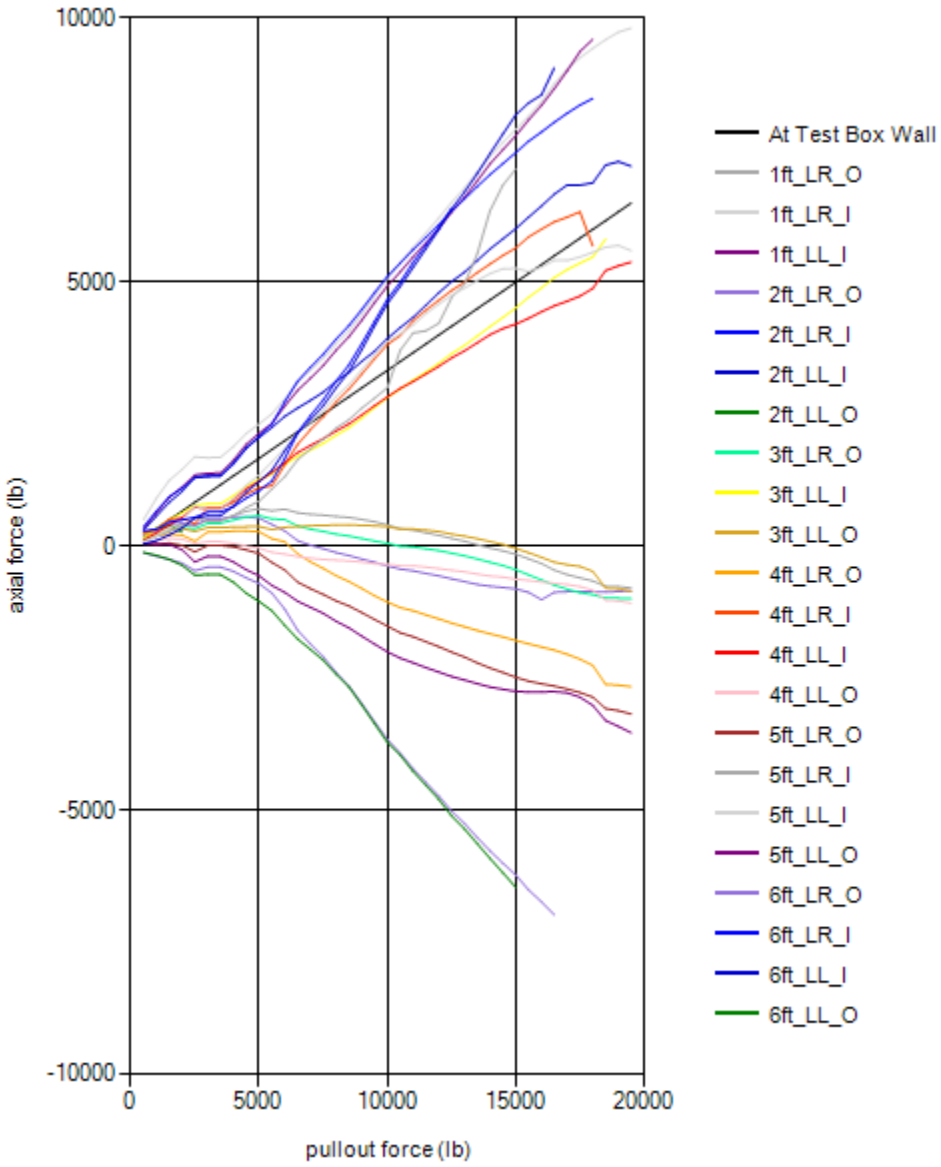
Test Information	
Test Date:	5/9/2011 10:02:00 AM
Test Identification:	TS25.01-G-6x12-W20xW11-L6-Z5-T
Test Facility:	12'x12'x4' MSE Test Box

Sketch

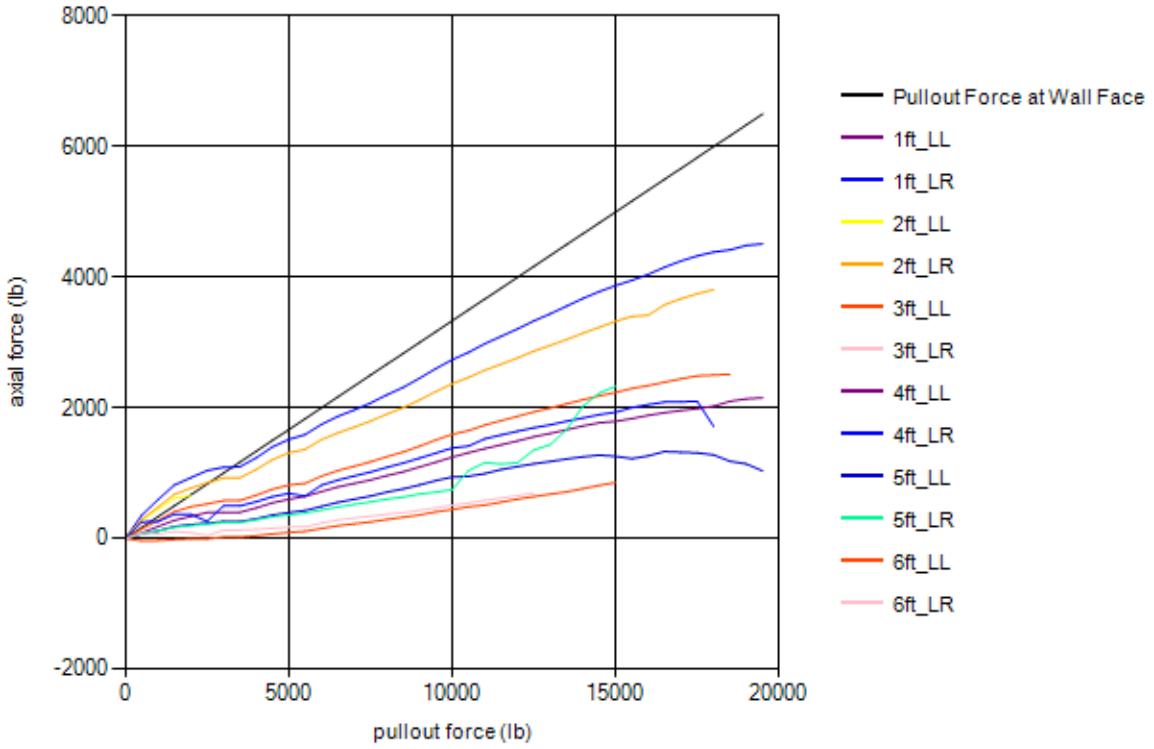


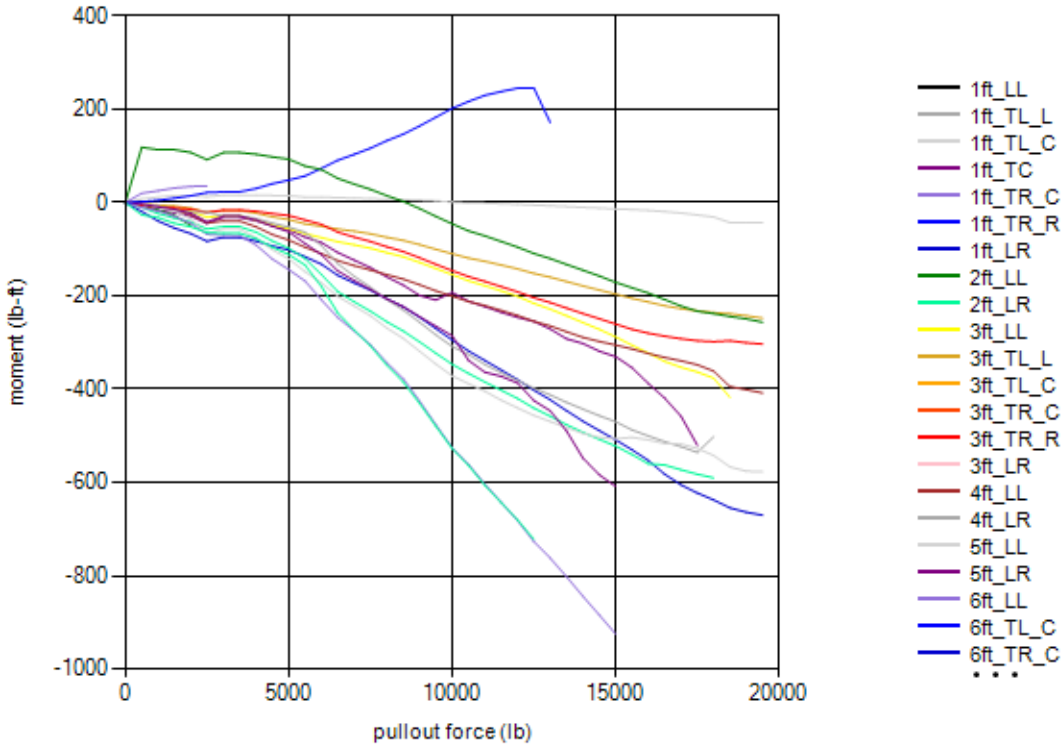
MSE Reinforcement					
Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	12	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.5
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	6

Axial Load-Pullout Load Data by Gage

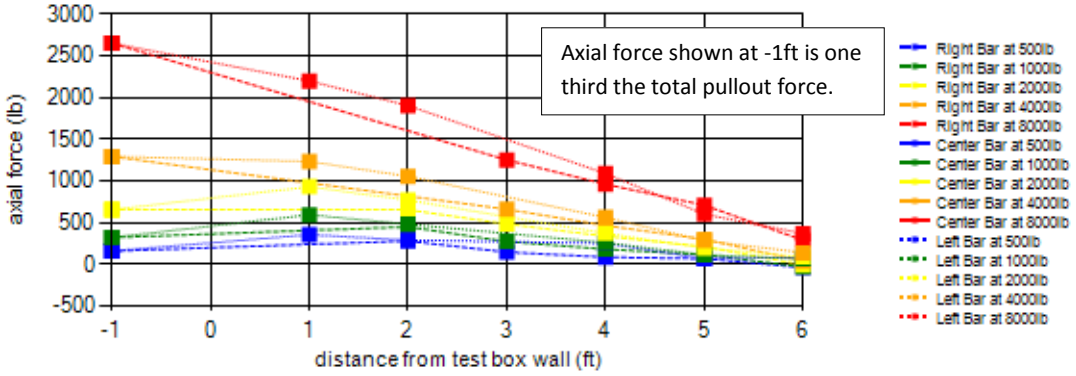


Axial Load-Pullout Load And Moment-Pullout Load Data by Location





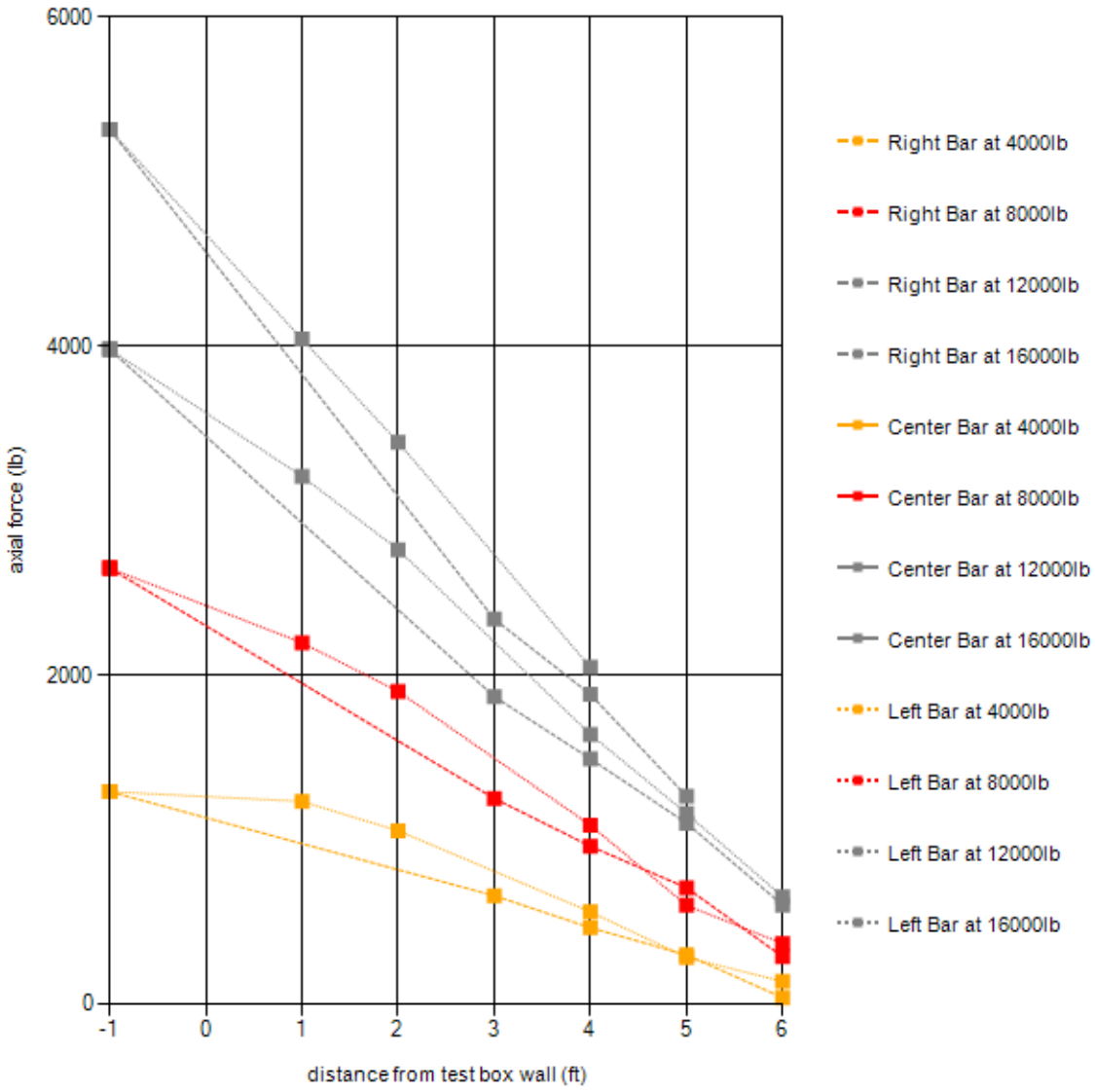
Axial Load-Distance from Test Box Wall Plot – Service Loads



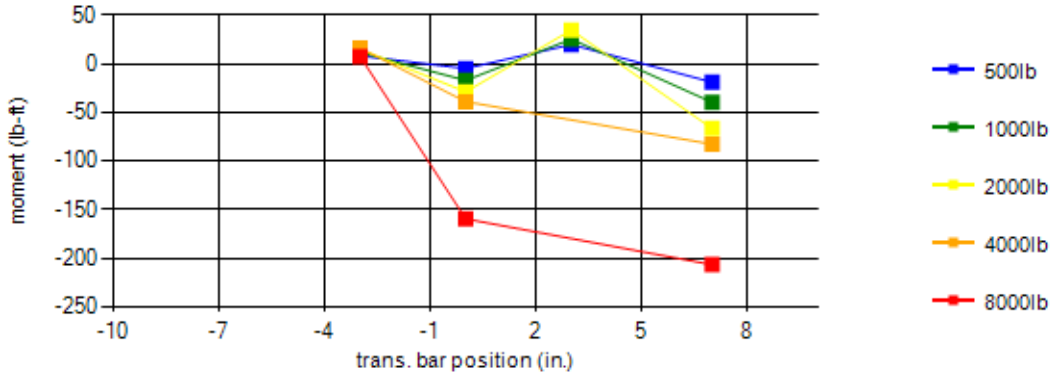
Axial Load Results

Pullout Resistance, P_r (lb)	*Axial Load, P (lb) calculated from strain data at distances from test box wall*									
	1ft_LR	*2ft_LL*	*2ft_LR*	*3ft_LL*	*4ft_LL*	*4ft_LR*	*5ft_LL*	*5ft_LR*	*6ft_LL*	*6ft_LR*
500	356	281	291	147	87	253	69	70	-37	84
1000	595	450	482	274	182	261	117	115	-32	67
2000	931	655	771	485	338	372	213	197	-7	90
3000	1090	ND	924	579	400	497	259	245	22	128
4000	1234	ND	1056	661	466	562	301	286	41	139
5000	1516	ND	1310	818	599	690	396	359	92	174
6000	1748	ND	1513	954	718	815	491	436	154	235
7000	1968	ND	1705	1105	841	957	601	521	223	311
8000	2199	ND	1903	1252	961	1089	709	602	290	370
9000	2453	ND	2120	1413	1095	1231	819	680	360	429
10000	2736	ND	2370	1594	1244	1384	941	747	442	510
11000	2982	ND	2577	1736	1375	1525	992	1163	511	582
12000	3210	ND	2765	1871	1493	1641	1102	1161	603	654
13000	3439	ND	2955	1997	1609	1740	1179	1436	679	ND
14000	3675	ND	3143	2125	1722	1845	1250	2028	762	ND
15000	3873	ND	3325	2236	1793	1932	1257	2330	856	ND
16000	4044	ND	3417	2342	1884	2049	1265	ND	ND	ND
17000	4249	ND	3669	2445	1958	2094	1319	ND	ND	ND
18000	4386	ND	3810	2502	2025	1716	1279	ND	ND	ND
19000	4487	ND	ND	ND	2138	ND	1142	ND	ND	ND

Axial Load-Distance from Test Box Wall Plot – All



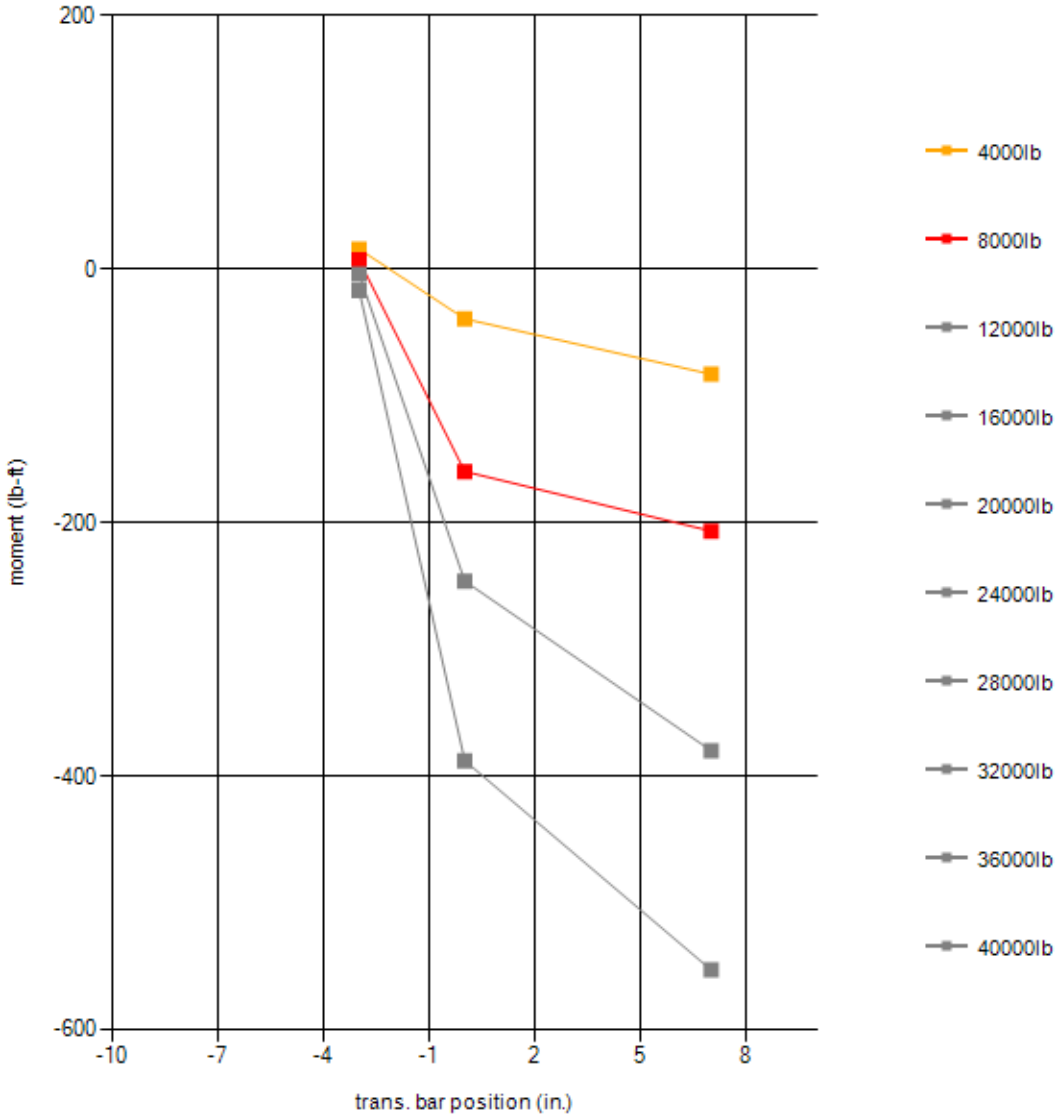
Moment Results along Transverse Bar at 1ft from Test Box Wall – Plot – Service Loads



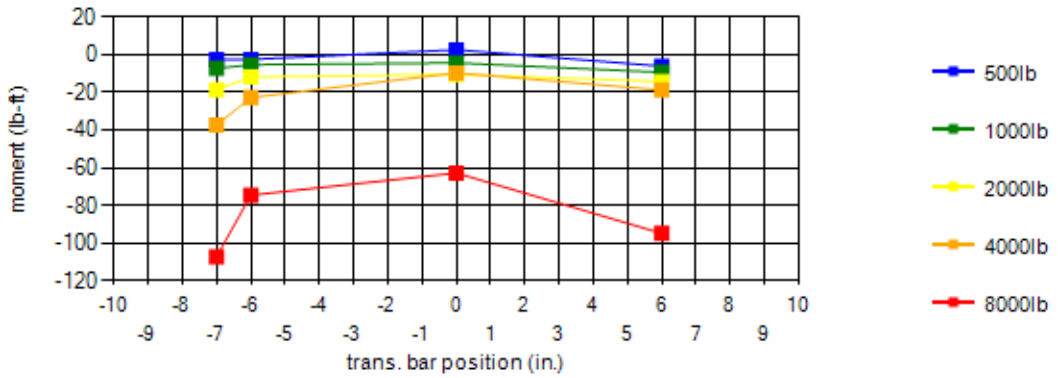
Moment Results along Transverse Bar at 1ft from Test Box Wall – Data

Pullout Resistance, P, (lb)	*Moment (lb-ft) calculated from strain data at distances from test box wall*			
	1ft_TL_C	*1ft_TC*	*1ft_TR_C*	*1ft_LR*
500	8	-5	20	-19
1000	12	-17	25	-40
2000	15	-29	35	-67
3000	16	-32	ND	-74
4000	16	-39	ND	-83
5000	15	-58	ND	-101
6000	12	-86	ND	-132
7000	10	-123	ND	-172
8000	7	-159	ND	-206
9000	5	-199	ND	-246
10000	1	-193	ND	-295
11000	-1	-223	ND	-338
12000	-4	-246	ND	-380
13000	-7	-271	ND	-423
14000	-10	-302	ND	-469
15000	-14	-330	ND	-509
16000	-17	-388	ND	-553
17000	-22	-458	ND	-605
18000	-31	ND	ND	-637
19000	-43	ND	ND	-664

Moment Results along Transverse Bar at 1ft from Test Box Wall – Plot – All



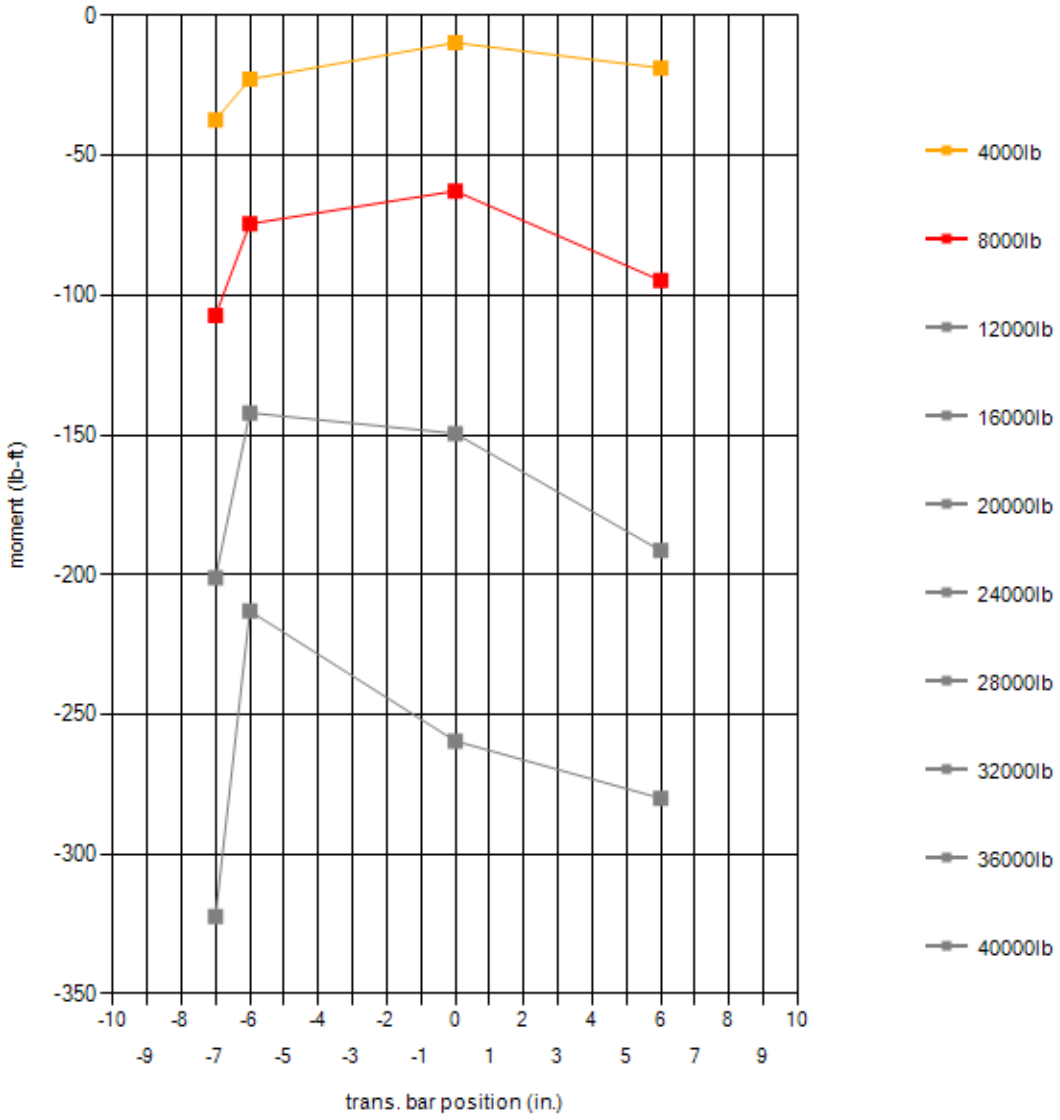
Moment Results along Transverse Bar at 3ft from Test Box Wall – Plot – Service Loads



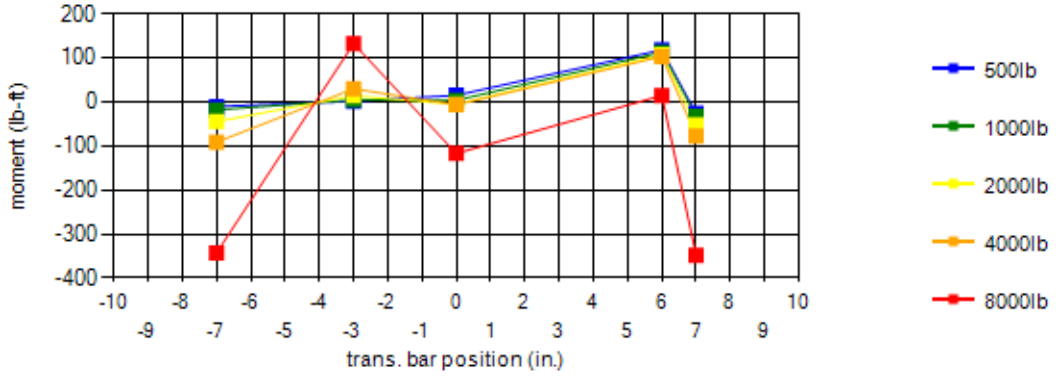
Moment Results along Transverse Bar at 3ft from Test Box Wall – Data

Pullout Resistance, P_r (lb)	*Moment (lb-ft) calculated from strain data at distances from test box wall*		
	3ft_LL	*3ft_TL_L*	*3ft_TR_R*
500	-3	-2	-6
1000	-7	-5	-9
2000	-19	-12	-14
3000	-28	-17	-16
4000	-37	-23	-19
5000	-56	-37	-28
6000	-75	-51	-47
7000	-90	-61	-74
8000	-107	-74	-95
9000	-128	-90	-118
10000	-155	-110	-146
11000	-178	-126	-169
12000	-201	-142	-191
13000	-228	-160	-214
14000	-257	-179	-238
15000	-288	-196	-260
16000	-322	-213	-280
17000	-353	-227	-292
18000	-376	-236	-298
19000	ND	-243	-301

Moment Results along Transverse Bar at 3ft from Test Box Wall – Plot – All



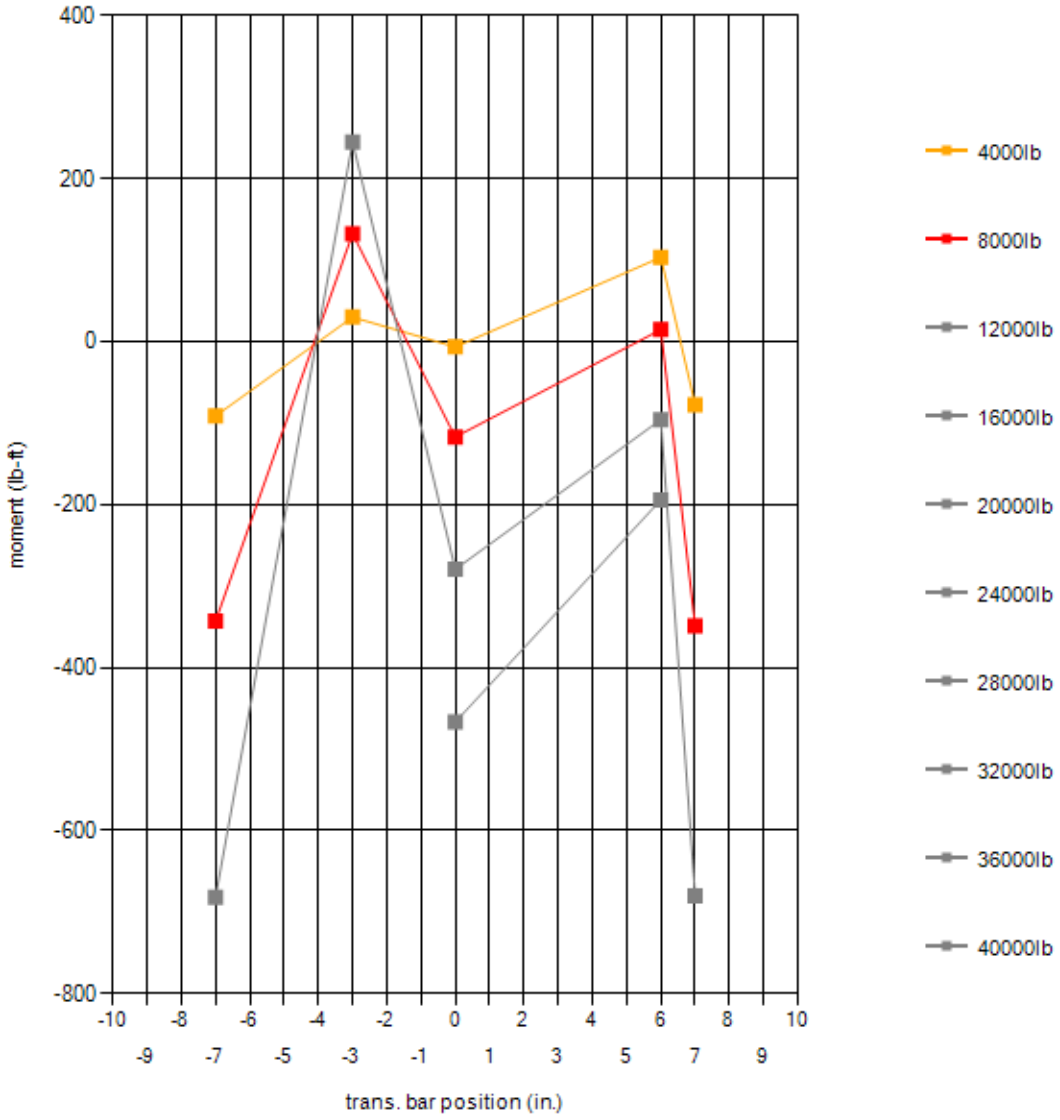
Moment Results along Transverse Bar at 6ft from Test Box Wall – Plot – Service Loads



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_C*	*6ft_TR_R*	*6ft_LR*
500	-10	2	118	-26
1000	-18	5	113	-32
2000	-45	14	107	-52
3000	-70	23	107	-66
4000	-91	30	104	-77
5000	-144	48	93	-111
6000	-209	73	71	-180
7000	-275	103	40	-273
8000	-343	133	15	-349
9000	-425	164	-13	-430
10000	-525	202	-45	-527
11000	-603	230	-71	-606
12000	-682	245	-95	-680
13000	-762	172	-120	ND
14000	-844	ND	-145	ND
15000	-925	ND	-171	ND
16000	ND	ND	-194	ND
17000	ND	ND	-222	ND
18000	ND	ND	-238	ND
19000	ND	ND	-249	ND

Moment Results along Transverse Bar at 6ft from Test Box Wall – Plot – All

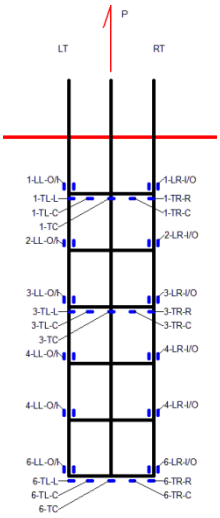


STRAIN GAGE REPORT FOR MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/6/2011 2:00:00 PM
Test Identification:	TS25.02-G-9x12-W20xW11-L6-Z5-T
Test Facility:	12'x12'x4' MSE Test Box

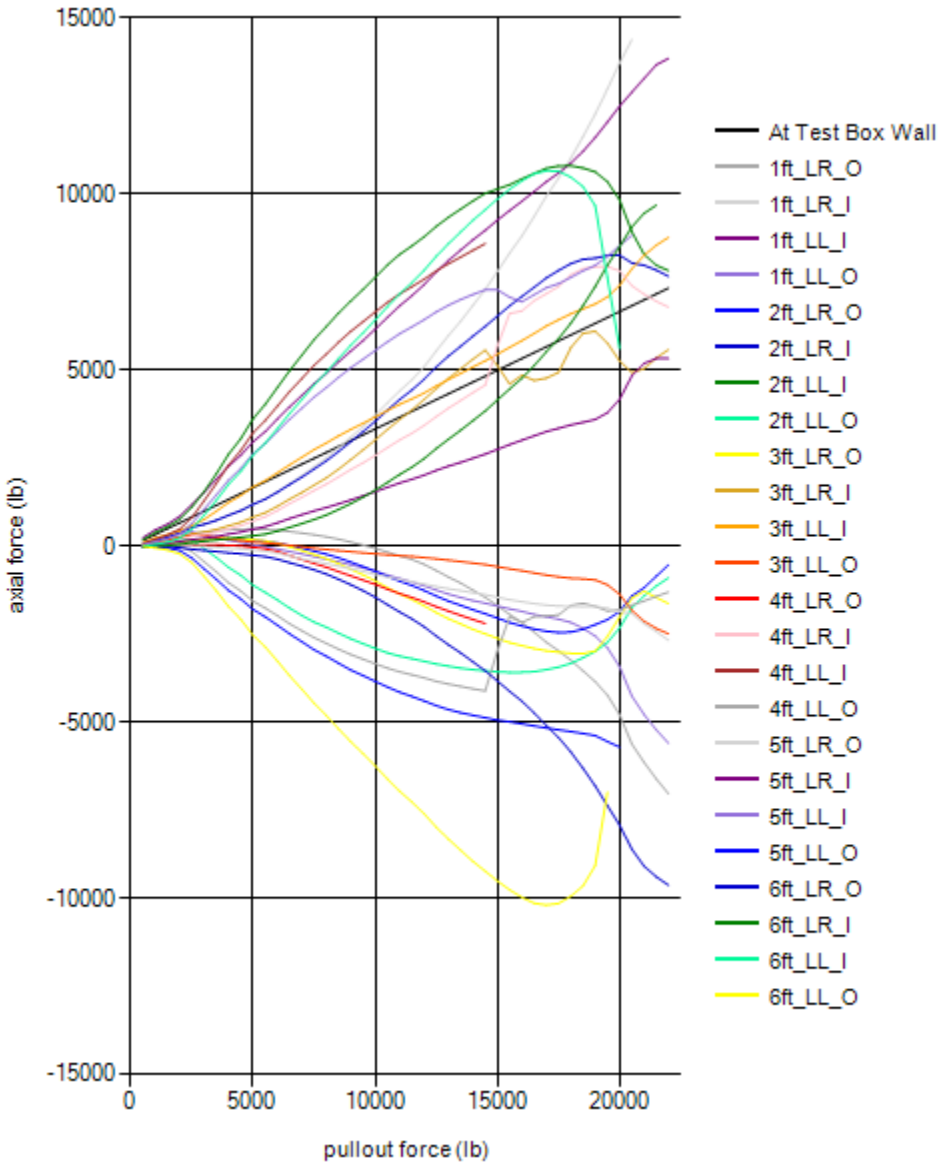
Sketch



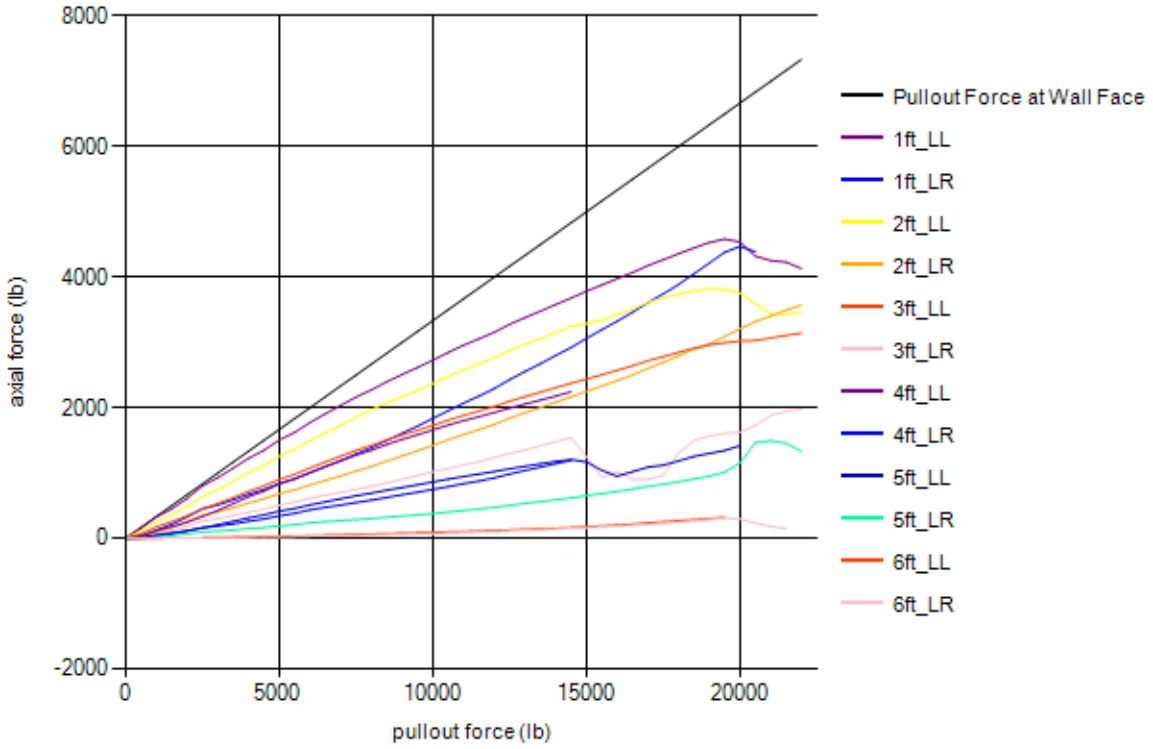
MSE Reinforcement

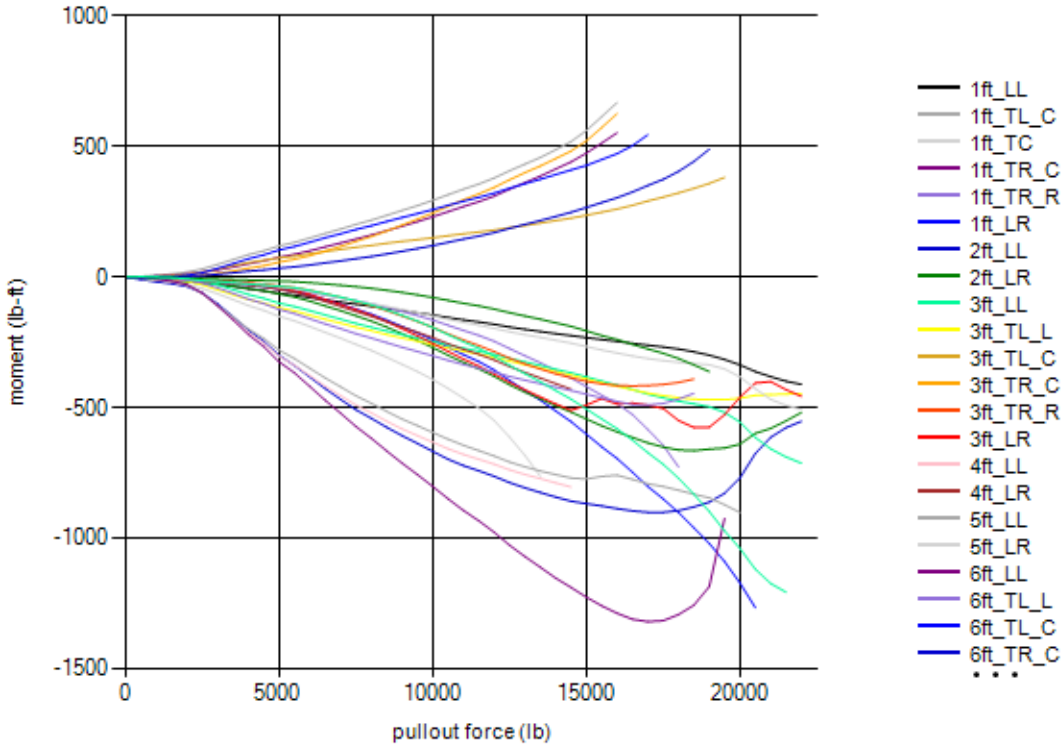
Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.5
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

Axial Load-Pullout Load Data by Gage

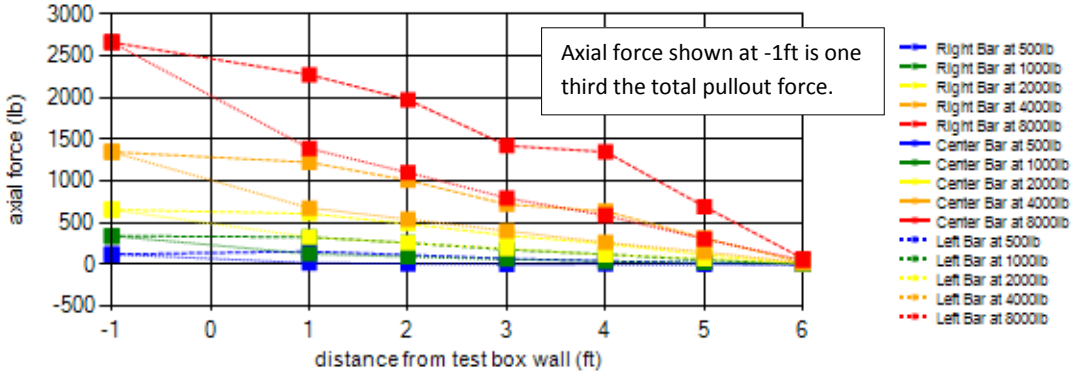


Axial Load-Pullout Load And Moment-Pullout Load Data by Location





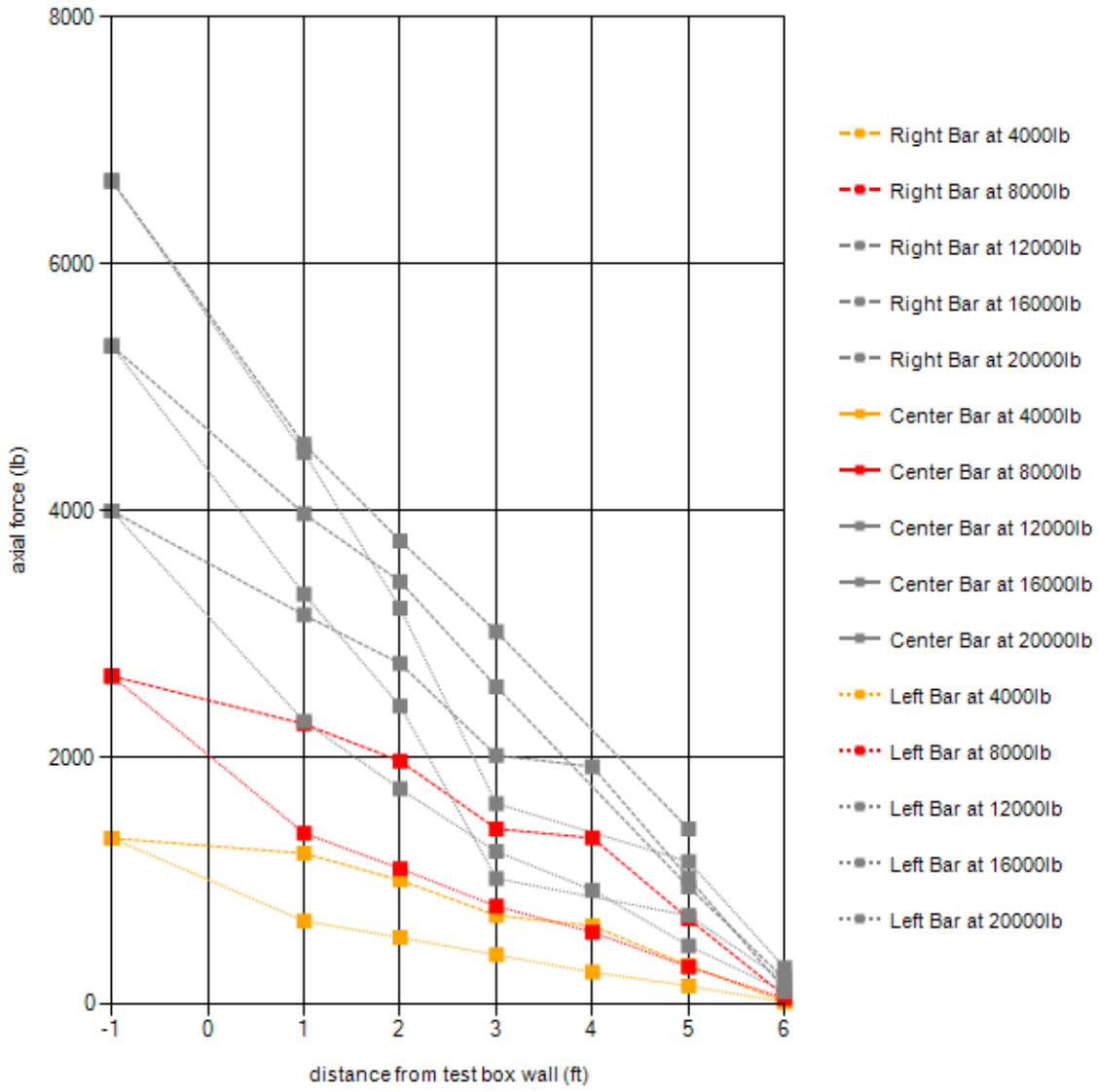
Axial Load-Distance from Test Box Wall Plot – Service Loads



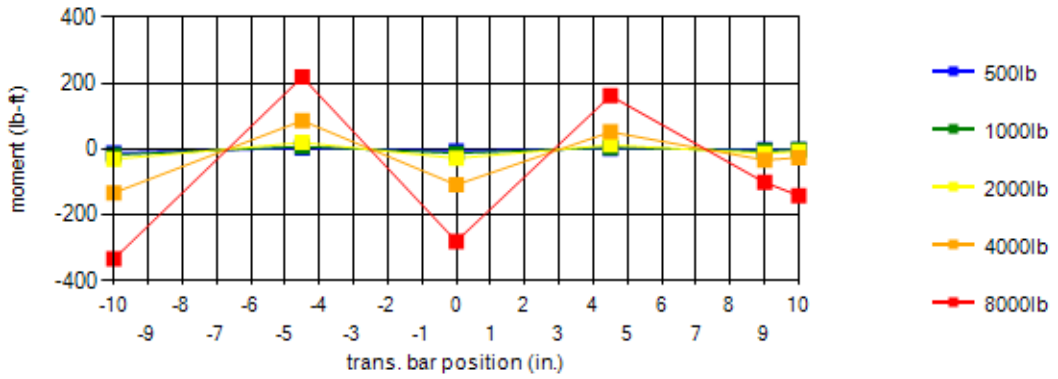
Axial Load Results

Pullout Resistance, P_r (lb)	*Axial Load, P (lb) calculated from strain data at distances from test box wall*											
	1ft_LL	*1ft_LR*	*2ft_LL*	*2ft_LR*	*3ft_LL*	*3ft_LR*	*4ft_LL*	*4ft_LR*	*5ft_LL*	*5ft_LR*	*6ft_LL*	*6ft_LR*
500	155	18	116	7	69	1	42	2	13	-2	0	-1
1000	326	127	259	93	178	62	120	36	54	20	3	4
2000	609	327	487	257	347	189	248	117	116	70	9	9
3000	930	513	747	407	534	302	428	190	208	113	16	14
4000	1224	677	1007	542	721	401	638	262	314	150	24	19
5000	1507	844	1258	683	904	509	833	345	416	190	34	24
6000	1772	1007	1495	817	1078	614	1006	436	512	239	44	33
7000	2036	1193	1733	956	1260	706	1185	511	606	273	55	42
8000	2273	1389	1973	1101	1424	796	1349	585	693	304	68	50
9000	2509	1610	2169	1263	1584	905	1515	669	780	341	81	61
10000	2730	1835	2372	1422	1731	1020	1661	750	863	380	94	73
11000	2957	2072	2584	1590	1883	1124	1803	839	948	428	107	88
12000	3156	2294	2764	1746	2019	1240	1927	927	1024	476	121	103
13000	3381	2557	2971	1925	2171	1356	2057	1041	1106	537	140	124
14000	3581	2801	3154	2085	2310	1479	2180	1145	1178	592	158	145
15000	3784	3062	3289	2252	2440	1257	ND	ND	1172	655	179	166
16000	3977	3326	3428	2418	2575	1021	ND	ND	952	721	205	188
17000	4178	3610	3615	2604	2721	906	ND	ND	1092	795	239	217
18000	4359	3890	3741	2795	2850	1300	ND	ND	1187	869	273	248
19000	4531	4216	3826	2980	2963	1568	ND	ND	1303	952	302	286
20000	4540	4471	3758	3211	3021	1628	ND	ND	1421	1158	ND	297
21000	4255	ND	3442	3404	3069	1885	ND	ND	ND	1497	ND	187
22000	4134	ND	3469	3572	3143	1979	ND	ND	ND	1333	ND	ND

Axial Load-Distance from Test Box Wall Plot – All



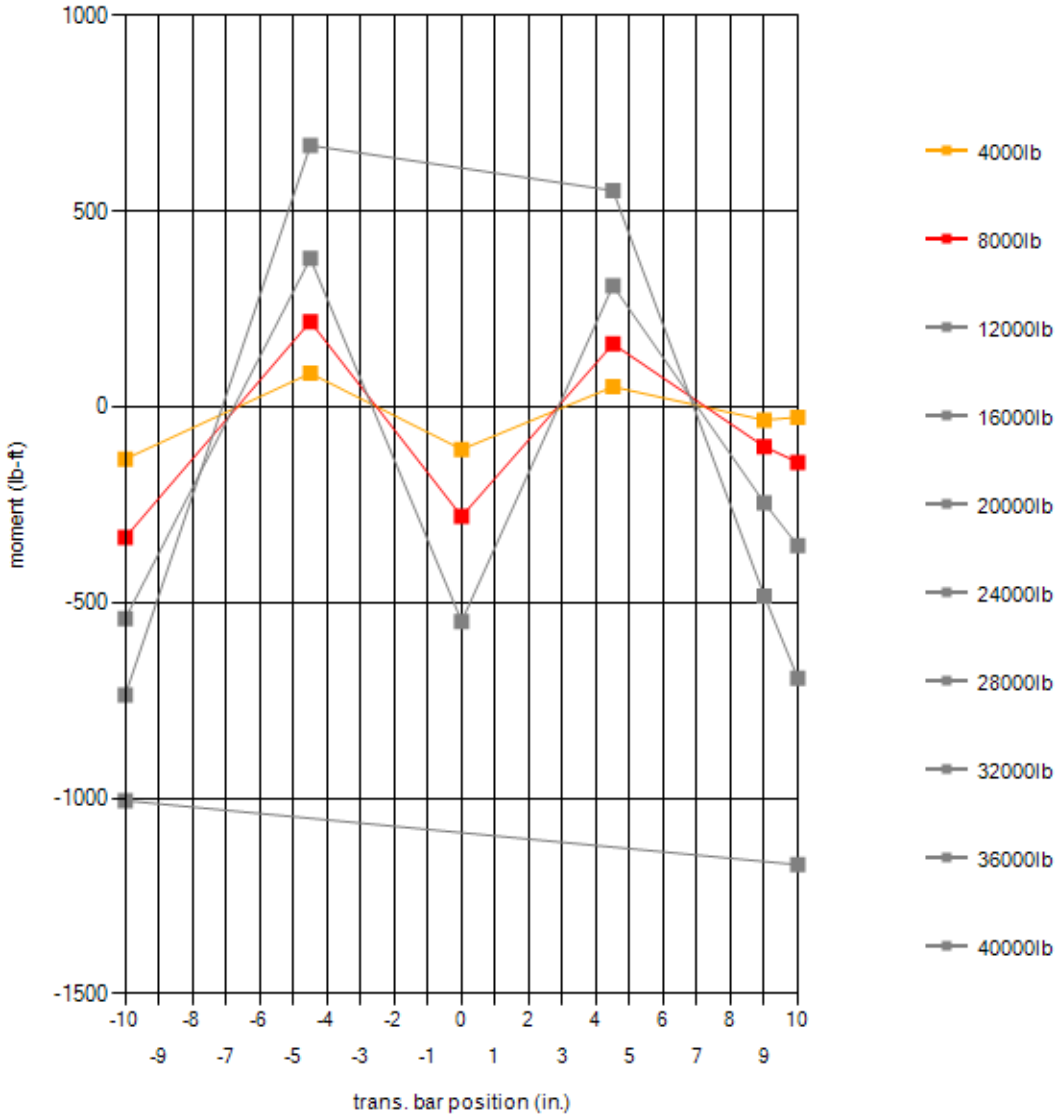
Moment Results along Transverse Bar at 1ft from Test Box Wall – Plot – Service Loads



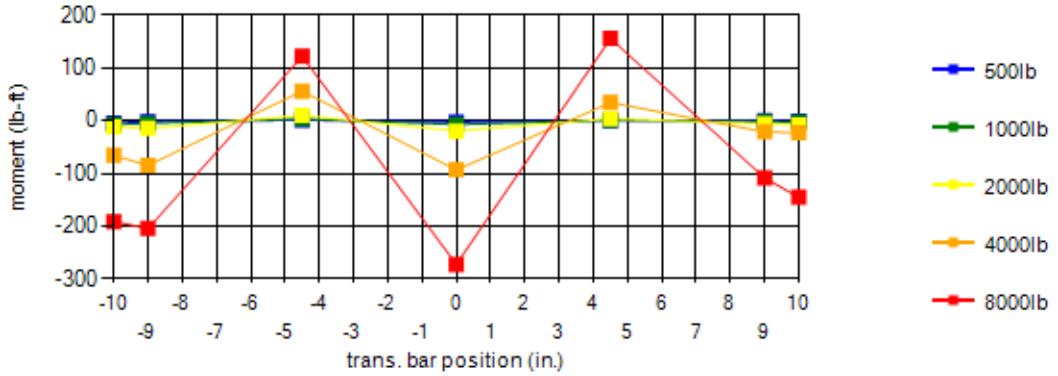
Moment Results along Transverse Bar at 1ft from Test Box Wall – Data

Pullout Resistance, P, (lb)	*Moment (lb-ft) calculated from strain data at distances from test box wall*					
	1ft_LL	*1ft_TL_C*	*1ft_TC*	*1ft_TR_C*	*1ft_TR_R*	*1ft_LR*
500	-11	3	-6	1	-1	-1
1000	-18	8	-13	4	-5	-1
2000	-31	20	-28	12	-14	-7
3000	-77	49	-63	28	-23	-14
4000	-133	86	-108	52	-34	-26
5000	-185	120	-150	77	-45	-45
6000	-234	150	-188	101	-59	-69
7000	-285	184	-233	131	-79	-103
8000	-333	218	-280	161	-101	-141
9000	-384	255	-333	195	-131	-188
10000	-435	294	-391	231	-164	-239
11000	-490	337	-463	271	-204	-296
12000	-541	380	-548	310	-245	-355
13000	-599	433	-682	362	-301	-434
14000	-648	488	ND	414	-357	-512
15000	-693	562	ND	475	-418	-601
16000	-736	669	ND	553	-483	-694
17000	-781	ND	ND	ND	-583	-801
18000	-824	ND	ND	ND	-726	-901
19000	-895	ND	ND	ND	ND	-1019
20000	-1007	ND	ND	ND	ND	-1170
21000	-1142	ND	ND	ND	ND	ND
22000	-1230	ND	ND	ND	ND	ND

Moment Results along Transverse Bar at 1ft from Test Box Wall – Plot – All



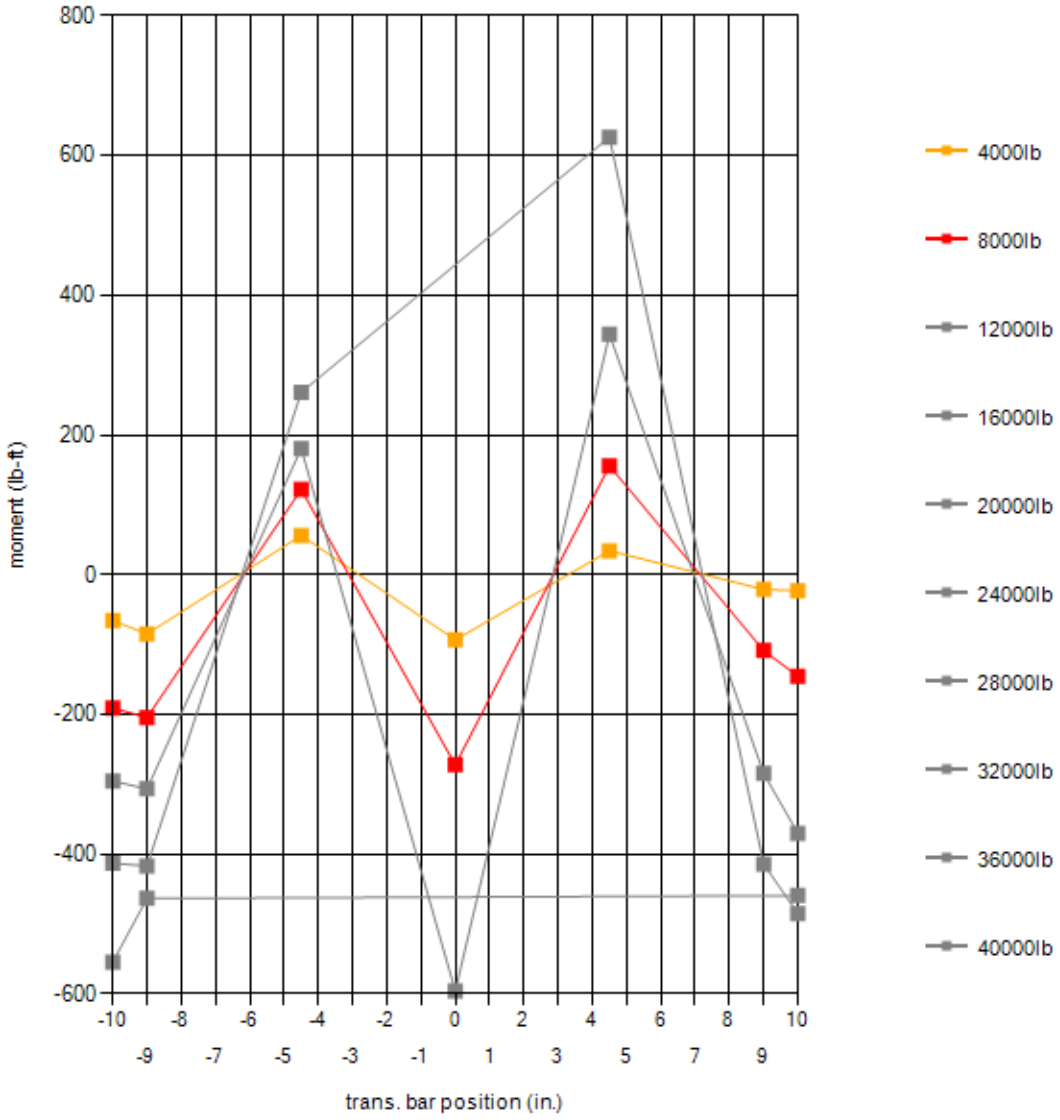
Moment Results along Transverse Bar at 3ft from Test Box Wall – Plot – Service Loads



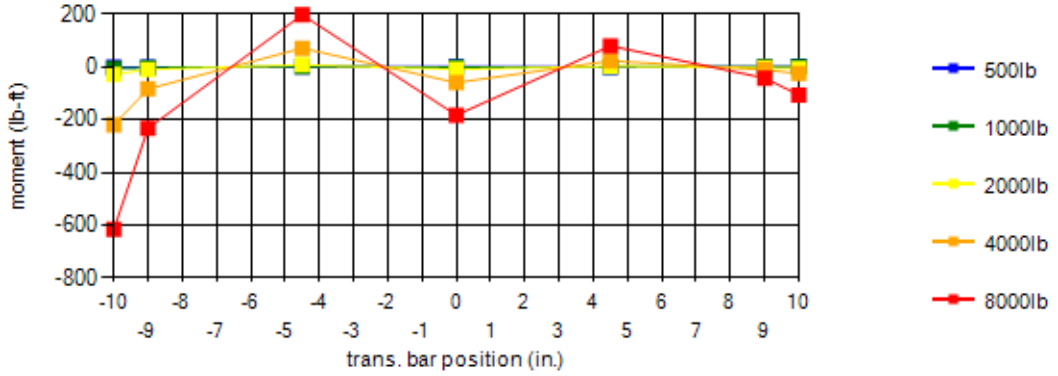
Moment Results along Transverse Bar at 3ft from Test Box Wall – Data

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	-4	-2	1	0	0	-1
1000	-8	-5	3	1	-2	-3
2000	-12	-15	10	4	-6	-8
3000	-29	-48	32	14	-13	-13
4000	-66	-85	56	34	-21	-23
5000	-99	-117	74	58	-33	-40
6000	-128	-145	90	83	-50	-66
7000	-161	-176	106	118	-77	-104
8000	-191	-204	122	156	-109	-145
9000	-220	-232	137	199	-148	-196
10000	-246	-257	151	245	-192	-253
11000	-272	-283	166	296	-240	-313
12000	-295	-307	181	344	-285	-370
13000	-324	-335	198	400	-332	-431
14000	-352	-362	217	454	-370	-485
15000	-382	-390	237	522	-399	-490
16000	-413	-417	261	626	-414	-486
17000	-447	-444	292	ND	-415	-489
18000	-475	-461	323	ND	-403	-549
19000	-495	-469	359	ND	ND	-574
20000	-555	-464	ND	ND	ND	-459
21000	-657	-450	ND	ND	ND	-400
22000	-712	-445	ND	ND	ND	-456

Moment Results along Transverse Bar at 3ft from Test Box Wall – Plot – All



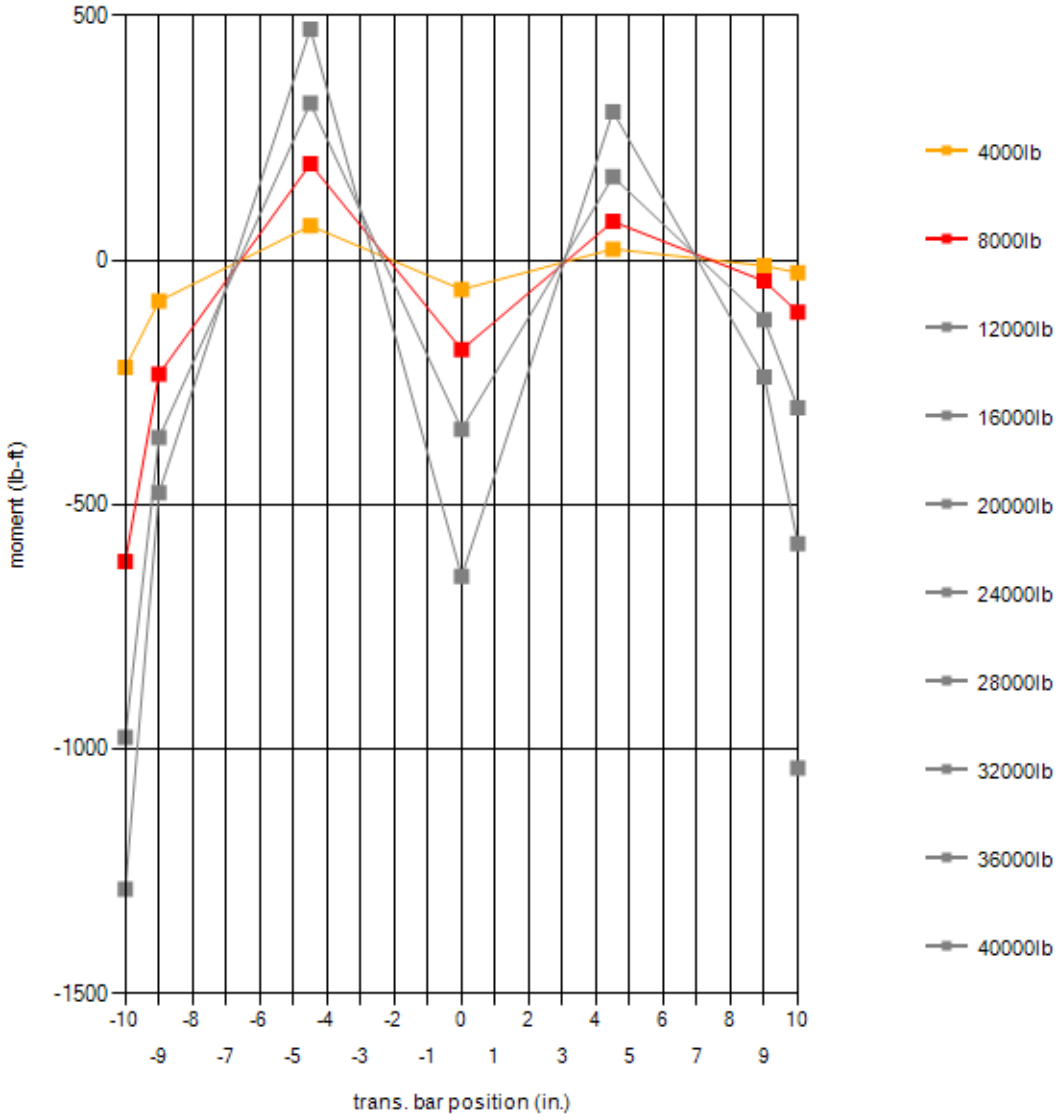
Moment Results along Transverse Bar at 6ft from Test Box Wall – Plot – Service Loads



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	0	0	0	0	1	2
1000	-6	-2	1	0	0	1
2000	-28	-10	7	3	-3	-6
3000	-110	-41	34	11	-7	-16
4000	-219	-83	70	23	-11	-25
5000	-323	-123	104	34	-15	-35
6000	-418	-159	134	47	-21	-51
7000	-520	-197	166	63	-31	-76
8000	-616	-233	197	79	-43	-106
9000	-711	-268	229	99	-58	-146
10000	-801	-301	259	121	-77	-192
11000	-893	-334	291	146	-100	-247
12000	-976	-363	322	171	-122	-302
13000	-1069	-394	358	202	-149	-369
14000	-1151	-421	393	233	-174	-433
15000	-1225	-448	428	267	-206	-505
16000	-1286	-476	473	304	-239	-580
17000	-1318	-489	545	351	-274	-671
18000	-1291	-467	ND	405	-311	-769
19000	-1185	ND	ND	490	-361	-897
20000	ND	ND	ND	ND	ND	-1039
21000	ND	ND	ND	ND	ND	-1172

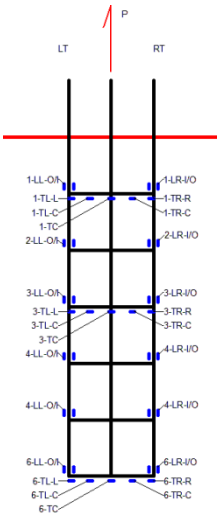
Moment Results along Transverse Bar at 6ft from Test Box Wall – Plot – All



STRAIN GAGE REPORT FOR MSE REINFORCEMENT PULLOUT TEST

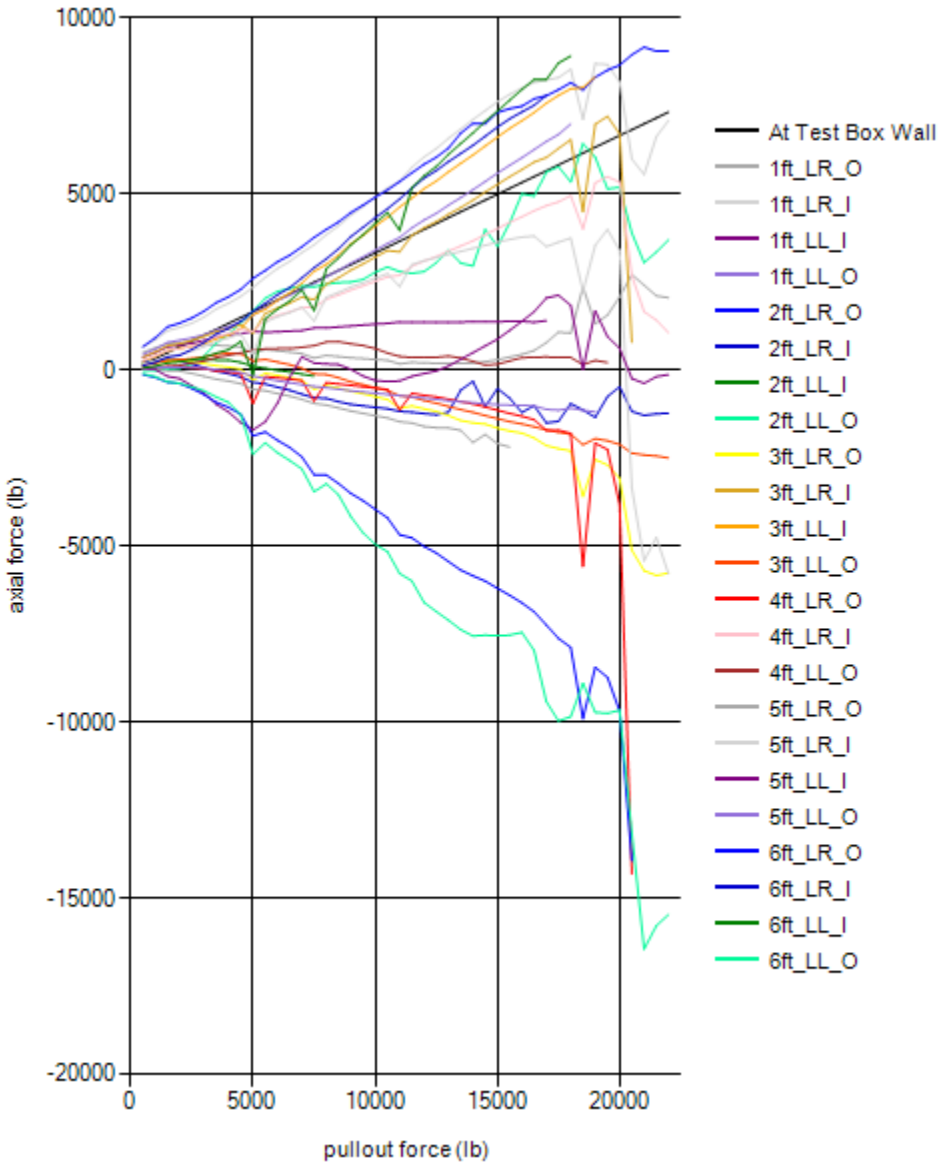
Test Information	
Test Date:	5/6/2011 10:55:00 AM
Test Identification:	TS25.03-G-6x12-W20xW11-L6-Z12-T
Test Facility:	12'x12'x4' MSE Test Box

Sketch

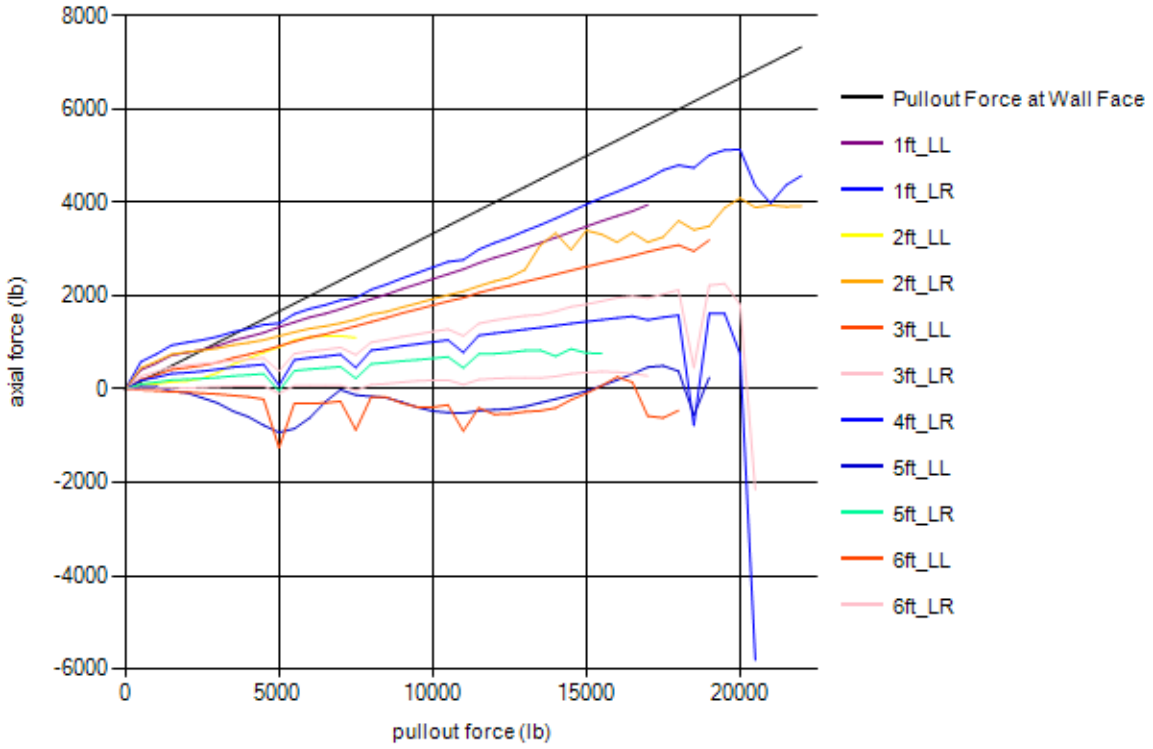


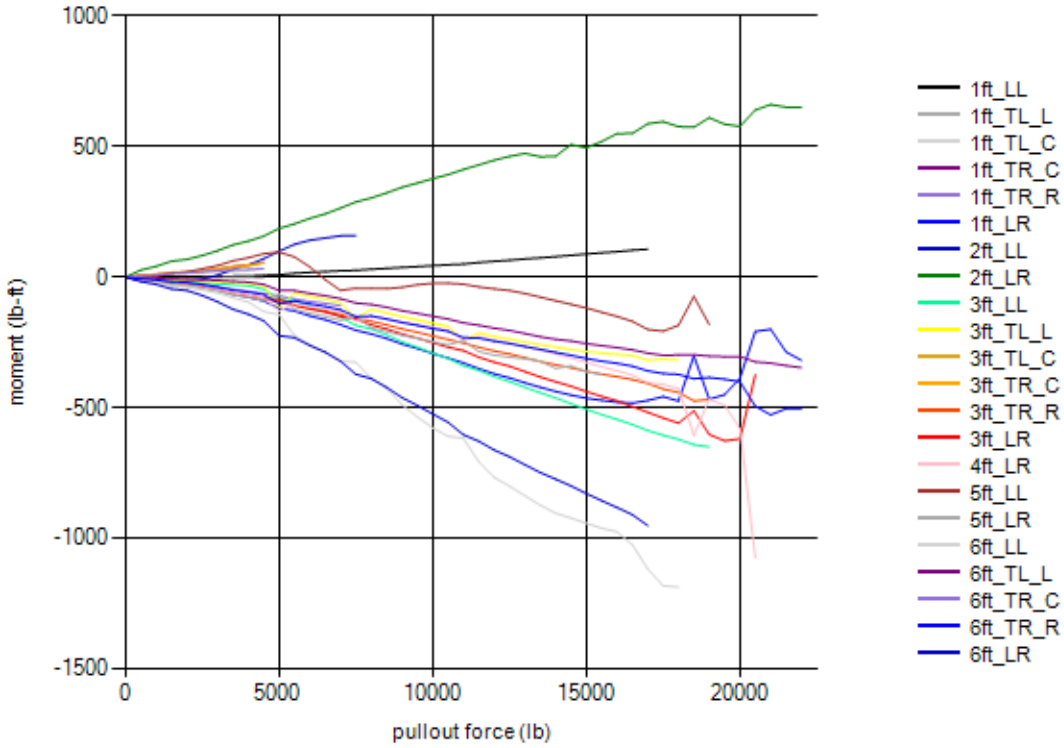
MSE Reinforcement					
Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	12	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.5
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	6

Axial Load-Pullout Load Data by Gage

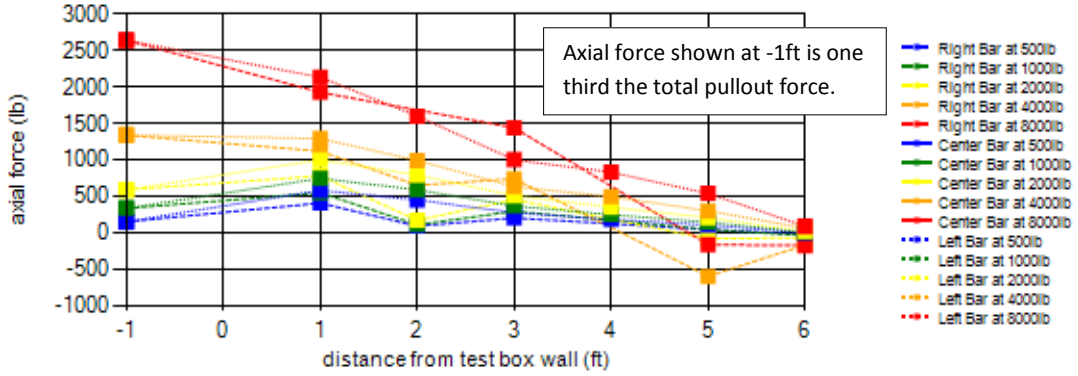


Axial Load-Pullout Load And Moment-Pullout Load Data by Location





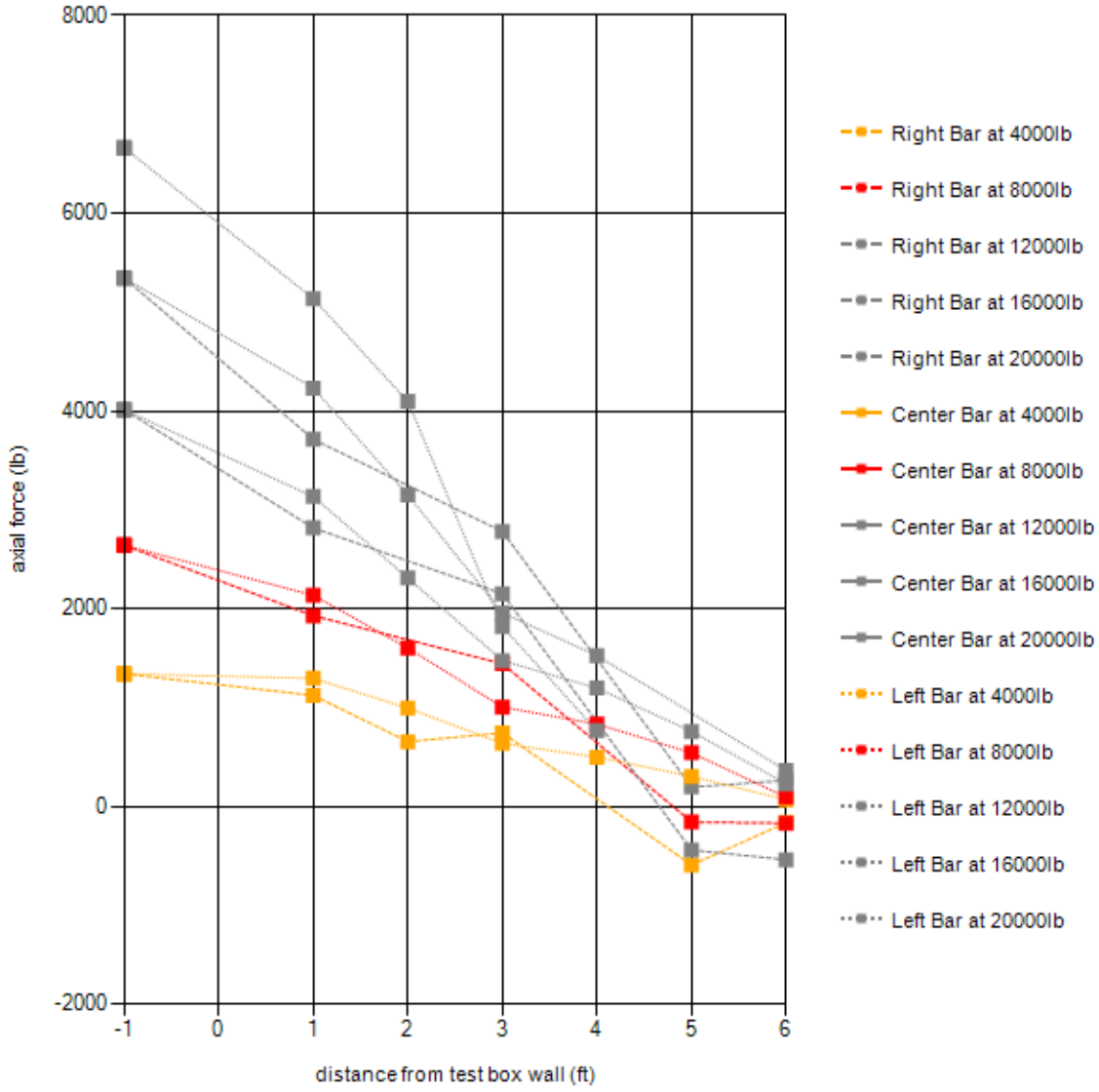
Axial Load-Distance from Test Box Wall Plot – Service Loads



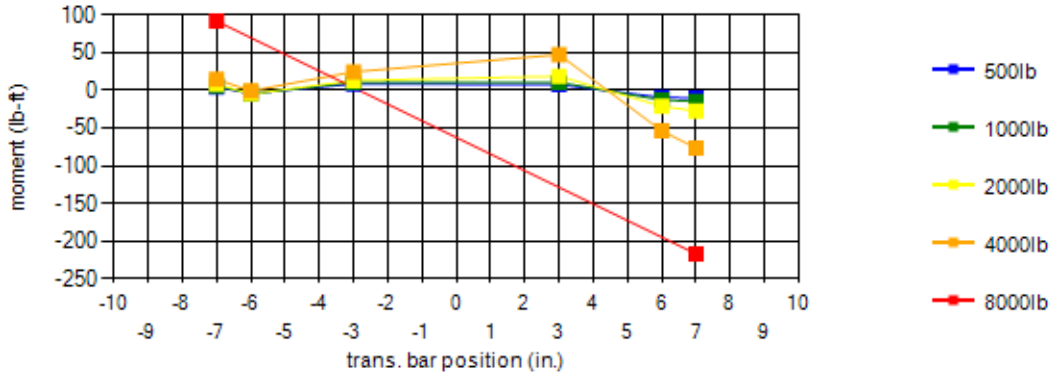
Axial Load Results

Pullout Resistance, P_r (lb)	*Axial Load, P (lb) calculated from strain data at distances from test box wall*										
	1ft_LL	*1ft_LR*	*2ft_LL*	*2ft_LR*	*3ft_LL*	*3ft_LR*	*4ft_LR*	*5ft_LL*	*5ft_LR*	*6ft_LL*	*6ft_LR*
500	412	586	97	455	208	279	187	51	110	-17	7
1000	552	750	114	594	300	371	252	50	150	-32	11
2000	783	1003	175	797	459	514	353	-77	211	-65	24
3000	929	1126	349	878	571	577	426	-295	251	-106	51
4000	1123	1296	656	994	744	637	499	-591	305	-163	68
5000	1333	1413	899	1138	925	388	85	-926	-37	-1256	-92
6000	1540	1724	1118	1299	1110	811	673	-615	429	-304	78
7000	1716	1907	1141	1414	1265	895	744	-13	483	-260	81
8000	1929	2135	ND	1603	1444	1005	833	-157	543	-170	95
9000	2149	2376	ND	1755	1629	1123	925	-277	603	-297	151
10000	2360	2614	ND	1932	1799	1233	1010	-469	661	-386	191
11000	2572	2772	ND	2097	1959	1143	786	-512	457	-898	95
12000	2817	3134	ND	2311	2151	1475	1197	-441	760	-538	228
13000	3025	3389	ND	2561	2303	1572	1281	-372	827	-485	246
14000	3252	3662	ND	3349	2461	1670	1361	-210	706	-405	274
15000	3489	3962	ND	3402	2625	1818	1447	-44	775	-90	358
16000	3713	4232	ND	3151	2780	1958	1526	197	ND	263	365
17000	3953	4513	ND	3152	2944	1952	1485	472	ND	-576	286
18000	ND	4802	ND	3608	3089	2129	1584	387	ND	-457	ND
19000	ND	5015	ND	3493	3195	2227	1624	251	ND	ND	ND
20000	ND	5136	ND	4097	ND	1819	766	ND	ND	ND	ND
21000	ND	3986	ND	3947	ND	ND	ND	ND	ND	ND	ND
22000	ND	4576	ND	3926	ND	ND	ND	ND	ND	ND	ND

Axial Load-Distance from Test Box Wall Plot – All



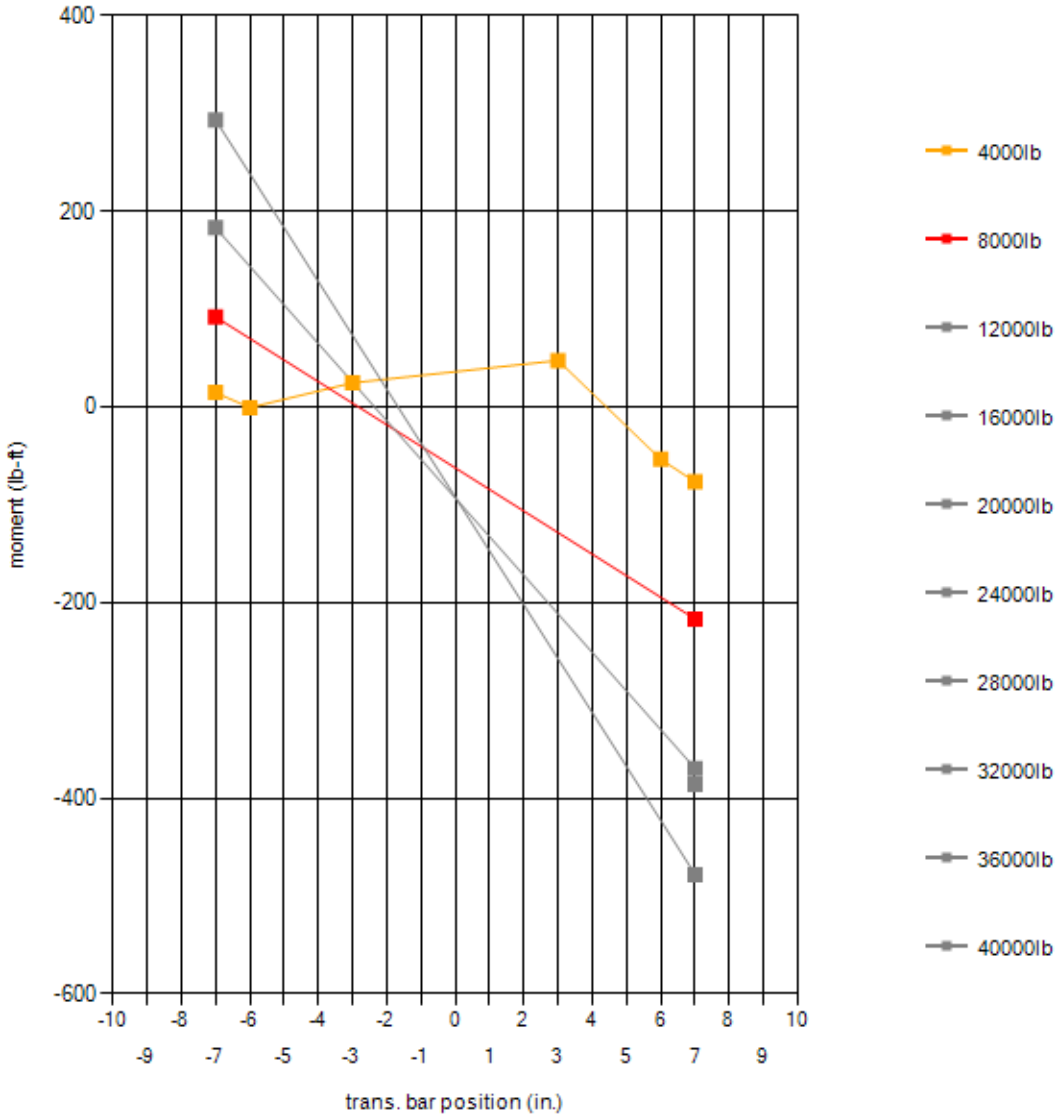
Moment Results along Transverse Bar at 1ft from Test Box Wall – Plot – Service Loads



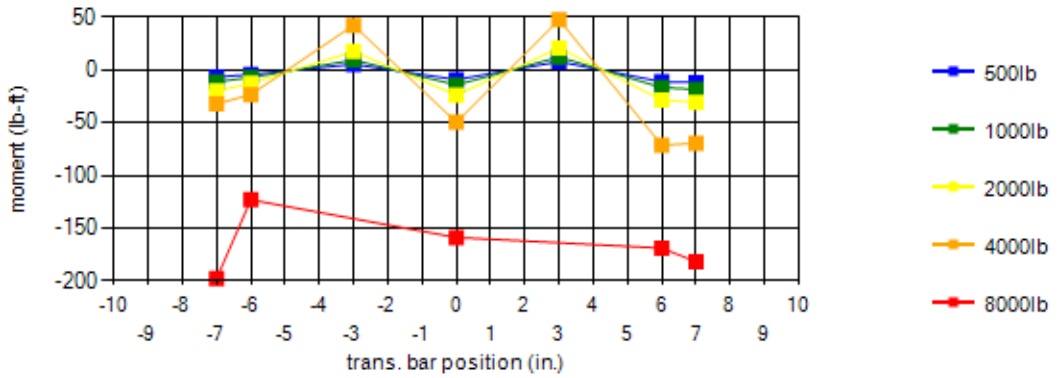
Moment Results along Transverse Bar at 1ft from Test Box Wall – Data

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_TR_C*	*1ft_TR_R*	*1ft_LR*
500	5	-4	9	8	-9	-10
1000	6	-4	11	11	-13	-14
2000	9	-4	13	19	-21	-27
3000	10	-2	17	31	-36	-49
4000	15	-1	25	48	-54	-77
5000	29	ND	ND	ND	-72	-119
6000	56	ND	ND	ND	-92	-148
7000	74	ND	ND	ND	-109	-182
8000	92	ND	ND	ND	ND	-217
9000	113	ND	ND	ND	ND	-255
10000	133	ND	ND	ND	ND	-292
11000	152	ND	ND	ND	ND	-328
12000	183	ND	ND	ND	ND	-370
13000	210	ND	ND	ND	ND	-404
14000	237	ND	ND	ND	ND	-437
15000	267	ND	ND	ND	ND	-463
16000	294	ND	ND	ND	ND	-478
17000	322	ND	ND	ND	ND	-471
18000	ND	ND	ND	ND	ND	-474
19000	ND	ND	ND	ND	ND	-467
20000	ND	ND	ND	ND	ND	-386
21000	ND	ND	ND	ND	ND	-199
22000	ND	ND	ND	ND	ND	-318

Moment Results along Transverse Bar at 1ft from Test Box Wall – Plot – All



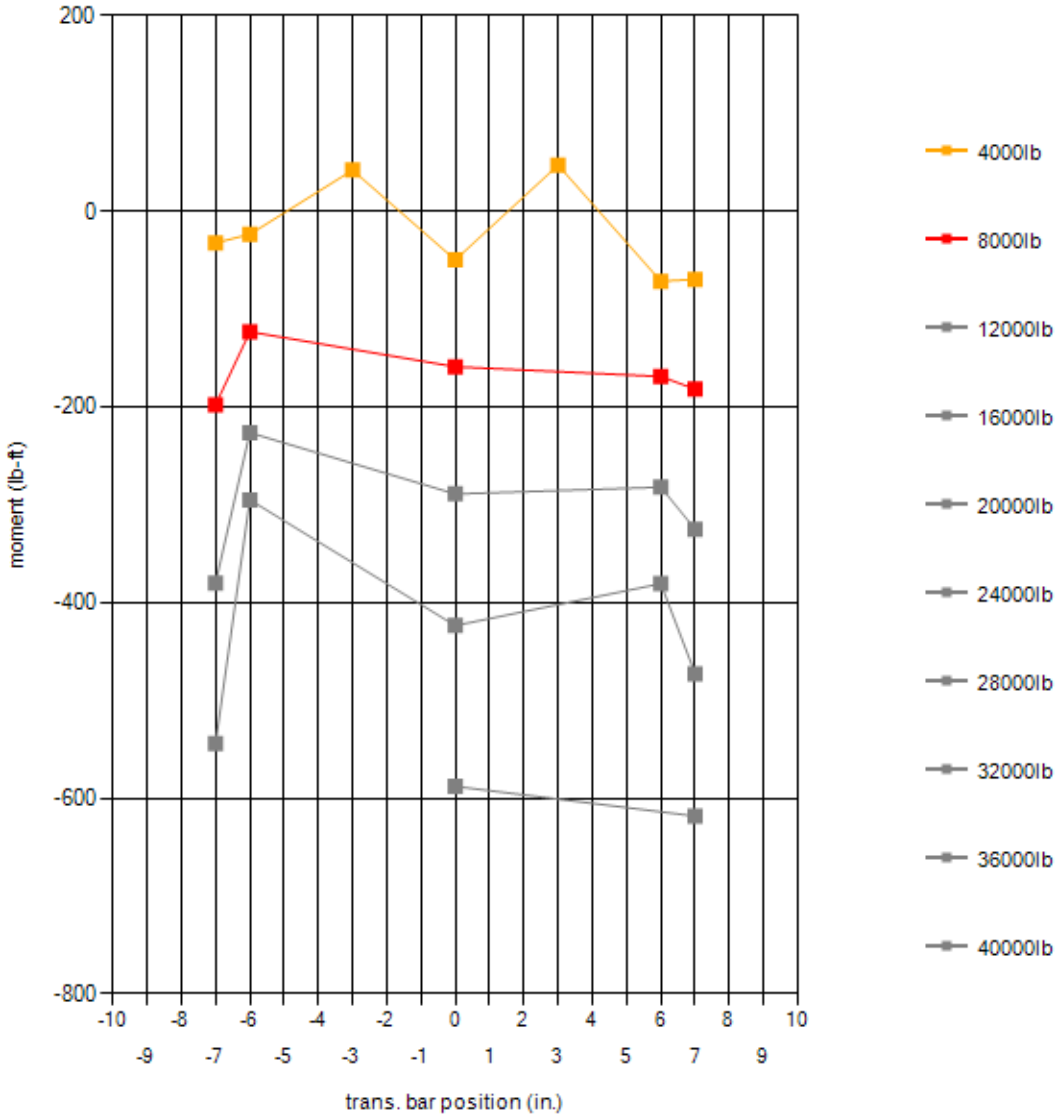
Moment Results along Transverse Bar at 3ft from Test Box Wall – Plot – Service Loads



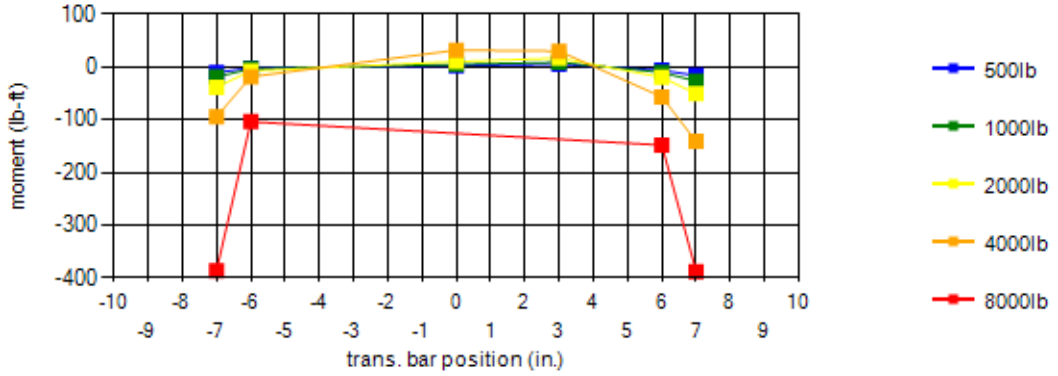
Moment Results along Transverse Bar at 3ft from Test Box Wall – Data

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	-7	-4	5	8	-11	-12
1000	-11	-7	9	12	-17	-18
2000	-20	-13	18	21	-29	-31
3000	-24	-17	27	33	-49	-49
4000	-32	-23	42	47	-71	-69
5000	-83	-115	ND	ND	-96	-84
6000	-111	-73	ND	ND	-119	-121
7000	-153	-97	ND	ND	-142	-150
8000	-198	-123	ND	ND	-169	-182
9000	-247	-151	ND	ND	-198	-217
10000	-290	-176	ND	ND	-225	-251
11000	-339	-241	ND	ND	-252	-281
12000	-380	-226	ND	ND	-282	-325
13000	-421	-248	ND	ND	-308	-361
14000	-462	-267	ND	ND	-335	-400
15000	-506	-284	ND	ND	-360	-438
16000	-544	-295	ND	ND	-381	-473
17000	-587	-318	ND	ND	-407	-517
18000	-620	-317	ND	ND	-441	-559
19000	-649	ND	ND	ND	-468	-602
20000	ND	ND	ND	ND	ND	-618

Moment Results along Transverse Bar at 3ft from Test Box Wall – Plot – All



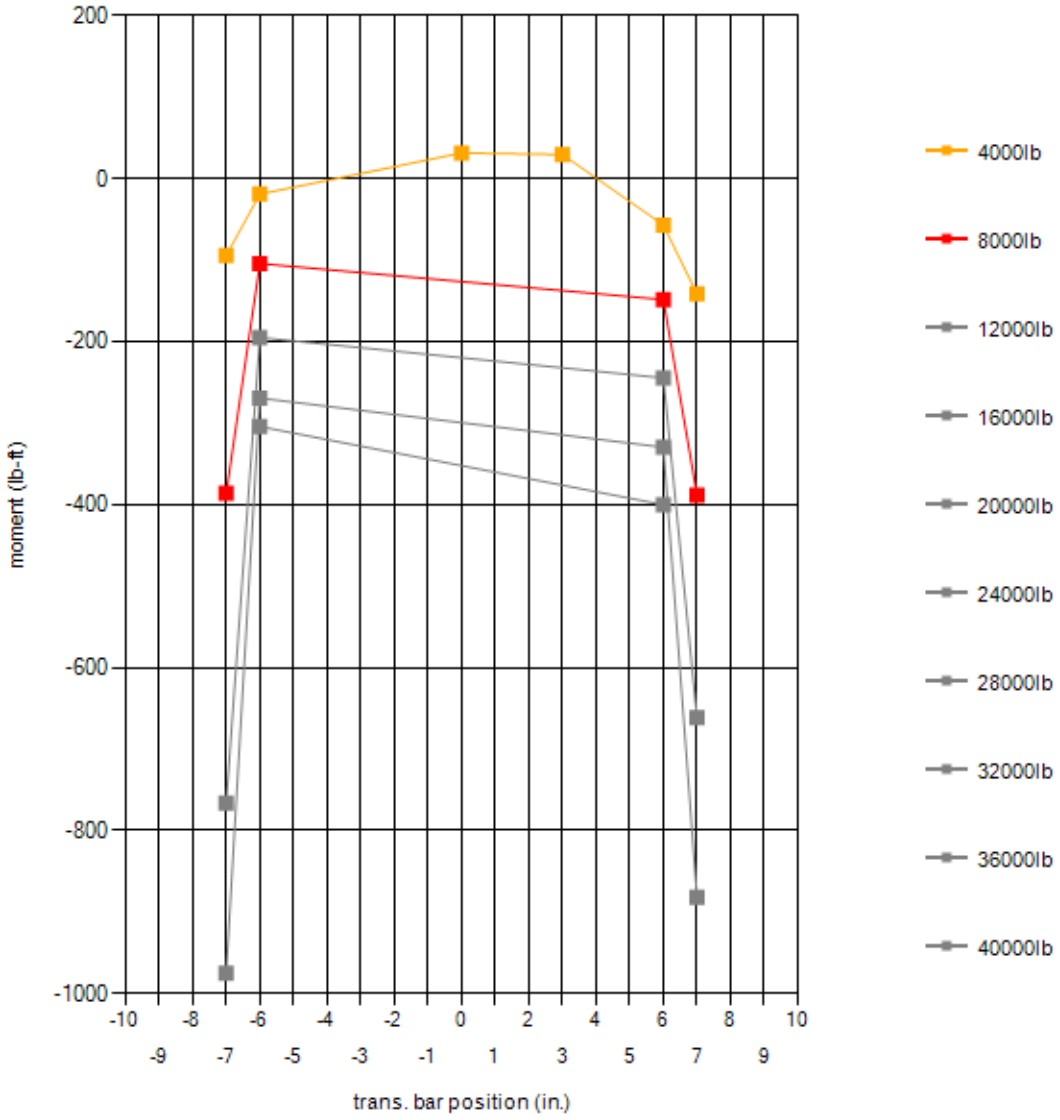
Moment Results along Transverse Bar at 6ft from Test Box Wall – Plot – Service Loads



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_TR_C*	*6ft_TR_R*	*6ft_LR*
500	-11	-2	5	-6	-16
1000	-19	-4	9	-10	-27
2000	-38	-8	17	-20	-51
3000	-60	-12	25	-38	-94
4000	-94	-19	30	-57	-141
5000	-143	-50	ND	-100	-224
6000	-258	-62	ND	-102	-261
7000	-321	-82	ND	-125	-321
8000	-386	-104	ND	-148	-388
9000	-487	-128	ND	-173	-461
10000	-576	-149	ND	-196	-523
11000	-616	-175	ND	-231	-603
12000	-766	-195	ND	-244	-661
13000	-836	-216	ND	-265	-718
14000	-903	-238	ND	-288	-773
15000	-942	-254	ND	-311	-828
16000	-975	-269	ND	-329	-881
17000	-1117	-290	ND	-359	-951
18000	-1186	-297	ND	-372	ND
19000	ND	-302	ND	-384	ND
20000	ND	-304	ND	-400	ND
21000	ND	-329	ND	-527	ND
22000	ND	-346	ND	-503	ND

Moment Results along Transverse Bar at 6ft from Test Box Wall – Plot – All

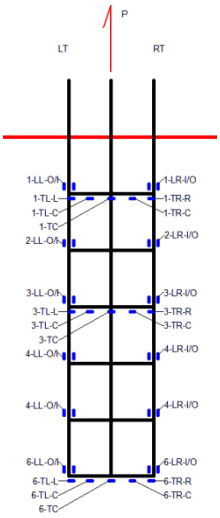


STRAIN GAGE REPORT FOR MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/6/2011 9:12:00 AM
Test Identification:	TS25.04-G-9x12-W20xW11-L6-Z12-T
Test Facility:	12'x12'x4' MSE Test Box

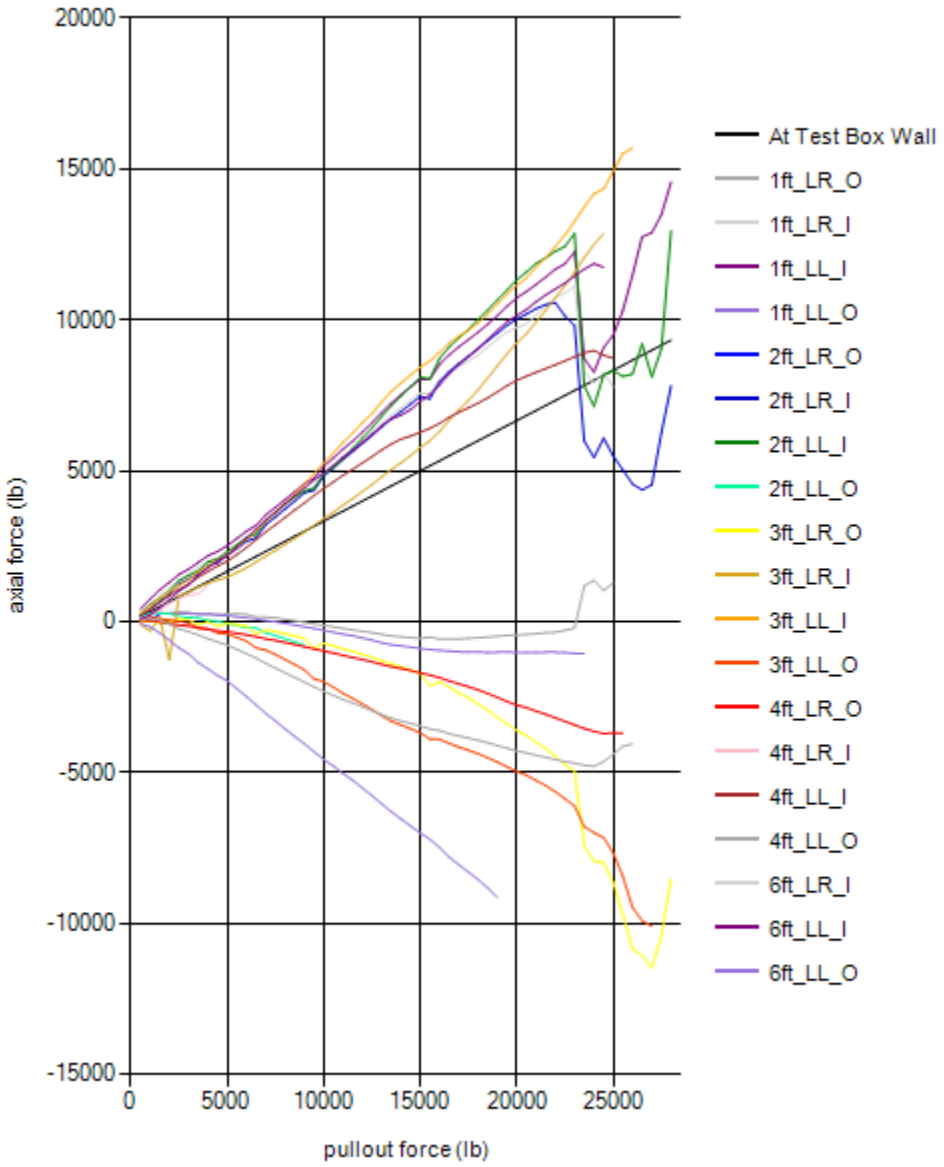
Sketch



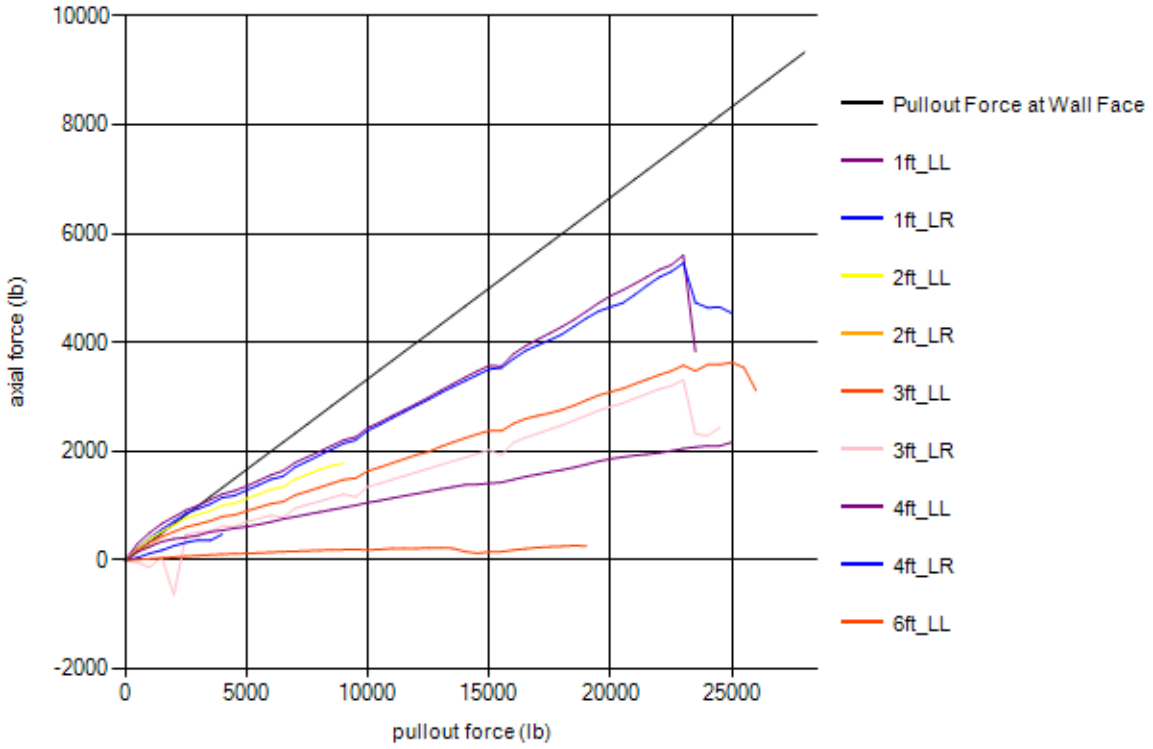
MSE Reinforcement

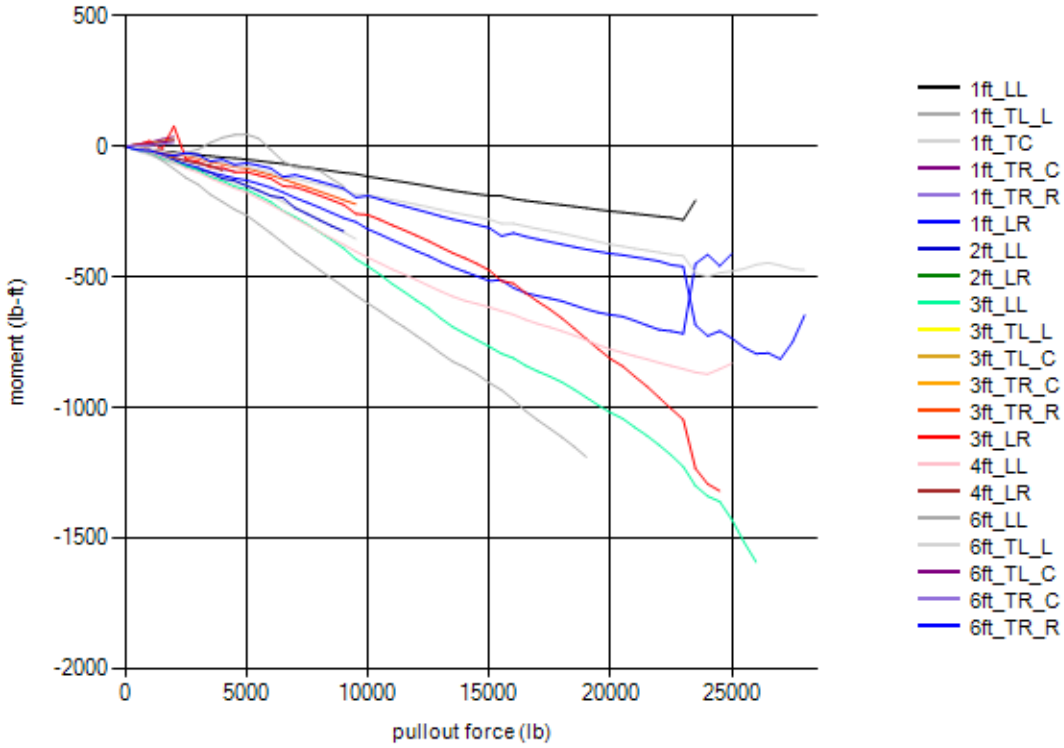
Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.5
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

Axial Load-Pullout Load Data by Gage

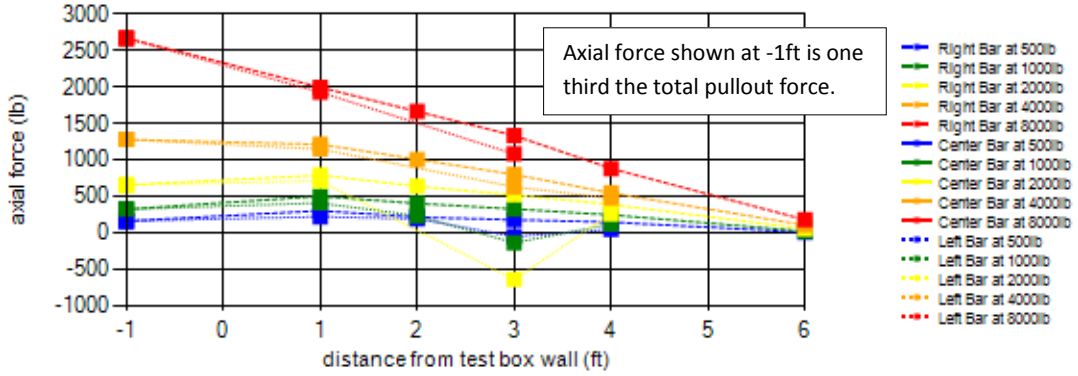


Axial Load-Pullout Load And Moment-Pullout Load Data by Location





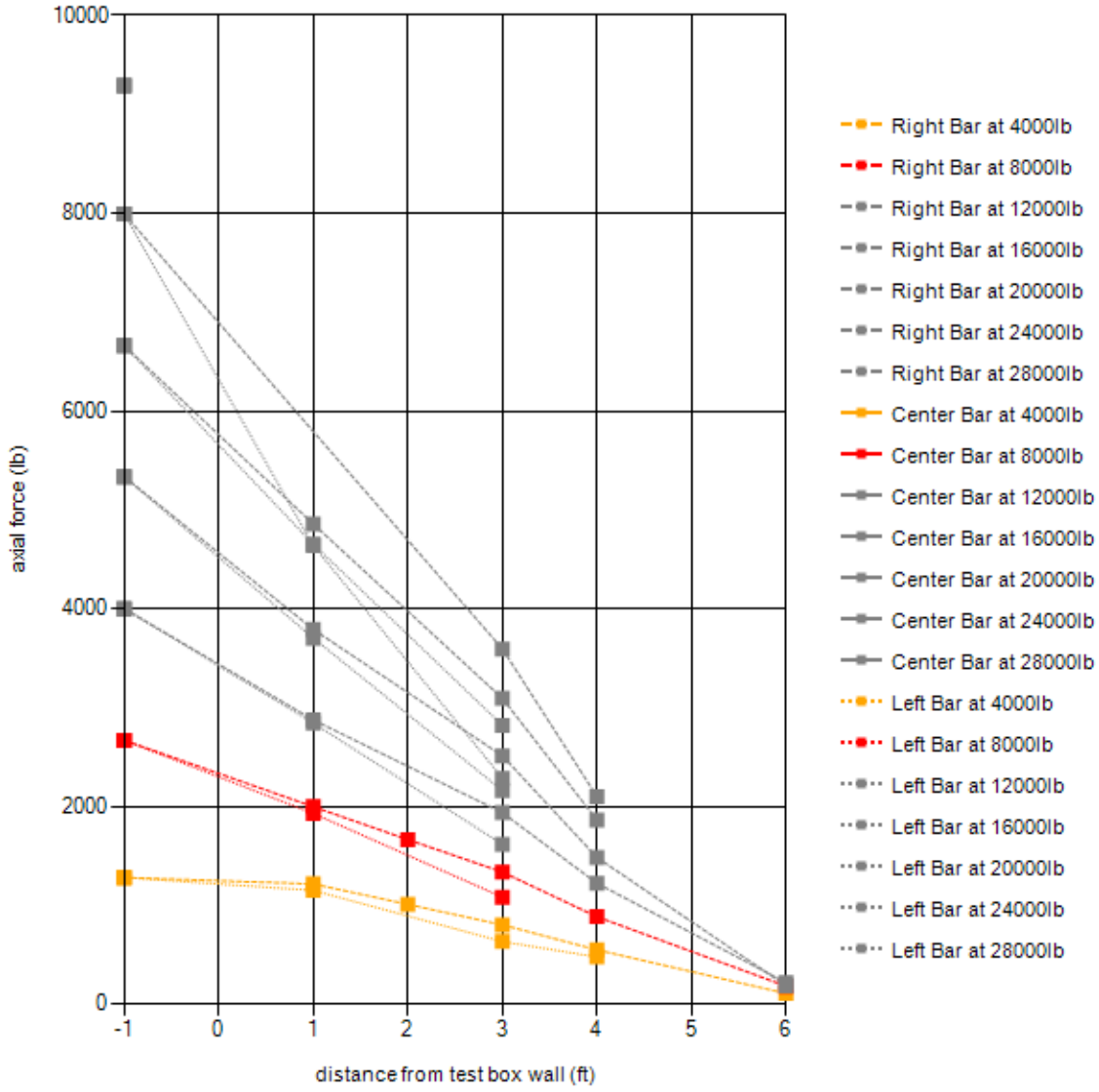
Axial Load-Distance from Test Box Wall Plot – Service Loads



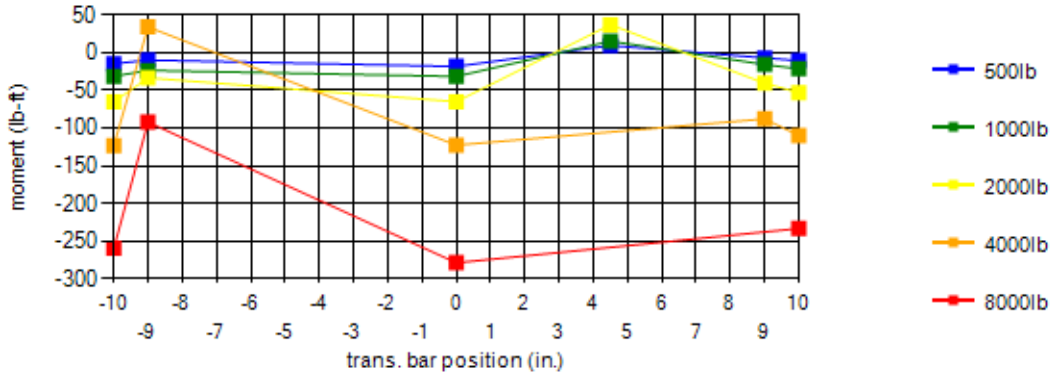
Axial Load Results

Pullout Resistance, P_r (lb)	*Axial Load, P (lb) calculated from strain data at distances from test box wall*								
	1ft_LL	*1ft_LR*	*2ft_LL*	*2ft_LR*	*3ft_LL*	*3ft_LR*	*4ft_LL*	*4ft_LR*	*6ft_LL*
500	307	225	218	195	183	-46	150	49	12
1000	505	413	406	236	331	-132	250	124	25
2000	794	713	643	ND	524	-637	392	264	59
3000	1004	946	838	ND	665	521	456	370	84
4000	1216	1151	1010	ND	803	634	550	478	109
5000	1362	1286	1132	ND	901	708	614	ND	125
6000	1565	1487	1301	ND	1040	823	701	ND	145
7000	1794	1712	1490	ND	1195	956	798	ND	165
8000	1998	1930	1665	ND	1337	1083	885	ND	183
9000	2207	2148	1780	ND	1482	1212	968	ND	193
10000	2436	2385	ND	ND	1641	1351	1059	ND	188
11000	2652	2613	ND	ND	1786	1484	1140	ND	215
12000	2876	2844	ND	ND	1937	1617	1223	ND	218
13000	3118	3075	ND	ND	2087	1755	1308	ND	229
14000	3360	3295	ND	ND	2245	1886	1385	ND	158
15000	3577	3510	ND	ND	2379	2025	1412	ND	150
16000	3791	3703	ND	ND	2512	2161	1484	ND	186
17000	4057	3950	ND	ND	2656	2329	1579	ND	233
18000	4292	4153	ND	ND	2767	2483	1659	ND	256
19000	4569	4445	ND	ND	2940	2658	1761	ND	261
20000	4856	4653	ND	ND	3093	2821	1862	ND	ND
21000	5081	4879	ND	ND	3240	2973	1925	ND	ND
22000	5336	5198	ND	ND	3404	3144	1973	ND	ND
23000	5604	5459	ND	ND	3580	3313	2050	ND	ND
24000	ND	4640	ND	ND	3593	2286	2100	ND	ND
25000	ND	4539	ND	ND	3636	ND	2169	ND	ND
26000	ND	ND	ND	ND	3116	ND	ND	ND	ND
27000	ND	ND	ND	ND	ND	ND	ND	ND	ND
28000	ND	ND	ND	ND	ND	ND	ND	ND	ND

Axial Load-Distance from Test Box Wall Plot – All



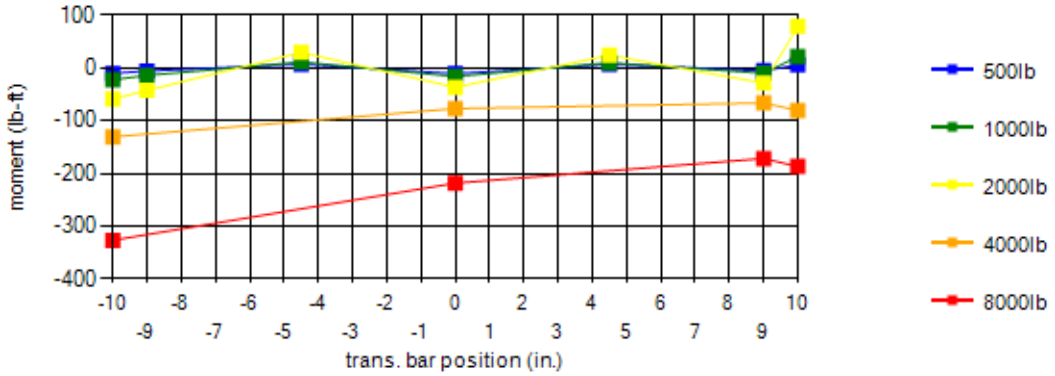
Moment Results along Transverse Bar at 1ft from Test Box Wall – Plot – Service Loads



Moment Results along Transverse Bar at 1ft from Test Box Wall – Data

Pullout Resistance, P, (lb)	*Moment (lb-ft) calculated from strain data at distances from test box wall*					
	1ft_LL	*1ft_TL_L*	*1ft_TC*	*1ft_TR_C*	*1ft_TR_R*	*1ft_LR*
500	-14	-10	-18	10	-7	-10
1000	-31	-23	-31	15	-16	-21
2000	-65	-33	-65	37	-40	-53
3000	-93	-11	-88	ND	-64	-80
4000	-123	34	-122	ND	-88	-110
5000	-146	47	-148	ND	ND	-129
6000	-182	-12	-187	ND	ND	-157
7000	-222	-80	-233	ND	ND	-196
8000	-259	-92	-278	ND	ND	-233
9000	-300	-152	-328	ND	ND	-273
10000	-344	ND	ND	ND	ND	-316
11000	-388	ND	ND	ND	ND	-358
12000	-431	ND	ND	ND	ND	-399
13000	-482	ND	ND	ND	ND	-441
14000	-526	ND	ND	ND	ND	-479
15000	-564	ND	ND	ND	ND	-514
16000	-599	ND	ND	ND	ND	-541
17000	-639	ND	ND	ND	ND	-572
18000	-670	ND	ND	ND	ND	-592
19000	-705	ND	ND	ND	ND	-623
20000	-742	ND	ND	ND	ND	-644
21000	-771	ND	ND	ND	ND	-667
22000	-802	ND	ND	ND	ND	-701
23000	-841	ND	ND	ND	ND	-716
24000	ND	ND	ND	ND	ND	-413
25000	ND	ND	ND	ND	ND	-411

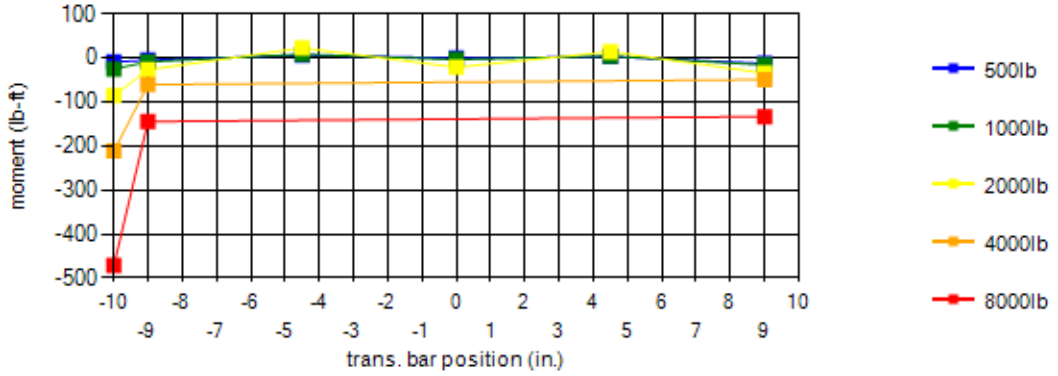
Moment Results along Transverse Bar at 3ft from Test Box Wall – Plot – Service Loads



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	-11	-6	7	7	-5	6
1000	-23	-14	11	10	-10	22
2000	-59	-43	29	24	-29	78
3000	-90	ND	ND	ND	-44	-57
4000	-131	ND	ND	ND	-67	-81
5000	-165	ND	ND	ND	-83	-97
6000	-212	ND	ND	ND	-109	-122
7000	-270	ND	ND	ND	-141	-155
8000	-327	ND	ND	ND	-172	-187
9000	-389	ND	ND	ND	-205	-223
10000	-458	ND	ND	ND	ND	-262
11000	-526	ND	ND	ND	ND	-301
12000	-589	ND	ND	ND	ND	-341
13000	-657	ND	ND	ND	ND	-385
14000	-716	ND	ND	ND	ND	-427
15000	-765	ND	ND	ND	ND	-474
16000	-810	ND	ND	ND	ND	-524
17000	-861	ND	ND	ND	ND	-593
18000	-902	ND	ND	ND	ND	-658
19000	-960	ND	ND	ND	ND	-736
20000	-1018	ND	ND	ND	ND	-812
21000	-1075	ND	ND	ND	ND	-880
22000	-1142	ND	ND	ND	ND	-960
23000	-1225	ND	ND	ND	ND	-1045
24000	-1338	ND	ND	ND	ND	-1291
25000	-1428	ND	ND	ND	ND	ND
26000	-1590	ND	ND	ND	ND	ND

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*
500	-9	-4	7	3	-12
1000	-25	-9	9	5	-16
2000	-85	-27	23	15	-34
3000	-145	-39	ND	ND	-31
4000	-211	-60	ND	ND	-49
5000	-263	-77	ND	ND	-63
6000	-332	-99	ND	ND	-83
7000	-405	-123	ND	ND	-108
8000	-472	-144	ND	ND	-133
9000	-537	-165	ND	ND	-160
10000	-600	-186	ND	ND	-189
11000	-663	-204	ND	ND	-216
12000	-724	-222	ND	ND	-241
13000	-791	-242	ND	ND	-267
14000	-845	-261	ND	ND	-289
15000	-904	-278	ND	ND	-311
16000	-969	-294	ND	ND	-331
17000	-1047	-315	ND	ND	-355
18000	-1112	-332	ND	ND	-374
19000	-1189	-353	ND	ND	-394
20000	ND	-375	ND	ND	-409
21000	ND	-390	ND	ND	-423
22000	ND	-405	ND	ND	-438
23000	ND	-418	ND	ND	-459
24000	ND	-498	ND	ND	-725
25000	ND	-477	ND	ND	-733
26000	ND	-452	ND	ND	-793
27000	ND	-455	ND	ND	-813
28000	ND	-472	ND	ND	-646

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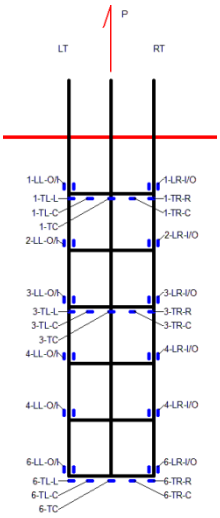
STRAIN GAGE REPORT FOR MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/17/2011 12:26:00 PM
Test Identification:	TS26.01-G-6x12-W20xW11-L6-Z20-T
Test Facility:	12'x12'x4' MSE Test Box

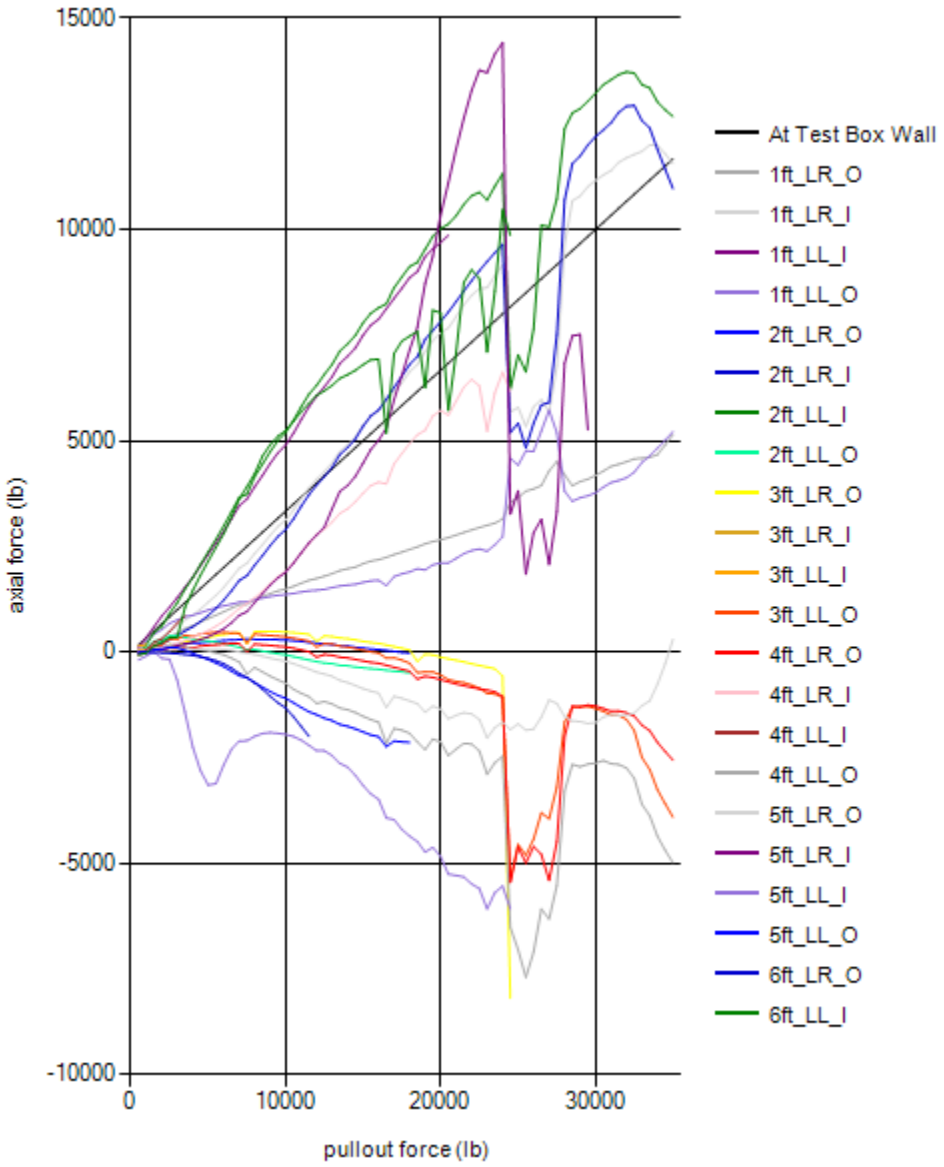
Sketch



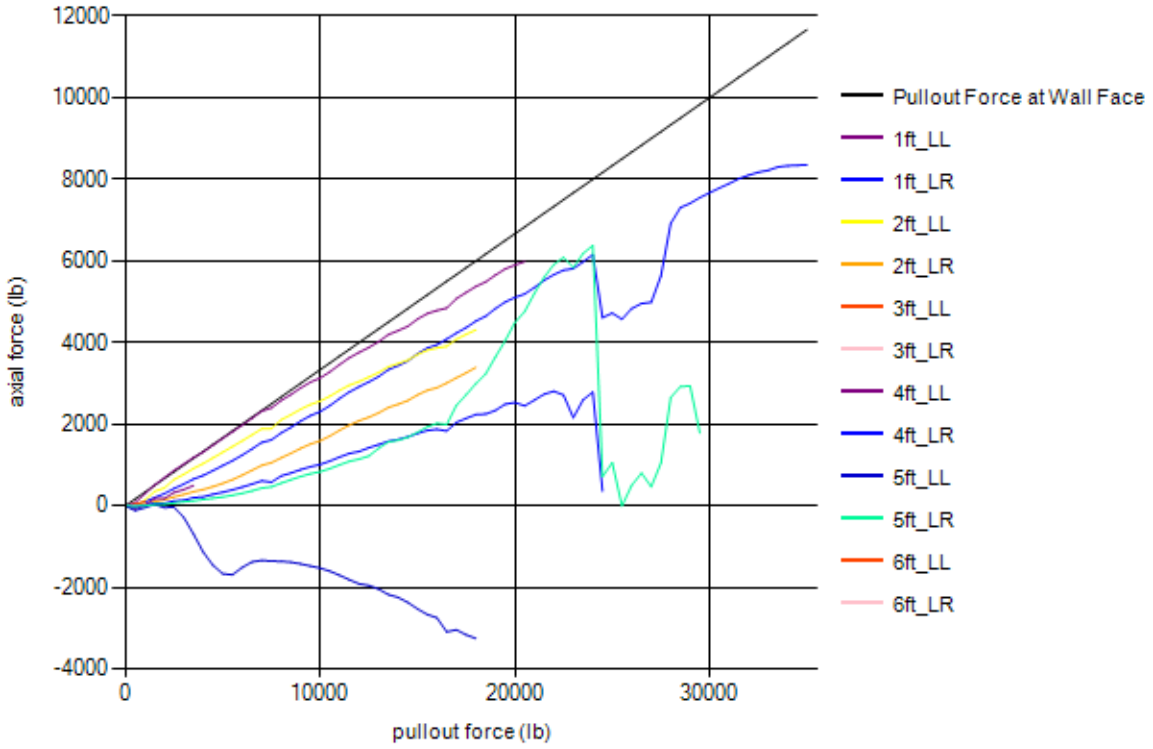
MSE Reinforcement

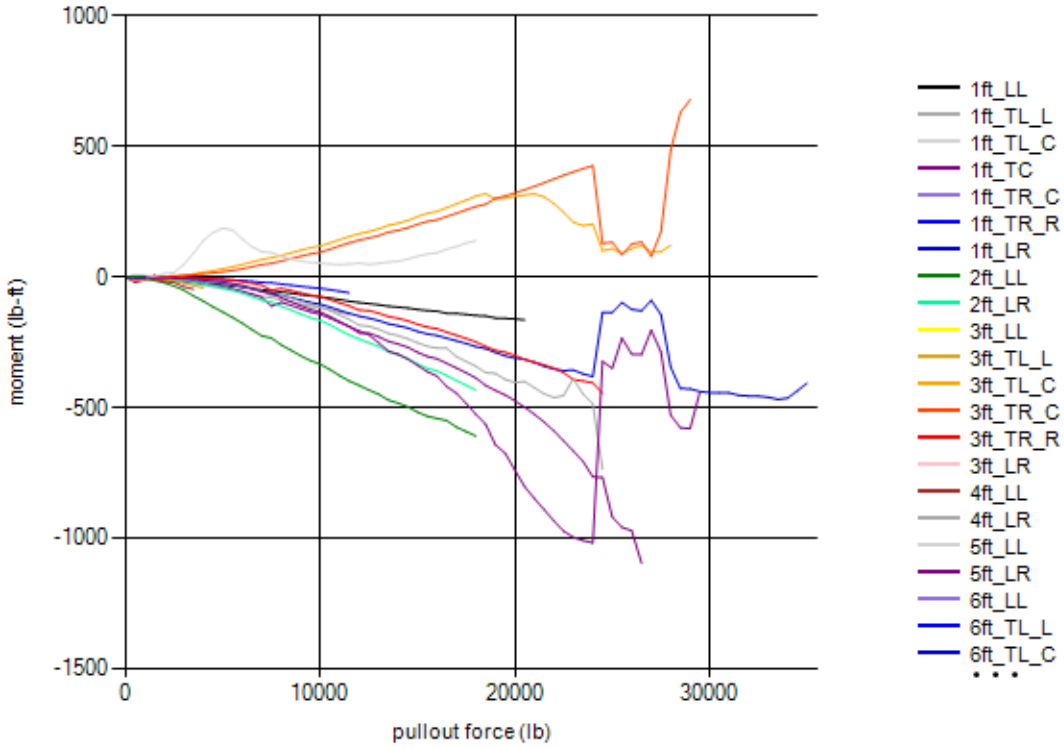
Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	12	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.5
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	6

Axial Load-Pullout Load Data by Gage

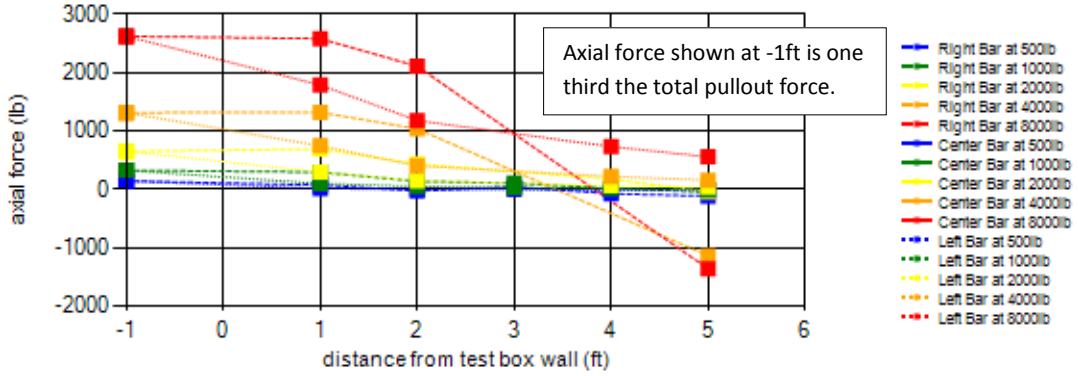


Axial Load-Pullout Load And Moment-Pullout Load Data by Location





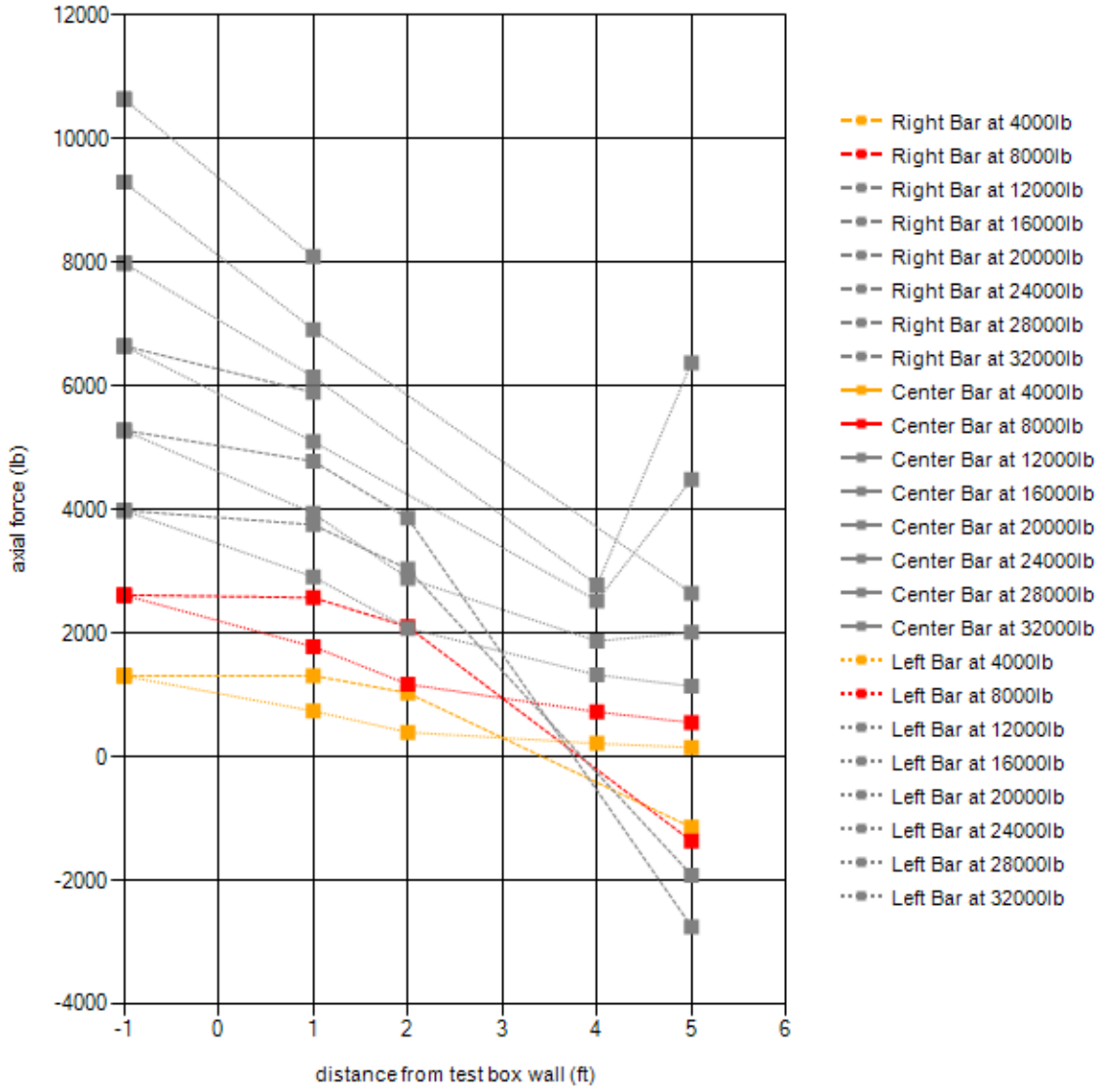
Axial Load-Distance from Test Box Wall Plot – Service Loads



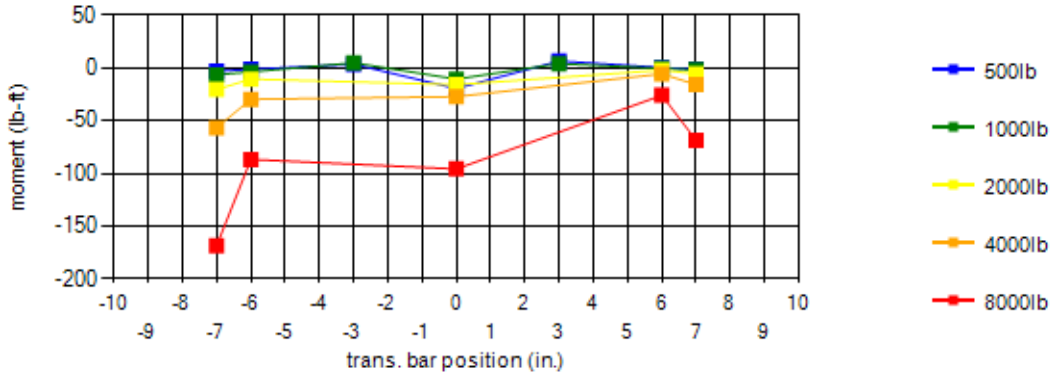
Axial Load Results

Pullout Resistance, P_r (lb)	*Axial Load, P (lb) calculated from strain data at distances from test box wall*									
	1ft_LL	*1ft_LR*	*2ft_LL*	*2ft_LR*	*3ft_LL*	*3ft_LR*	*4ft_LL*	*4ft_LR*	*5ft_LL*	*5ft_LR*
500	75	15	-29	2	43	-4	-75	-22	-114	-8
1000	293	98	137	48	105	30	16	12	-45	2
2000	688	297	436	146	ND	ND	175	62	-41	37
3000	1022	532	772	277	ND	ND	395	134	-285	101
4000	1318	744	1036	400	ND	ND	ND	220	-1137	156
5000	1652	986	1314	550	ND	ND	ND	331	-1664	218
6000	1974	1241	1591	749	ND	ND	ND	458	-1510	305
7000	2318	1551	1885	992	ND	ND	ND	612	-1337	434
8000	2580	1786	2107	1178	ND	ND	ND	731	-1360	556
9000	2889	2074	2366	1407	ND	ND	ND	885	-1423	718
10000	3131	2308	2566	1592	ND	ND	ND	1013	-1525	834
11000	3461	2629	2827	1850	ND	ND	ND	1194	-1701	1003
12000	3759	2916	3042	2083	ND	ND	ND	1329	-1911	1146
13000	4019	3164	3265	2274	ND	ND	ND	1497	-2038	1406
14000	4291	3436	3482	2486	ND	ND	ND	1624	-2243	1608
15000	4574	3727	3708	2717	ND	ND	ND	1774	-2527	1802
16000	4785	3943	3867	2893	ND	ND	ND	1876	-2745	2018
17000	5077	4231	4084	3139	ND	ND	ND	2044	-3038	2462
18000	5375	4528	4313	3390	ND	ND	ND	2238	-3252	2995
19000	5650	4833	ND	ND	ND	ND	ND	2336	ND	3646
20000	5900	5103	ND	ND	ND	ND	ND	2531	ND	4492
21000	ND	5350	ND	ND	ND	ND	ND	2590	ND	5203
22000	ND	5664	ND	ND	ND	ND	ND	2808	ND	5910
23000	ND	5809	ND	ND	ND	ND	ND	2160	ND	5837
24000	ND	6154	ND	ND	ND	ND	ND	2783	ND	6379
25000	ND	4720	ND	ND	ND	ND	ND	ND	ND	1057
26000	ND	4832	ND	ND	ND	ND	ND	ND	ND	501
27000	ND	4985	ND	ND	ND	ND	ND	ND	ND	466
28000	ND	6917	ND	ND	ND	ND	ND	ND	ND	2652
29000	ND	7412	ND	ND	ND	ND	ND	ND	ND	2935
30000	ND	7670	ND	ND	ND	ND	ND	ND	ND	ND
31000	ND	7894	ND	ND	ND	ND	ND	ND	ND	ND
32000	ND	8098	ND	ND	ND	ND	ND	ND	ND	ND
33000	ND	8217	ND	ND	ND	ND	ND	ND	ND	ND
34000	ND	8332	ND	ND	ND	ND	ND	ND	ND	ND
35000	ND	8353	ND	ND	ND	ND	ND	ND	ND	ND

Axial Load-Distance from Test Box Wall Plot – All



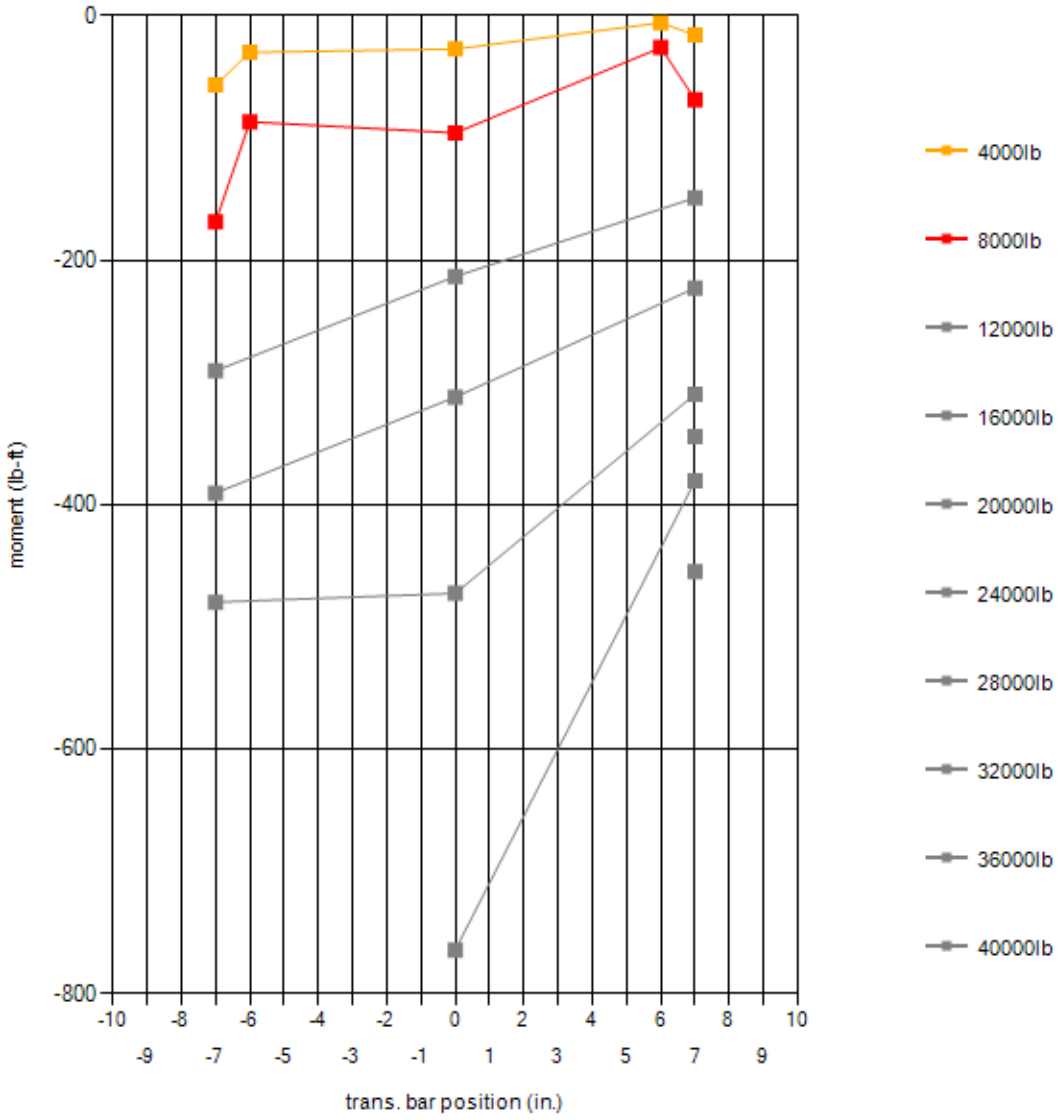
Moment Results along Transverse Bar at 1ft from Test Box Wall – Plot – Service Loads



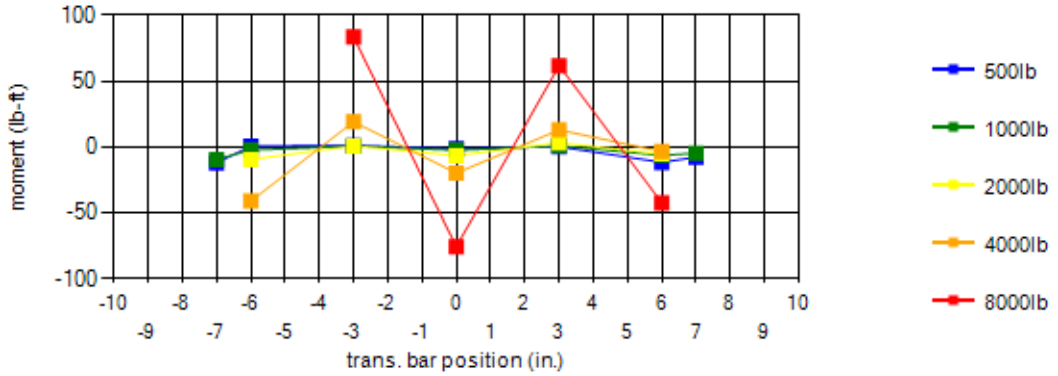
Moment Results along Transverse Bar at 1ft from Test Box Wall – Data

Pullout Resistance, P, (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	-3	-1	3	-20	6	0	-1
1000	-7	-4	5	-11	4	0	-2
2000	-20	-11	ND	-16	ND	-2	-6
3000	-34	-18	ND	-22	ND	-4	-11
4000	-57	-30	ND	-27	ND	-6	-16
5000	-83	-43	ND	-35	ND	-9	-24
6000	-112	-58	ND	-53	ND	-13	-37
7000	-144	-74	ND	-77	ND	-20	-54
8000	-169	-87	ND	-96	ND	-26	-69
9000	-199	-103	ND	-121	ND	-35	-87
10000	-224	-116	ND	-142	ND	-42	-103
11000	-258	-134	ND	-173	ND	-54	-127
12000	-290	ND	ND	-213	ND	ND	-149
13000	-315	ND	ND	-227	ND	ND	-166
14000	-342	ND	ND	-256	ND	ND	-185
15000	-370	ND	ND	-287	ND	ND	-207
16000	-390	ND	ND	-312	ND	ND	-223
17000	-416	ND	ND	-347	ND	ND	-243
18000	-440	ND	ND	-386	ND	ND	-266
19000	-469	ND	ND	-434	ND	ND	-288
20000	-480	ND	ND	-472	ND	ND	-309
21000	ND	ND	ND	-525	ND	ND	-327
22000	ND	ND	ND	-588	ND	ND	-351
23000	ND	ND	ND	-665	ND	ND	-355
24000	ND	ND	ND	-764	ND	ND	-380
25000	ND	ND	ND	-918	ND	ND	-135
26000	ND	ND	ND	-970	ND	ND	-123
27000	ND	ND	ND	ND	ND	ND	-88
28000	ND	ND	ND	ND	ND	ND	-344
29000	ND	ND	ND	ND	ND	ND	-427
30000	ND	ND	ND	ND	ND	ND	-441
31000	ND	ND	ND	ND	ND	ND	-443
32000	ND	ND	ND	ND	ND	ND	-455
33000	ND	ND	ND	ND	ND	ND	-459
34000	ND	ND	ND	ND	ND	ND	-463
35000	ND	ND	ND	ND	ND	ND	-405

Moment Results along Transverse Bar at 1ft from Test Box Wall – Plot – All



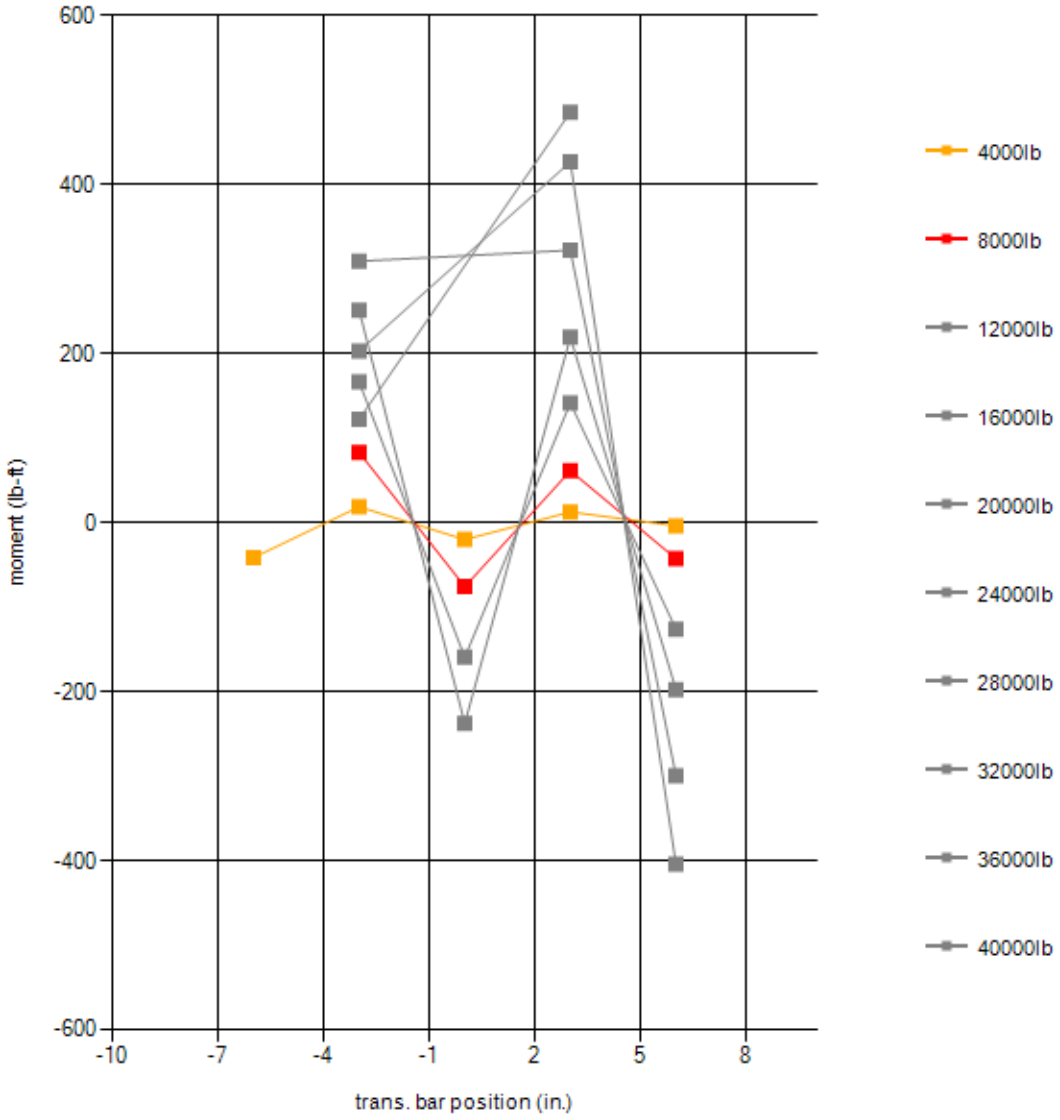
Moment Results along Transverse Bar at 3ft from Test Box Wall – Plot – Service Loads



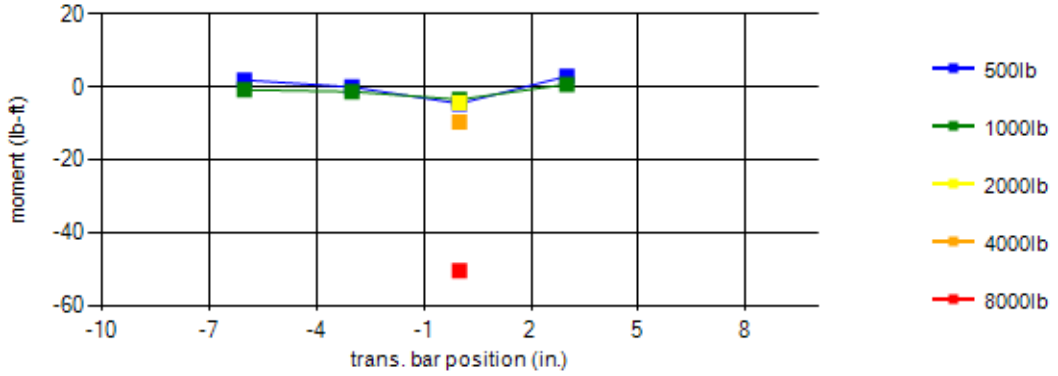
Moment Results along Transverse Bar at 3ft from Test Box Wall – Data

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	-12	1	1	0	-12	-8
1000	-9	-2	1	1	-6	-5
2000	ND	-9	1	3	-5	ND
3000	ND	-21	5	7	-2	ND
4000	ND	-41	19	13	-3	ND
5000	ND	ND	32	21	-8	ND
6000	ND	ND	48	32	-16	ND
7000	ND	ND	68	48	-30	ND
8000	ND	ND	83	62	-42	ND
9000	ND	ND	103	80	-60	ND
10000	ND	ND	120	96	-75	ND
11000	ND	ND	144	120	-98	ND
12000	ND	ND	167	142	-126	ND
13000	ND	ND	185	159	-137	ND
14000	ND	ND	206	179	-157	ND
15000	ND	ND	232	203	-180	ND
16000	ND	ND	252	220	-197	ND
17000	ND	ND	281	245	-222	ND
18000	ND	ND	311	271	-248	ND
19000	ND	ND	300	301	-280	ND
20000	ND	ND	310	323	-299	ND
21000	ND	ND	319	348	-325	ND
22000	ND	ND	282	376	-348	ND
23000	ND	ND	210	403	-392	ND
24000	ND	ND	203	427	-404	ND
25000	ND	ND	110	134	ND	ND
26000	ND	ND	109	127	ND	ND
27000	ND	ND	97	80	ND	ND
28000	ND	ND	123	486	ND	ND
29000	ND	ND	ND	680	ND	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_TL_L	*6ft_TL_C*	*6ft_TR_C*
500	2	0	3
1000	-1	-1	1
2000	ND	ND	ND
3000	ND	ND	ND
4000	ND	ND	ND
5000	ND	ND	ND
6000	ND	ND	ND
7000	ND	ND	ND
8000	ND	ND	ND
9000	ND	ND	ND
10000	ND	ND	ND
11000	ND	ND	ND
12000	ND	ND	ND
13000	ND	ND	ND
14000	ND	ND	ND
15000	ND	ND	ND
16000	ND	ND	ND
17000	ND	ND	ND
18000	ND	ND	ND

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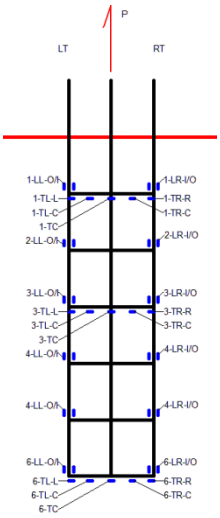
STRAIN GAGE REPORT FOR MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/17/2011 3:02:00 PM
Test Identification:	TS26.02-G-9x12-W20xW11-L6-Z20-T
Test Facility:	12'x12'x4' MSE Test Box

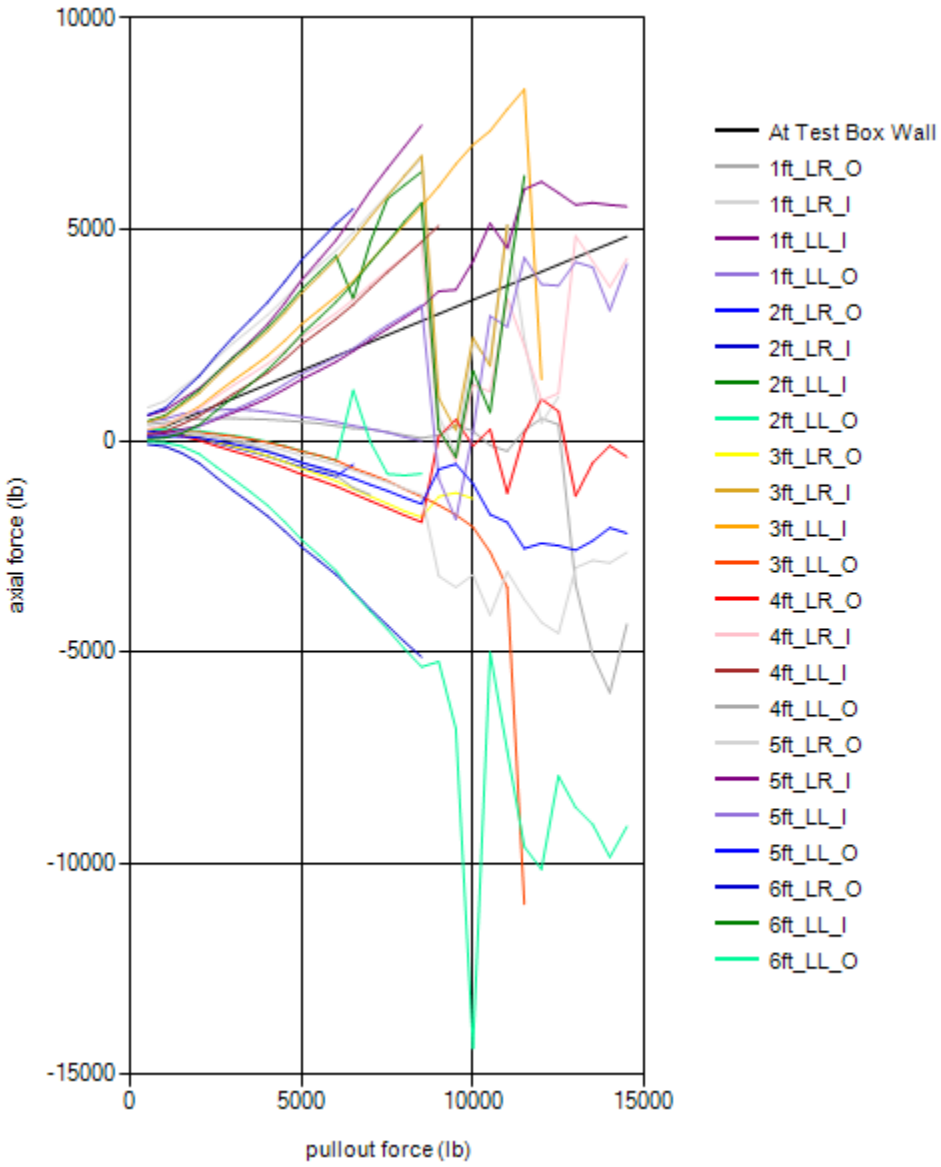
Sketch



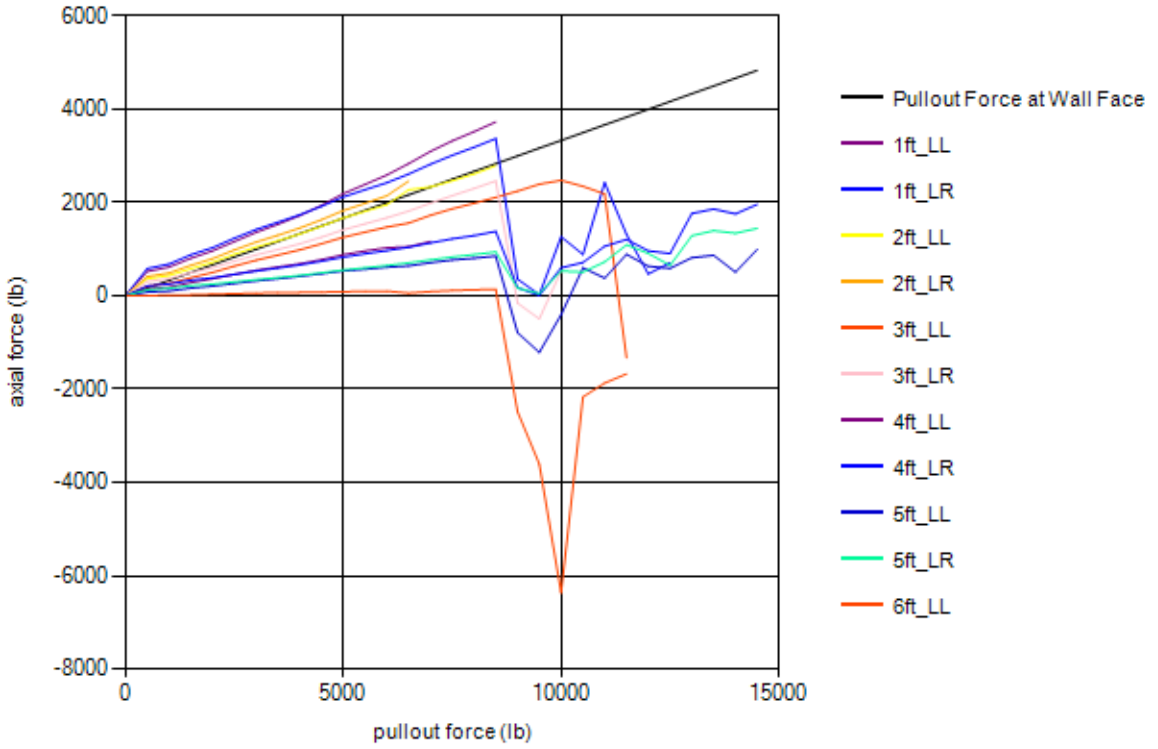
MSE Reinforcement

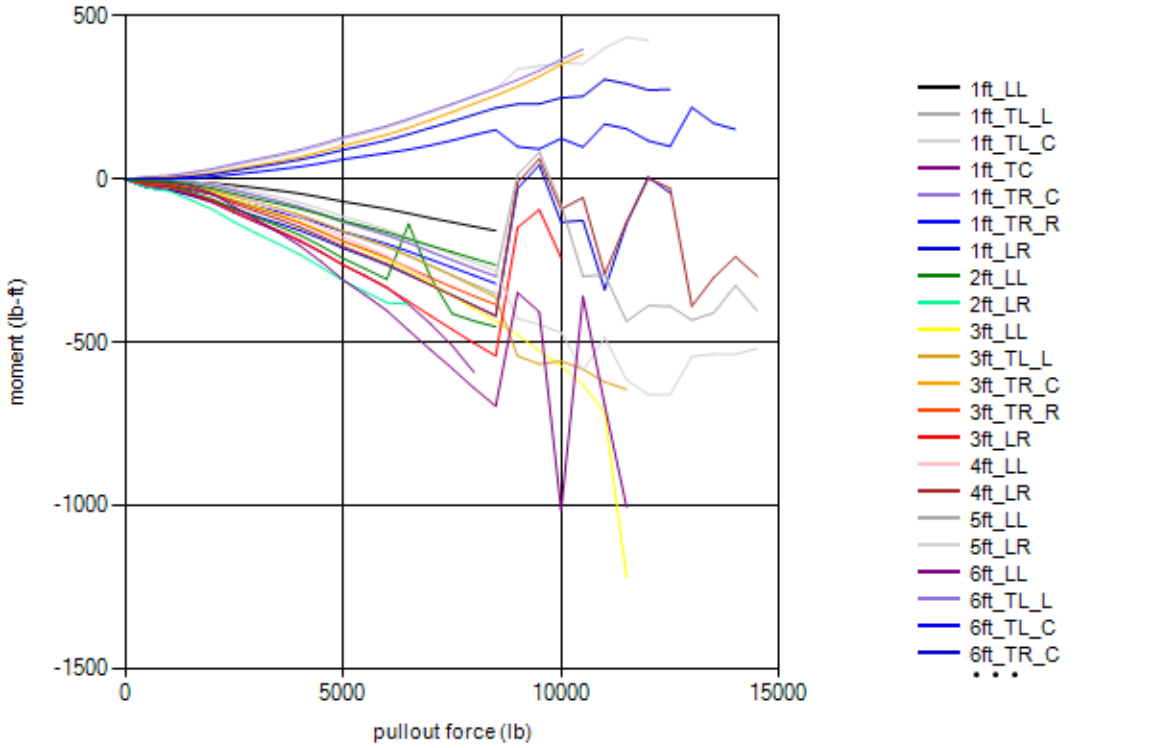
Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.5
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

Axial Load-Pullout Load Data by Gage

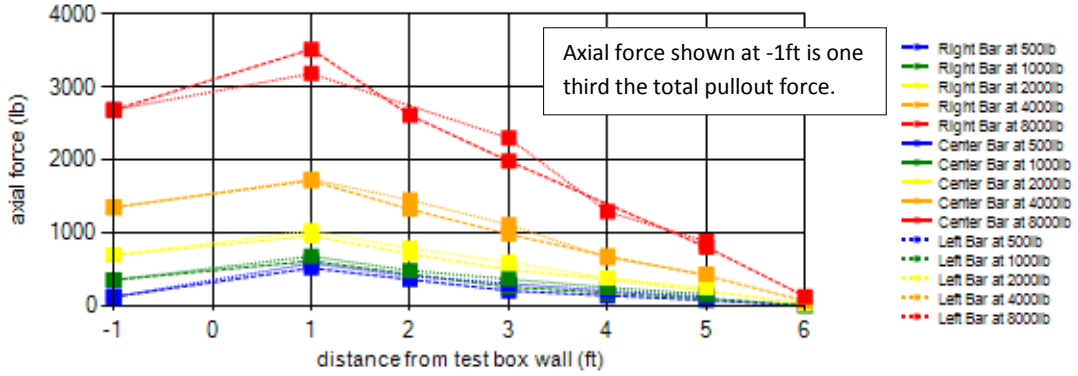


Axial Load-Pullout Load And Moment-Pullout Load Data by Location





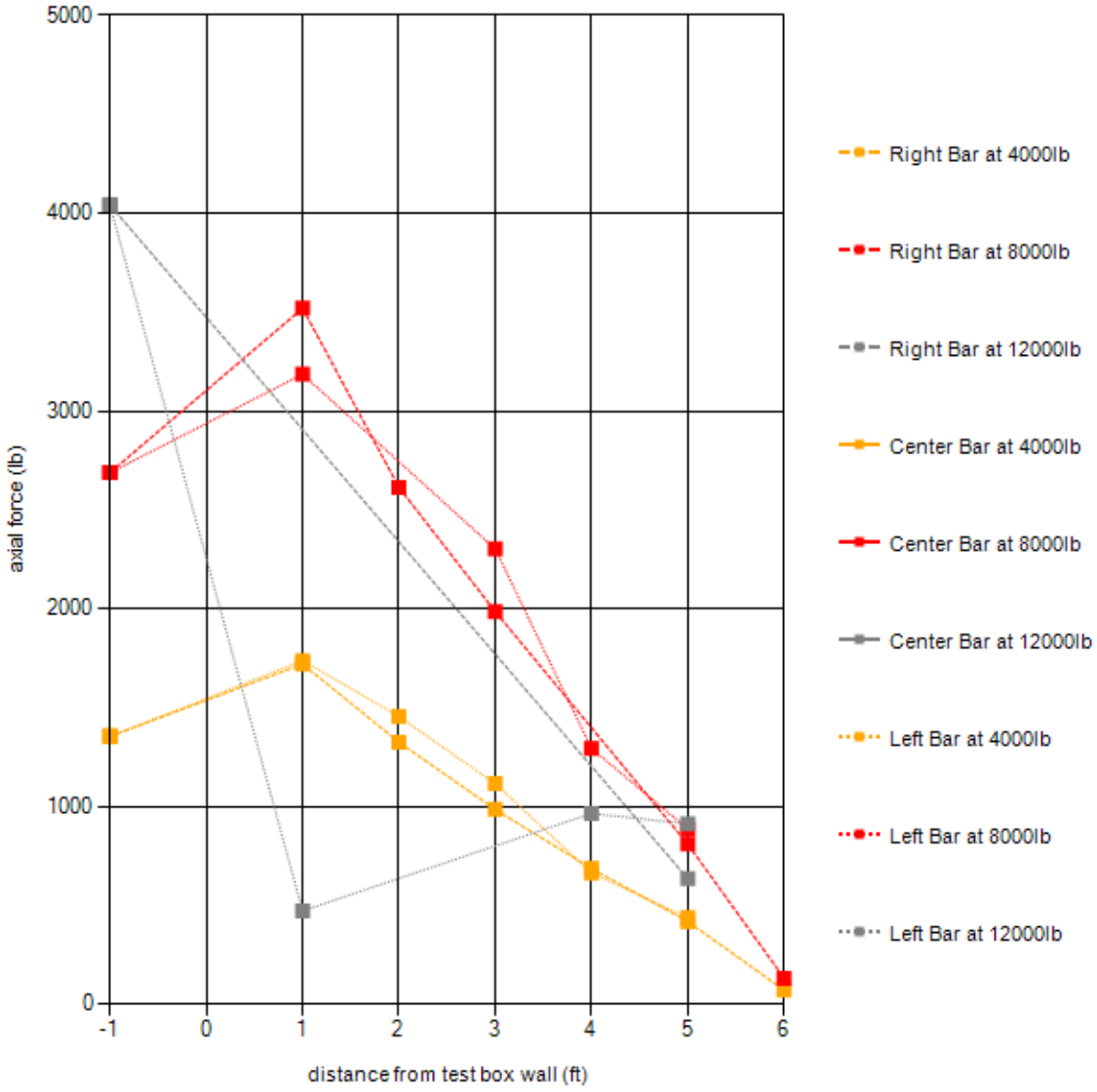
Axial Load-Distance from Test Box Wall Plot – Service Loads



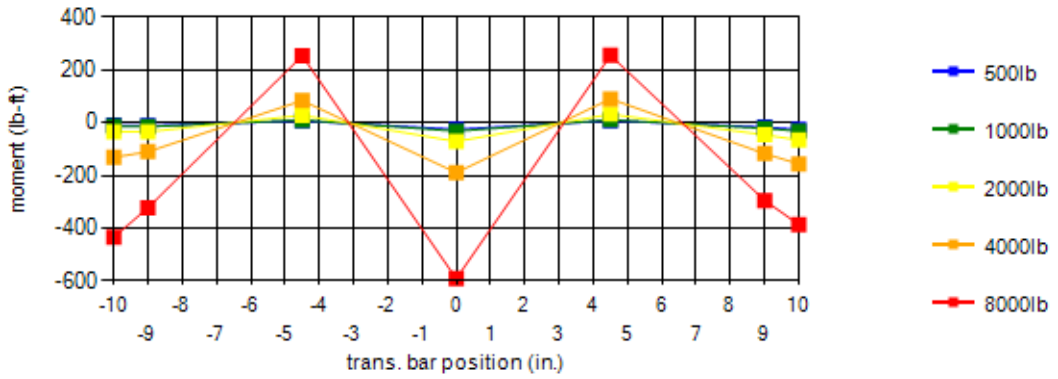
Axial Load Results

Pullout Resistance, P_r (lb)	*Axial Load, P (lb) calculated from strain data at distances from test box wall*										
	1ft_LL	*1ft_LR*	*2ft_LL*	*2ft_LR*	*3ft_LL*	*3ft_LR*	*4ft_LL*	*4ft_LR*	*5ft_LL*	*5ft_LR*	*6ft_LL*
500	522	585	364	413	211	308	144	212	81	130	7
1000	618	682	437	488	264	369	184	257	105	163	12
2000	966	1032	718	797	502	602	367	385	211	251	32
3000	1361	1423	1047	1154	766	878	548	533	321	348	60
4000	1720	1737	1325	1455	985	1116	686	663	418	438	71
5000	2190	2120	1670	1827	1255	1417	883	831	535	554	88
6000	2592	2426	1955	2144	1476	1673	1031	970	615	652	103
7000	3098	2823	2336	ND	1728	1987	1165	1136	712	772	91
8000	3520	3186	2614	ND	1986	2302	ND	1293	809	886	131
9000	ND	360	ND	ND	2247	-155	ND	177	-788	168	-2483
10000	ND	1267	ND	ND	2478	532	ND	602	-403	533	-6365
11000	ND	2428	ND	ND	2186	ND	ND	1062	381	728	-1868
12000	ND	472	ND	ND	ND	ND	ND	965	635	912	ND
13000	ND	ND	ND	ND	ND	ND	ND	1766	819	1289	ND
14000	ND	ND	ND	ND	ND	ND	ND	1759	510	1343	ND

Axial Load-Distance from Test Box Wall Plot – All



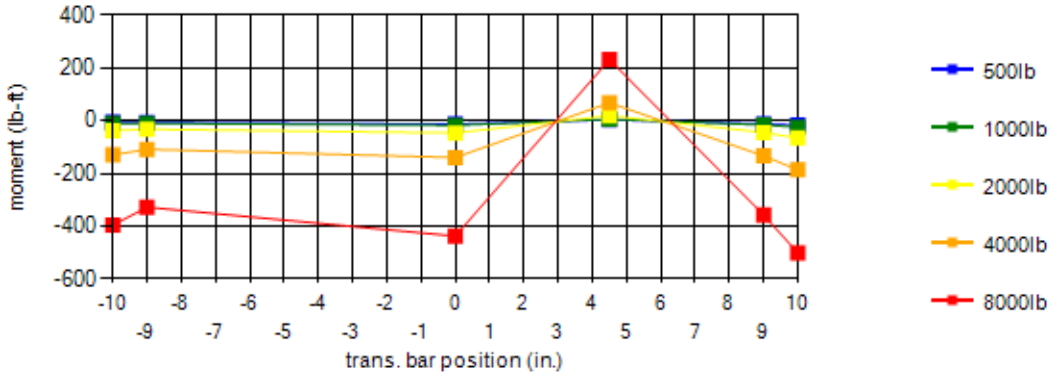
Moment Results along Transverse Bar at 1ft from Test Box Wall – Plot – Service Loads



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	-11	7	-25	8	-17	-26
1000	-13	-15	10	-32	11	-21	-32
2000	-34	-35	28	-71	32	-46	-66
3000	-78	-71	55	-132	61	-83	-113
4000	-131	-110	84	-189	90	-117	-157
5000	-205	-162	123	-263	128	-160	-211
6000	-272	-208	158	-331	163	-198	-263
7000	-356	-265	205	-443	208	-246	-323
8000	-434	-322	253	-591	255	-295	-387
9000	ND	ND	338	ND	304	ND	-29
10000	ND	ND	356	ND	367	ND	-132
11000	ND	ND	401	ND	ND	ND	-338
12000	ND	ND	425	ND	ND	ND	7

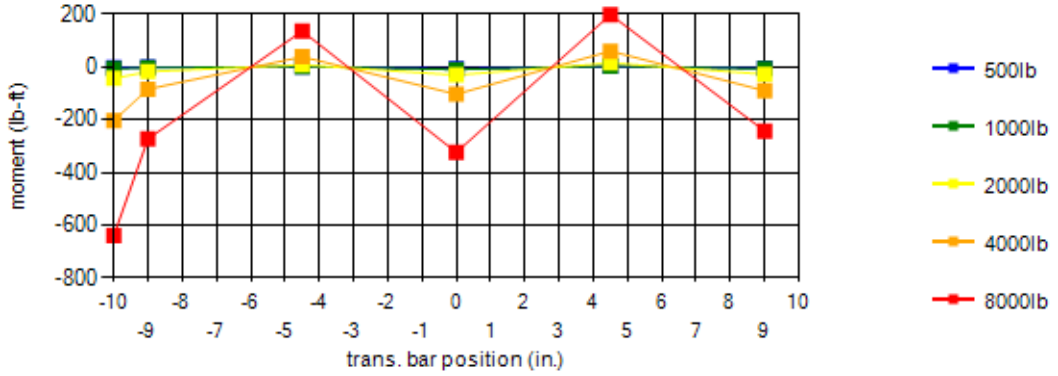
Moment Results along Transverse Bar at 3ft from Test Box Wall – Plot – Service Loads



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_TR_C*	*3ft_TR_R*	*3ft_LR*
500	-6	-7	4	-12	-17
1000	-11	-10	6	-16	-25
2000	-39	-33	19	-45	-66
3000	-84	-71	43	-90	-128
4000	-130	-109	68	-134	-187
5000	-190	-160	103	-190	-263
6000	-245	-205	137	-239	-332
7000	-319	-264	182	-301	-418
8000	-396	-328	231	-358	-502
9000	-477	-541	284	ND	-148
10000	-572	-557	351	ND	-241
11000	-715	-621	ND	ND	ND

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*
500	-4	-2	1	2	-5
1000	-7	-3	1	3	-7
2000	-44	-18	8	15	-28
3000	-123	-50	22	37	-60
4000	-203	-84	38	60	-90
5000	-309	-130	61	90	-128
6000	-402	-170	80	119	-161
7000	-522	-222	104	157	-203
8000	-639	-273	136	198	-243
9000	-347	ND	100	230	ND
10000	-1014	ND	125	249	ND
11000	-691	ND	169	306	ND
12000	ND	ND	118	273	ND
13000	ND	ND	220	ND	ND
14000	ND	ND	153	ND	ND

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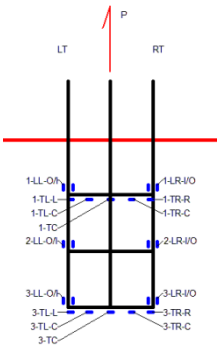
STRAIN GAGE REPORT FOR MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/19/2011 8:09:00 AM
Test Identification:	TS26.03-G-6x12-W20xW11-L3-Z40-T
Test Facility:	12'x12'x4' MSE Test Box

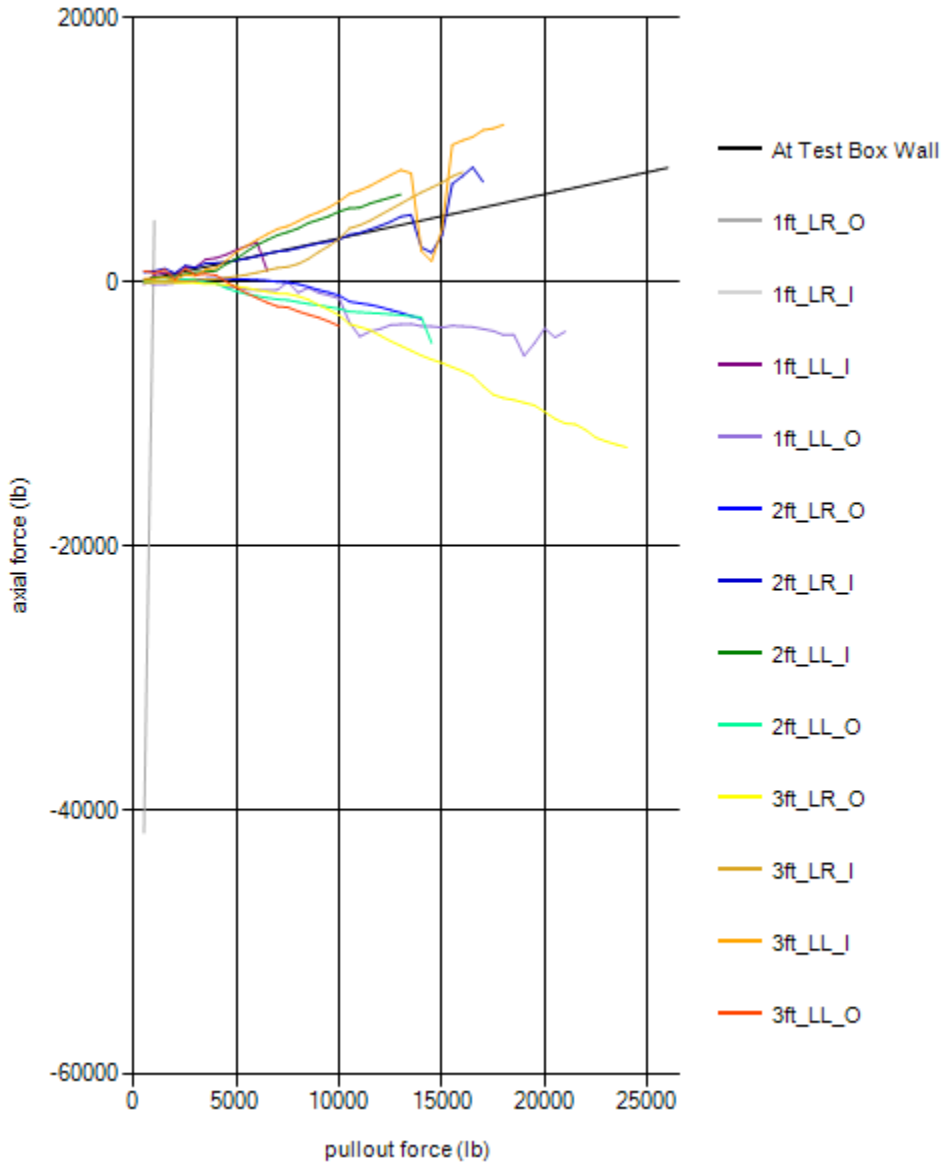
Sketch



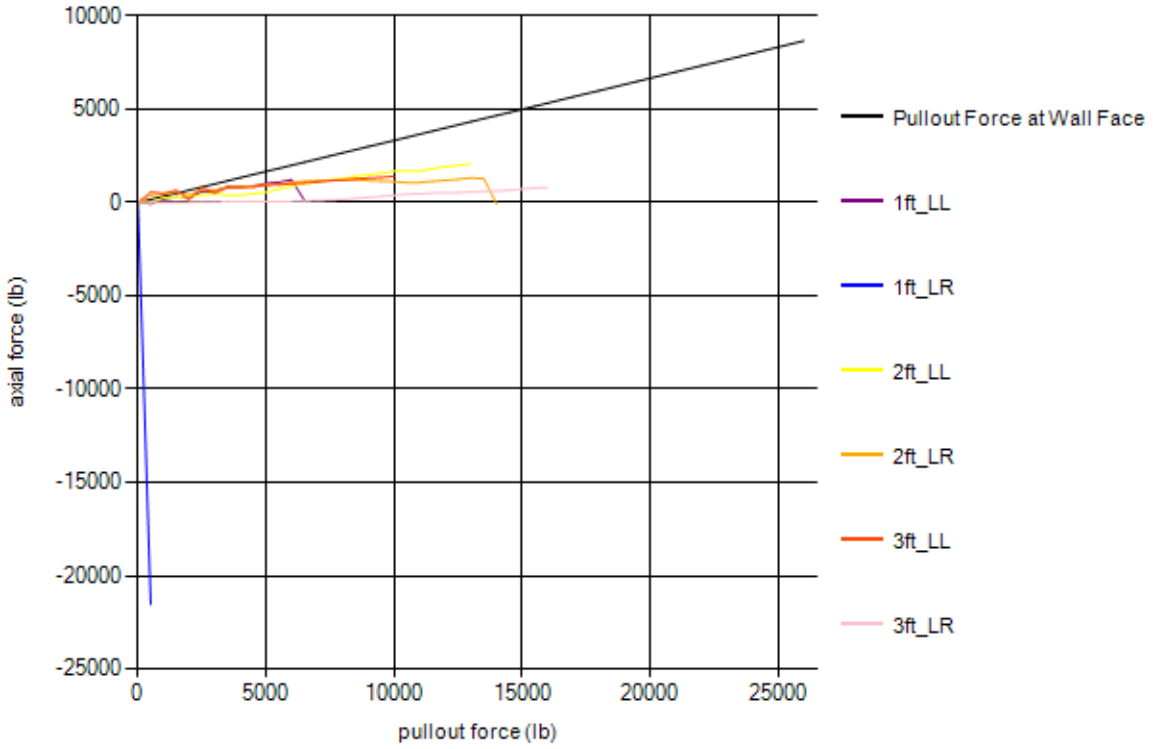
MSE Reinforcement

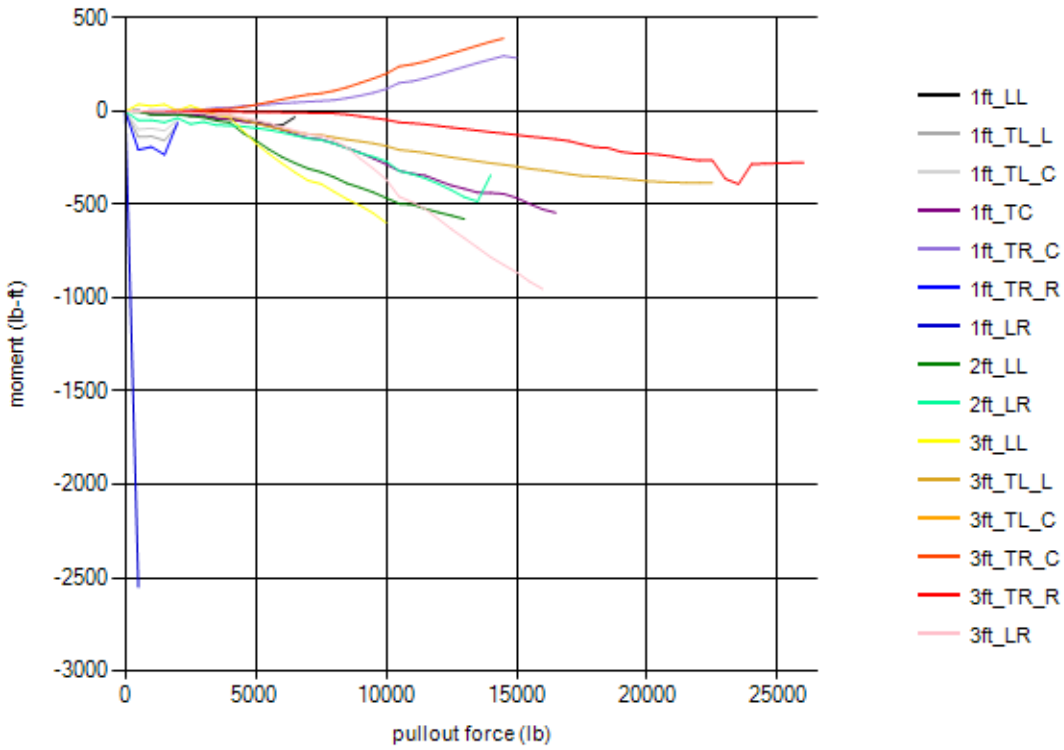
Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	3	*Number, N_t:*	3	*Number, N_l:*	3
Width, b (in.):	12	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.5
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	6

Axial Load-Pullout Load Data by Gage

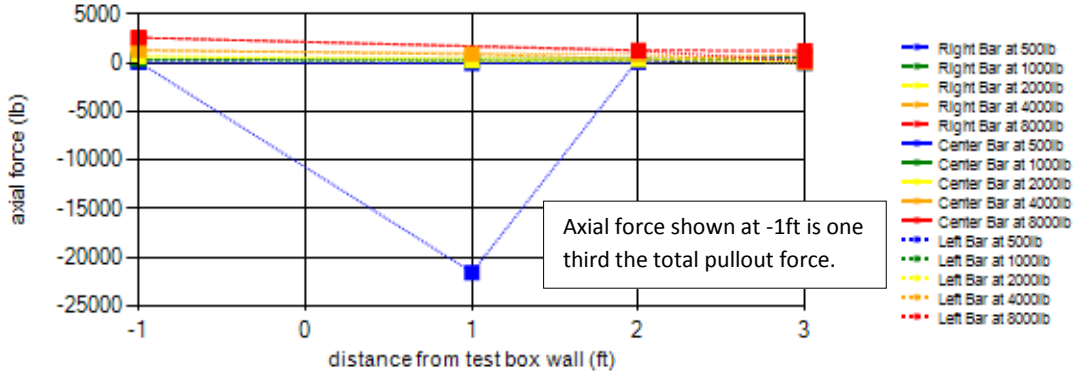


Axial Load-Pullout Load And Moment-Pullout Load Data by Location





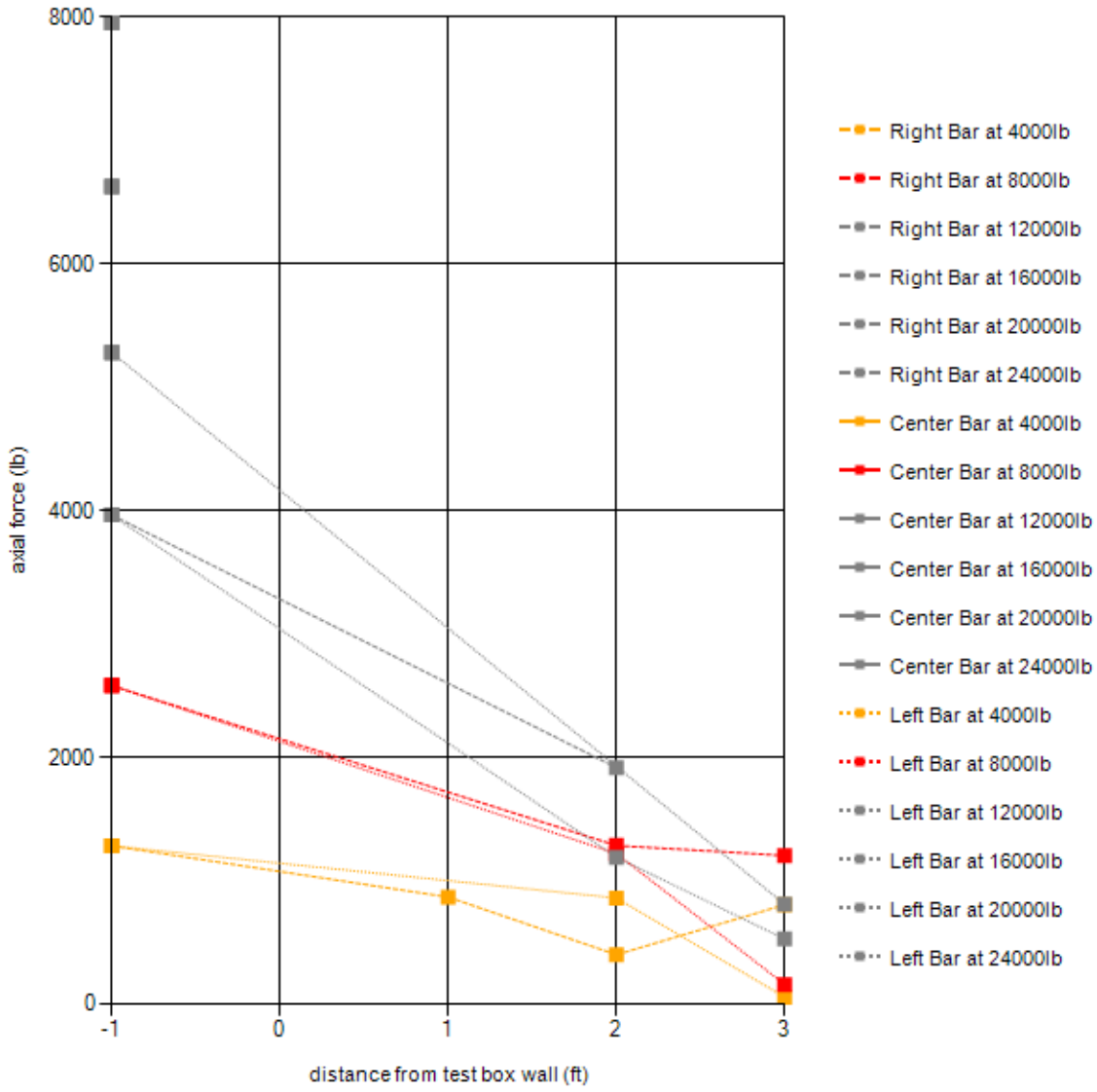
Axial Load-Distance from Test Box Wall Plot – Service Loads



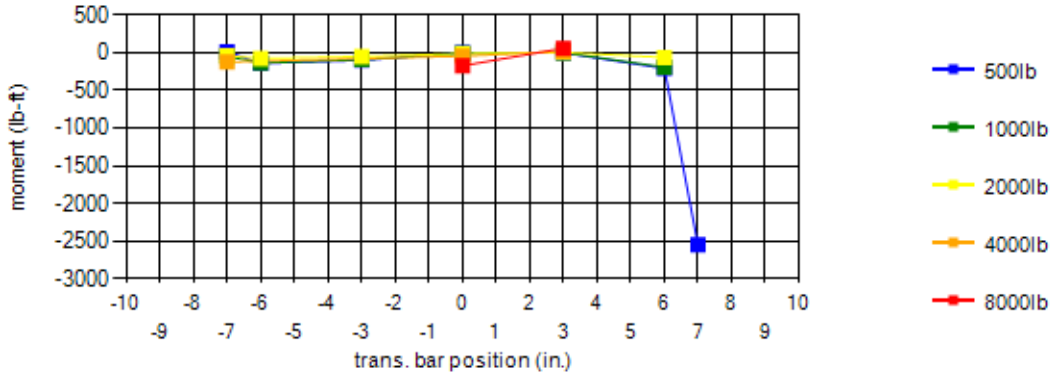
Axial Load Results

Pullout Resistance, P_r (lb)	*Axial Load, P (lb) calculated from strain data at distances from test box wall*					
	1ft_LL	*1ft_LR*	*2ft_LL*	*2ft_LR*	*3ft_LL*	*3ft_LR*
500	-70	-21541	17	385	562	1
1000	193	ND	253	455	492	11
2000	240	ND	316	404	169	21
3000	622	ND	476	668	517	41
4000	870	ND	403	862	808	59
5000	1032	ND	544	953	945	69
6000	1225	ND	885	1077	1012	74
7000	ND	ND	1134	1187	1103	108
8000	ND	ND	1288	1222	1207	161
9000	ND	ND	1492	1182	1314	282
10000	ND	ND	1674	1120	1404	395
11000	ND	ND	1684	1076	ND	464
12000	ND	ND	1919	1192	ND	530
13000	ND	ND	2082	1330	ND	570
14000	ND	ND	ND	-66	ND	629
15000	ND	ND	ND	ND	ND	722
16000	ND	ND	ND	ND	ND	811
17000	ND	ND	ND	ND	ND	ND
18000	ND	ND	ND	ND	ND	ND
19000	ND	ND	ND	ND	ND	ND
20000	ND	ND	ND	ND	ND	ND
21000	ND	ND	ND	ND	ND	ND
22000	ND	ND	ND	ND	ND	ND
23000	ND	ND	ND	ND	ND	ND
24000	ND	ND	ND	ND	ND	ND
25000	ND	ND	ND	ND	ND	ND
26000	ND	ND	ND	ND	ND	ND

Axial Load-Distance from Test Box Wall Plot – All



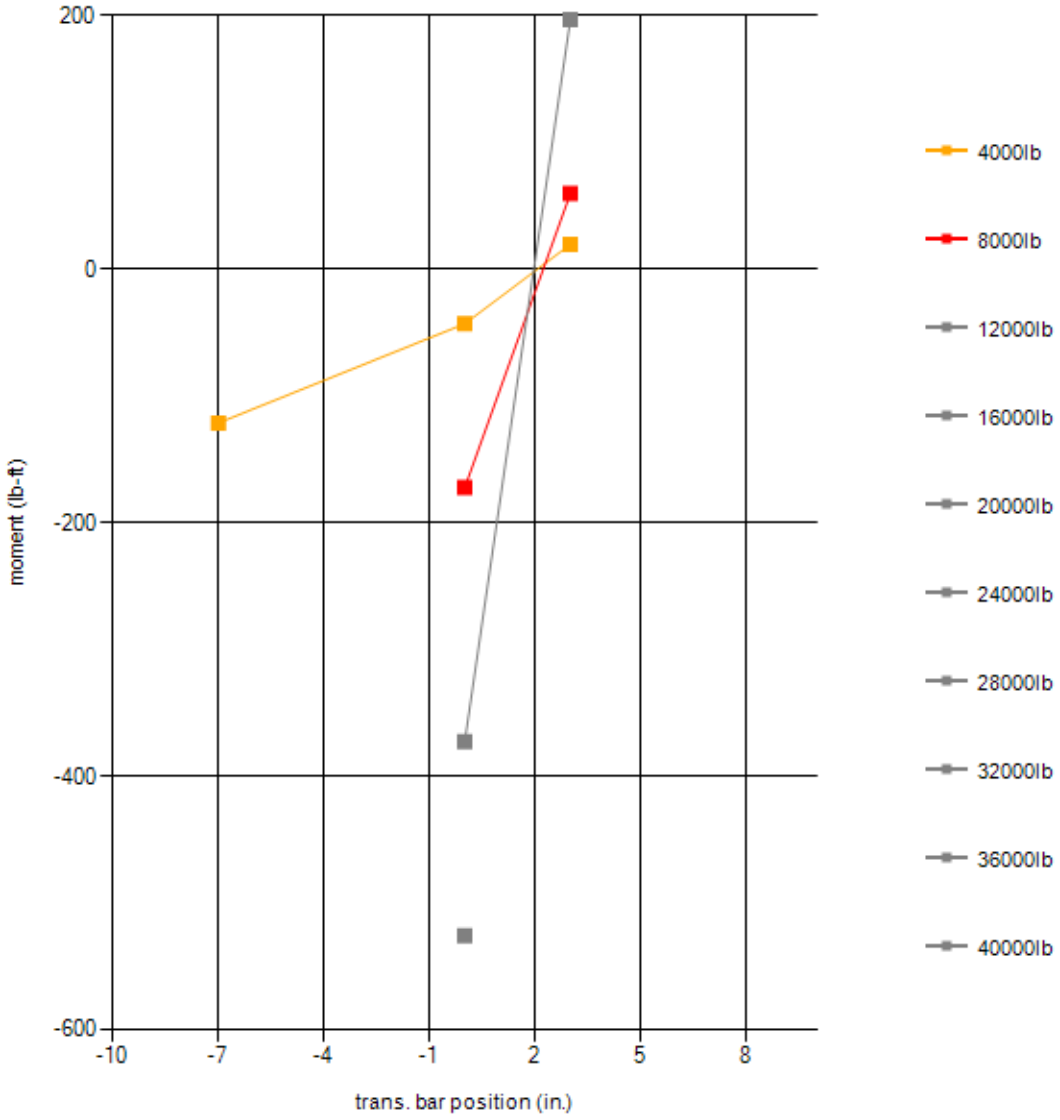
Moment Results along Transverse Bar at 1ft from Test Box Wall – Plot – Service Loads



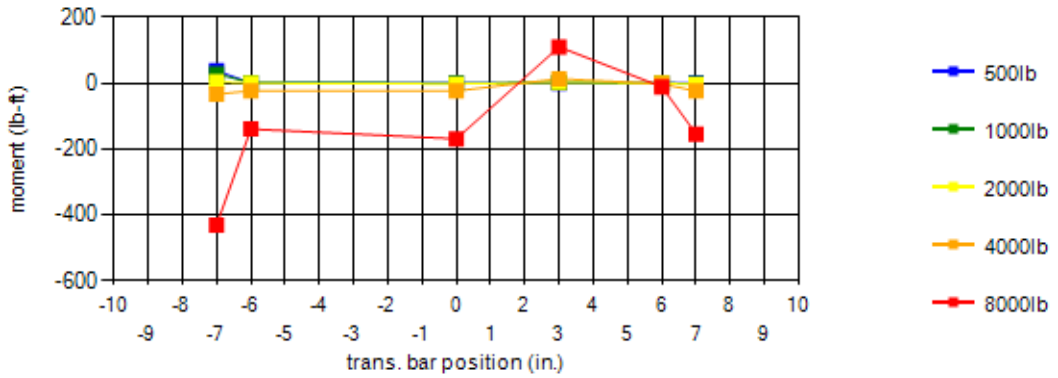
Moment Results along Transverse Bar at 1ft from Test Box Wall – Data

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	11	-137	-97	0	0	-207	-2550
1000	-46	-134	-91	-4	2	-191	ND
2000	-41	-74	-48	-10	5	-61	ND
3000	-64	ND	ND	-25	11	ND	ND
4000	-121	ND	ND	-43	20	ND	ND
5000	-178	ND	ND	-64	32	ND	ND
6000	-227	ND	ND	-99	43	ND	ND
7000	ND	ND	ND	-142	52	ND	ND
8000	ND	ND	ND	-172	60	ND	ND
9000	ND	ND	ND	-222	84	ND	ND
10000	ND	ND	ND	-284	120	ND	ND
11000	ND	ND	ND	-335	161	ND	ND
12000	ND	ND	ND	-372	197	ND	ND
13000	ND	ND	ND	-416	239	ND	ND
14000	ND	ND	ND	-438	278	ND	ND
15000	ND	ND	ND	-464	285	ND	ND
16000	ND	ND	ND	-526	ND	ND	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_TR_C*	*3ft_TR_R*	*3ft_LR*
500	38	0	0	0	0
1000	28	1	1	0	-2
2000	4	0	2	-1	-5
3000	5	-7	6	-1	-12
4000	-34	-23	13	-2	-24
5000	-172	-65	35	-4	-47
6000	-279	-97	64	-6	-84
7000	-371	-122	89	-8	-123
8000	-431	-140	110	-11	-155
9000	-505	-161	152	-27	-253
10000	-598	-186	201	-45	-366
11000	ND	-214	252	-64	-487
12000	ND	-235	289	-79	-578
13000	ND	-257	331	-95	-681
14000	ND	-277	373	-111	-781
15000	ND	-296	ND	-126	-863
16000	ND	-316	ND	-142	-952
17000	ND	-336	ND	-159	ND
18000	ND	-350	ND	-192	ND
19000	ND	-361	ND	-218	ND
20000	ND	-374	ND	-227	ND
21000	ND	-381	ND	-243	ND
22000	ND	-383	ND	-263	ND
23000	ND	ND	ND	-362	ND
24000	ND	ND	ND	-283	ND
25000	ND	ND	ND	-279	ND
26000	ND	ND	ND	-276	ND

Moment Results along Transverse Bar at 3ft from Test Box Wall – Plot – All