FOUNDATION TESTING & CONSULTING, LLC
Knowledge To Build On®

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May 24, 2012

Mr. Layne Colgrove
Chester Bross Construction Co.
PO Box 430
6739 County Road 423
Hannibal, Missouri 63401

Subject: WEAP Analysis Results
MoDOT –Bridge over Drainage Ditch No. 2
MoDOT Project No. J0P2239
Scott County, Missouri
FTC Project Number 032-2012

Dear Mr. Colgrove,

Please find attached the results of our wave equation analysis for the referenced project. We find that for the hammer you selected for this project (Delmag 19-32) that the required axial capacity of 157 to 181 kips (Maximum at End Bents and Intermediate Bents, respectively) as listed in the project plans can be achieved using reasonable values of blow count and stroke while staying within allowable stress limits for the 14-inch diameter, 0.375-inch thick wall steel piles. Please refer to attached plots from the WEAP program output.

Please note that we performed our analysis using the available soil boring data, typical hammer performance and our judgment acquired from experience at previous projects. As such, actual driving conditions may vary from those modeled. According we conclude that it is more like than not that the required axial capacity will be met for piling at or above (perhaps 10 feet higher) than planned tip elevation particularly with driving of subsequent pile at a given bent due to displacment effects.

Please note that this analysis is based on installation of the initial pile at each bent. It is possible that pile displacement effects following installation of subsequent pile at each bent could increase the capacity of the piling at a given depth.

Also, since the subsurface soils are indicated to be medium dense to dense and saturated there is the potential for high temporary excess pore pressures to cause dilation of the sand with a decrease in capacity at the pile toe. Such effects, if present, should manifest themselves within an hour or two following initial drive. Therefore we recommend that at least one pile per bent be subject to a same-day restrike (20 blows with a warm hammer) after one or two hours following initial drive (with or without PDA gages) to confirm that the combination of stroke and set has not deteriorated relative to the pile capacity correlated to those parameters at the time of initial drive.

We do not anticipate that any other restrike testing would be necessary at this project subject to MoDOT approval.

Please contact me with any questions.

Sincerely,

STATE OF MISSOURI
WILLIAM C. JONES
NUMBER
E-2001003894
REGISTERED PROFESSIONAL ENGINEER

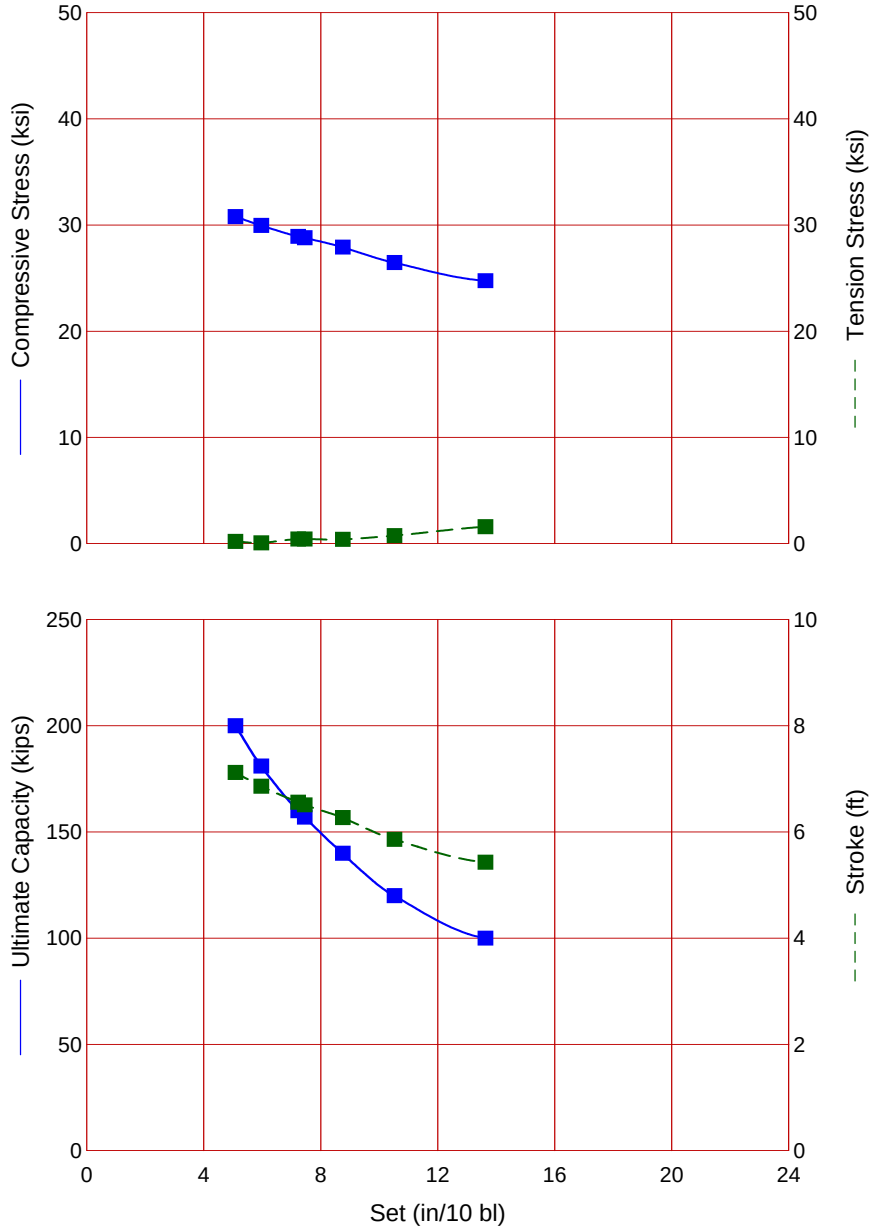
5/24/12

William C. Jones, P.E., P.G. – President, FTC

Enclosure: WEAP Program Output

Foundation Testing & Consulting LLC
Scott County Bridge A7956

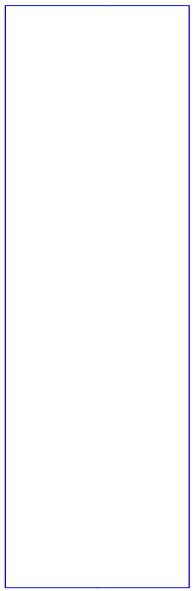
24-May-2012
GRLWEAP (TM) Version 2005



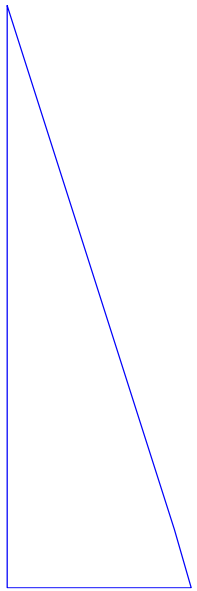
DELMAG D 19-32

Efficiency	0.800	
Helmet	1.00	kips
Hammer Cushion	37046400	kips/in
Skin Quake	0.100	in
Toe Quake	0.230	in
Skin Damping	0.050	sec/ft
Toe Damping	0.150	sec/ft
Pile Length	50.00	ft
Pile Top Area	16.05	ft in2

Pile Model



Skin Friction Distribution



Res. Shaft = 72 %
(Proportional)

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Scott County Bridge A7956 GRLWEAP (TM) Version 2005

Ultimate Capacity kips	Maximum Compression Stress ksi	Maximum Tension Stress ksi	Set in/10 bl	Stroke ft	Energy kips-ft
100.0	24.76	1.61	13.6	5.43	18.78
120.0	26.45	0.76	10.5	5.86	18.41
140.0	27.92	0.41	8.8	6.27	18.04
157.0	28.80	0.44	7.5	6.51	17.63
160.0	28.93	0.43	7.2	6.56	17.57
181.0	29.96	0.08	6.0	6.86	17.39
200.0	30.79	0.21	5.1	7.12	17.31

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May 24 2012

Scott County Bridge A7956

Gain/Loss 1 at Shaft and Toe 1.000 / 1.000

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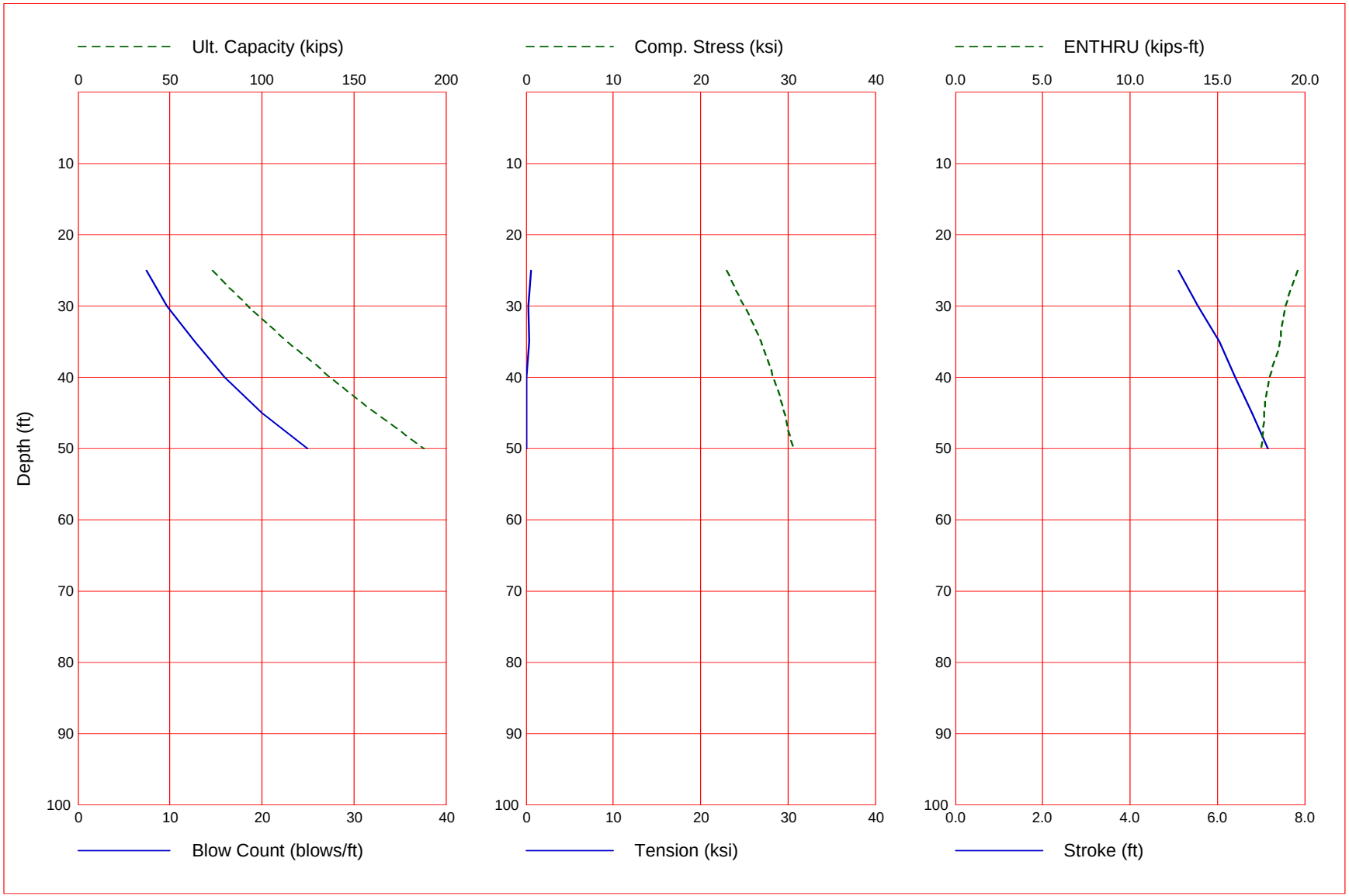

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May 24 2012
GRLWEAP(TM) Version 2005

Gain/Loss 1 at Shaft and Toe 1.000 / 1.000

Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/ft	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
25.0	73.0	21.0	51.9	7.4	22.972	-0.540	5.11	19.6
30.0	92.6	30.3	62.3	9.7	24.980	-0.295	5.55	18.9
35.0	113.9	41.2	72.7	12.7	26.910	-0.418	6.04	18.6
40.0	136.9	53.8	83.1	15.9	28.302	0.000	6.42	18.0
45.0	161.6	68.1	93.5	20.0	29.564	0.000	6.80	17.7
50.0	187.9	84.0	103.9	25.0	30.658	-0.042	7.16	17.5

Total Continuous Driving Time 10.00 minutes; Total Number of Blows 466

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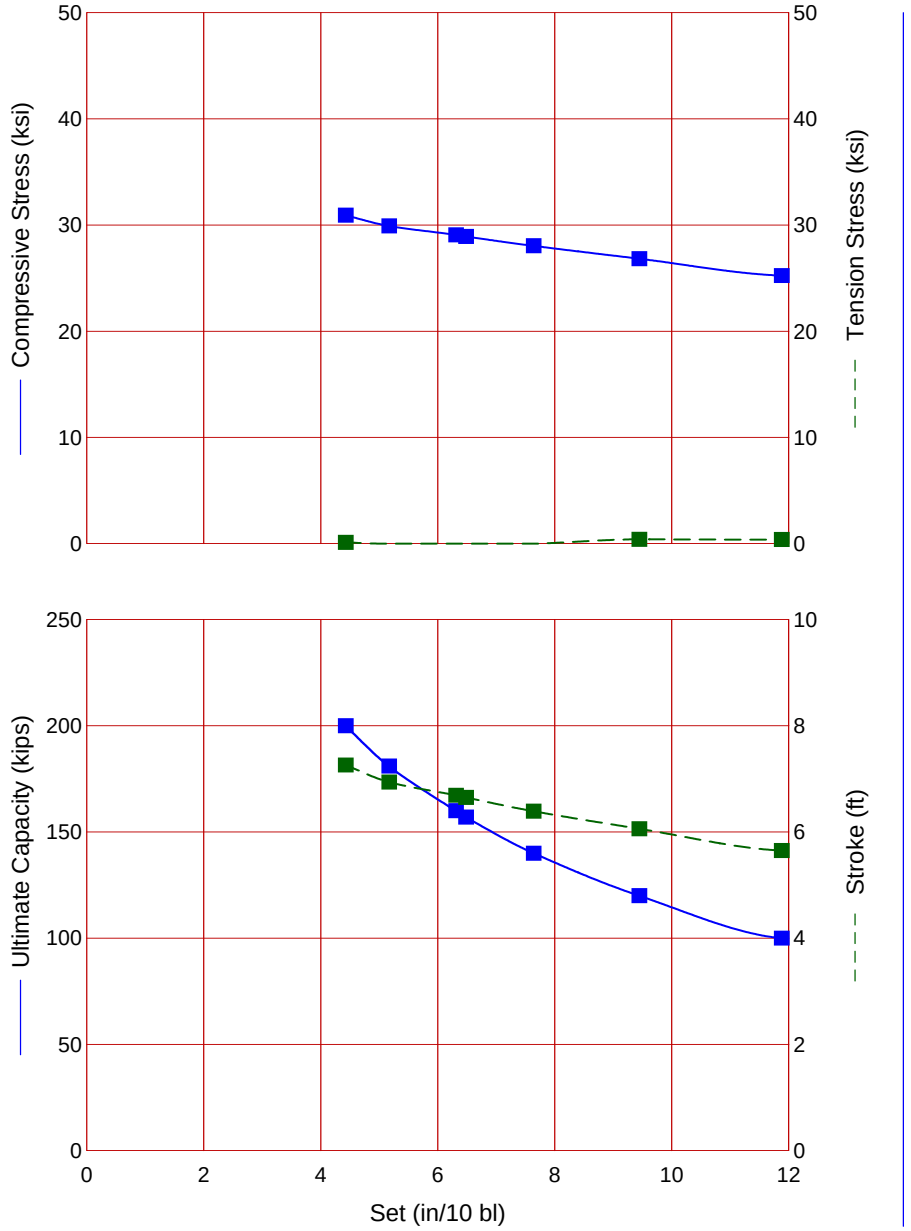
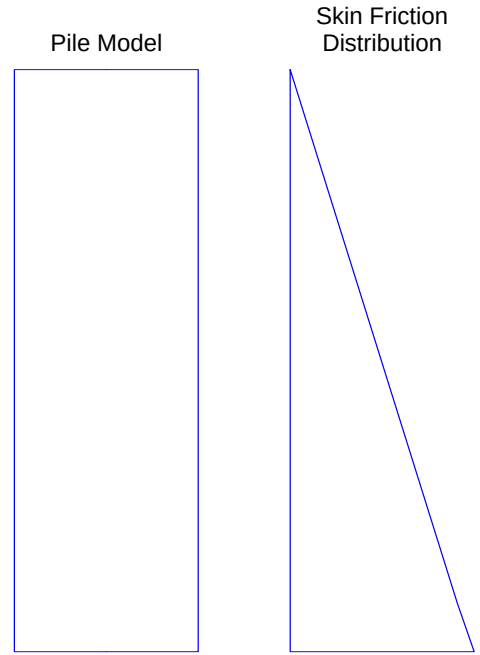


DELMAG D 19-32

Efficiency	0.800	
Helmet	1.00	kips
Hammer Cushion	37046400	kips/in
Skin Quake	0.100	in
Toe Quake	0.230	in
Skin Damping	0.050	sec/ft
Toe Damping	0.150	sec/ft
Pile Length	60.00	ft
Pile Top Area	16.05	ft in2



Res. Shaft = 47 %
(Proportional)

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Ultimate Capacity kips	Maximum Compression Stress ksi	Maximum Tension Stress ksi	Set in/10 bl	Stroke ft	Energy kips-ft
100.0	25.24	0.39	11.9	5.65	18.79
120.0	26.83	0.41	9.4	6.06	18.38
140.0	28.04	0.00	7.6	6.39	17.97
157.0	28.92	0.00	6.5	6.65	17.81
160.0	29.07	0.00	6.3	6.69	17.79
181.0	29.91	0.00	5.2	6.94	17.57
200.0	30.92	0.12	4.4	7.26	17.75

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Gain/Loss 1 at Shaft and Toe 1.000 / 1.000

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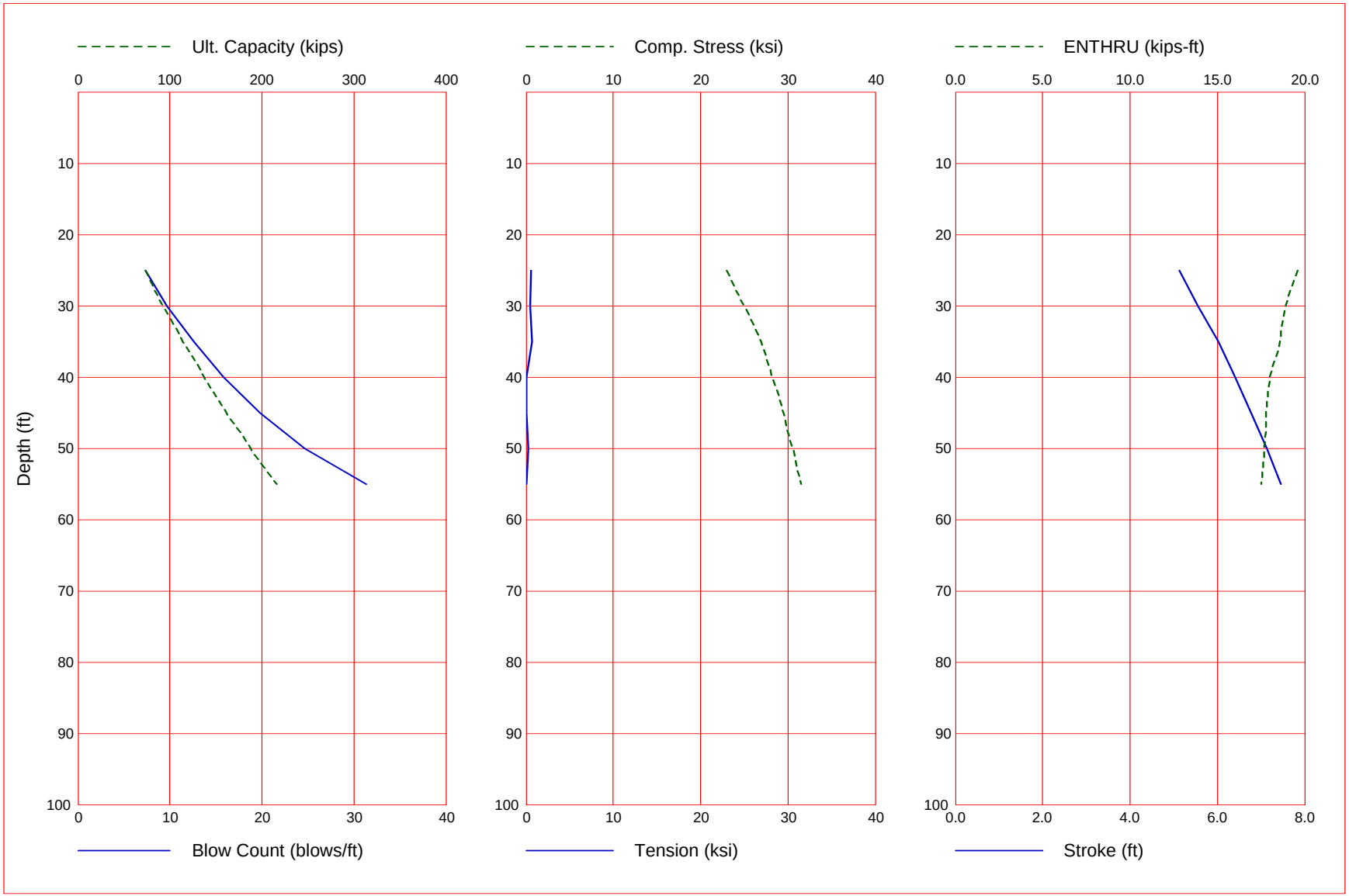

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Gain/Loss 1 at Shaft and Toe 1.000 / 1.000

Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/ft	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
25.0	73.0	21.0	51.9	7.3	23.038	-0.626	5.12	19.6
30.0	92.6	30.3	62.3	9.7	25.058	-0.531	5.56	18.9
35.0	113.9	41.2	72.7	12.6	26.903	-0.731	6.03	18.6
40.0	136.9	53.8	83.1	15.8	28.245	-0.106	6.40	18.0
45.0	161.6	68.1	93.5	19.8	29.485	0.000	6.77	17.8
50.0	188.0	84.1	103.9	24.7	30.571	-0.216	7.13	17.7
55.0	216.0	101.7	114.3	31.3	31.483	-0.101	7.45	17.5

Total Continuous Driving Time 13.00 minutes; Total Number of Blows 600