I-395 Signature Bridge Project

An overview of the first Florida Department of Transportation (FDOT) project utilizing Auger Cast in Place (ACIP) Pile foundations for a Major Bridge Structure.

Adrian Albert Viala, P.E., FDOT D4&6

Project Overview

Project Description

I-395 Reconstruction
from Midtown Interchange to MacArthur Causeway Bridge
(FPID 251688-1-52-01)

SR 836 Double-deck highway from West of NW 17th Ave to Midtown Interchange
(FPID 423126-1-52-01)

Westbound Connector from I-95 SB to SR-836 WB
(FPID 423126-2-52-01)

I-95 Pavement Reconstruction
from NW 8th St to NW 29th St
(FPID 429300-2-52-01)

Signature Bridge and Double Decker Bridge Concepts

Design Build Team

Contractor: Archer Western – de Moya Group JV

Design Management: Pevida Highway Designers

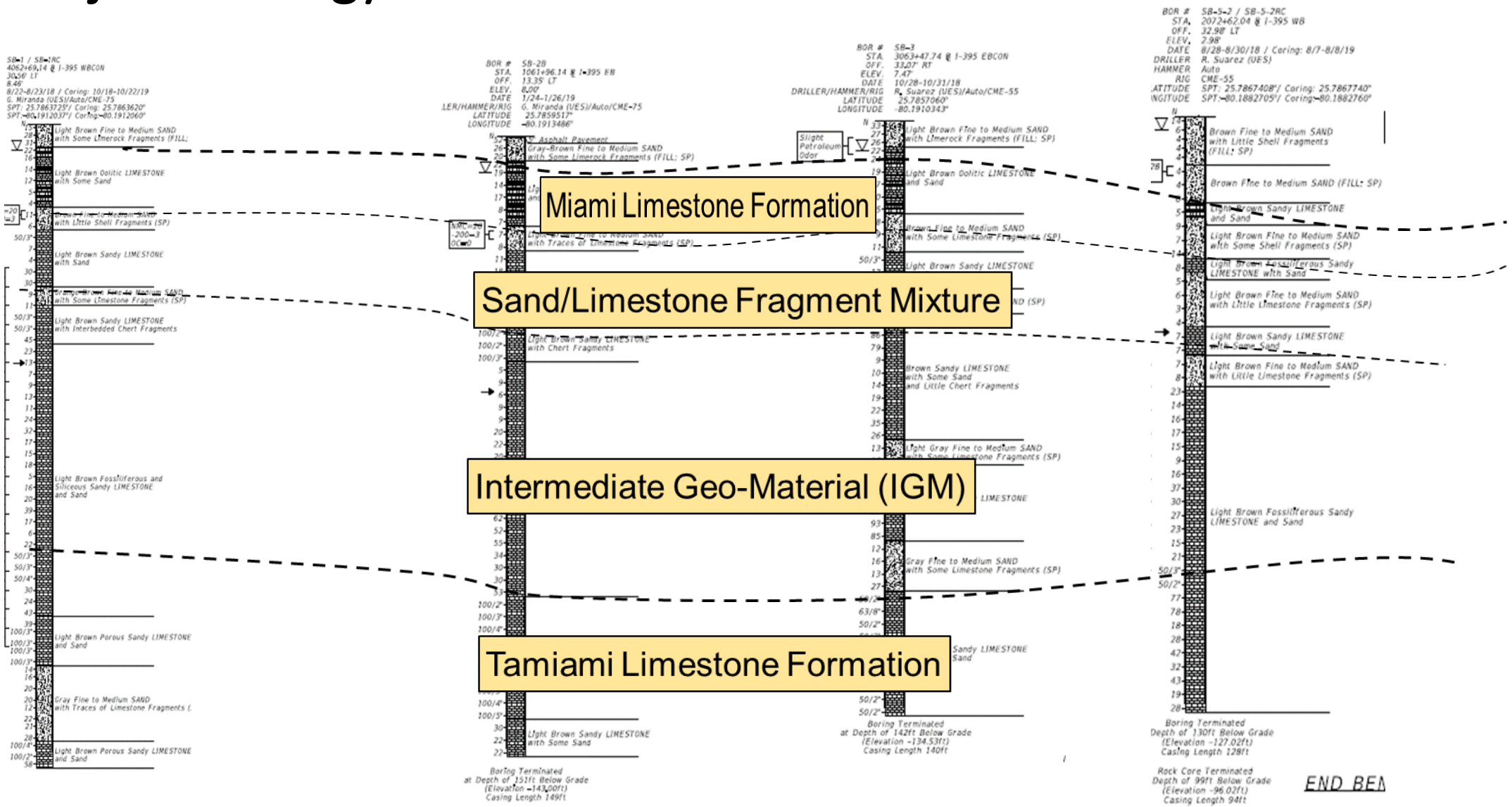
Bridge EOR: HDR, Corven and RS&H

Geotechnical EOR: Universal

ACIP Piling Contractor: Keller North America

Load Testing Consultant: LTC

Project Geology



Initial Foundation Type Issues

60% design concept from Design Build Team had 24 & 30-inch Square PCP Driven Piles for foundation support.

FDOT had concerns about the driven piles achieving expected NBR of 900 tons (which was above maximum values in the SDG) without issues.

A Probe pile test program was performed by the Design Build Team which confirmed the concerns.

Probe Pile Driving Data

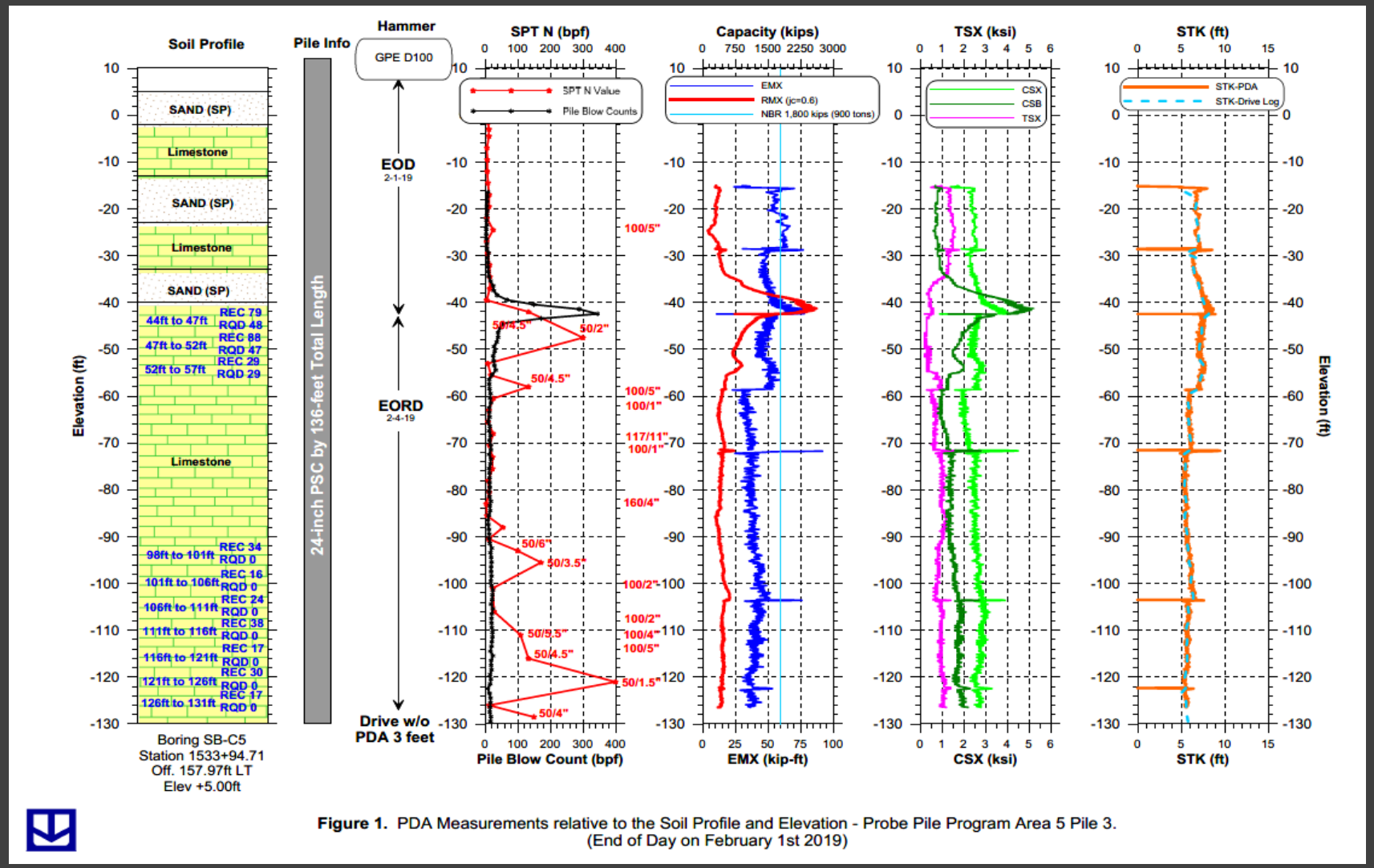


Figure 1. PDA Measurements relative to the Soil Profile and Elevation - Probe Pile Program Area 5 Pile 3.
(End of Day on February 1st 2019)

Probe Pile Driving Data

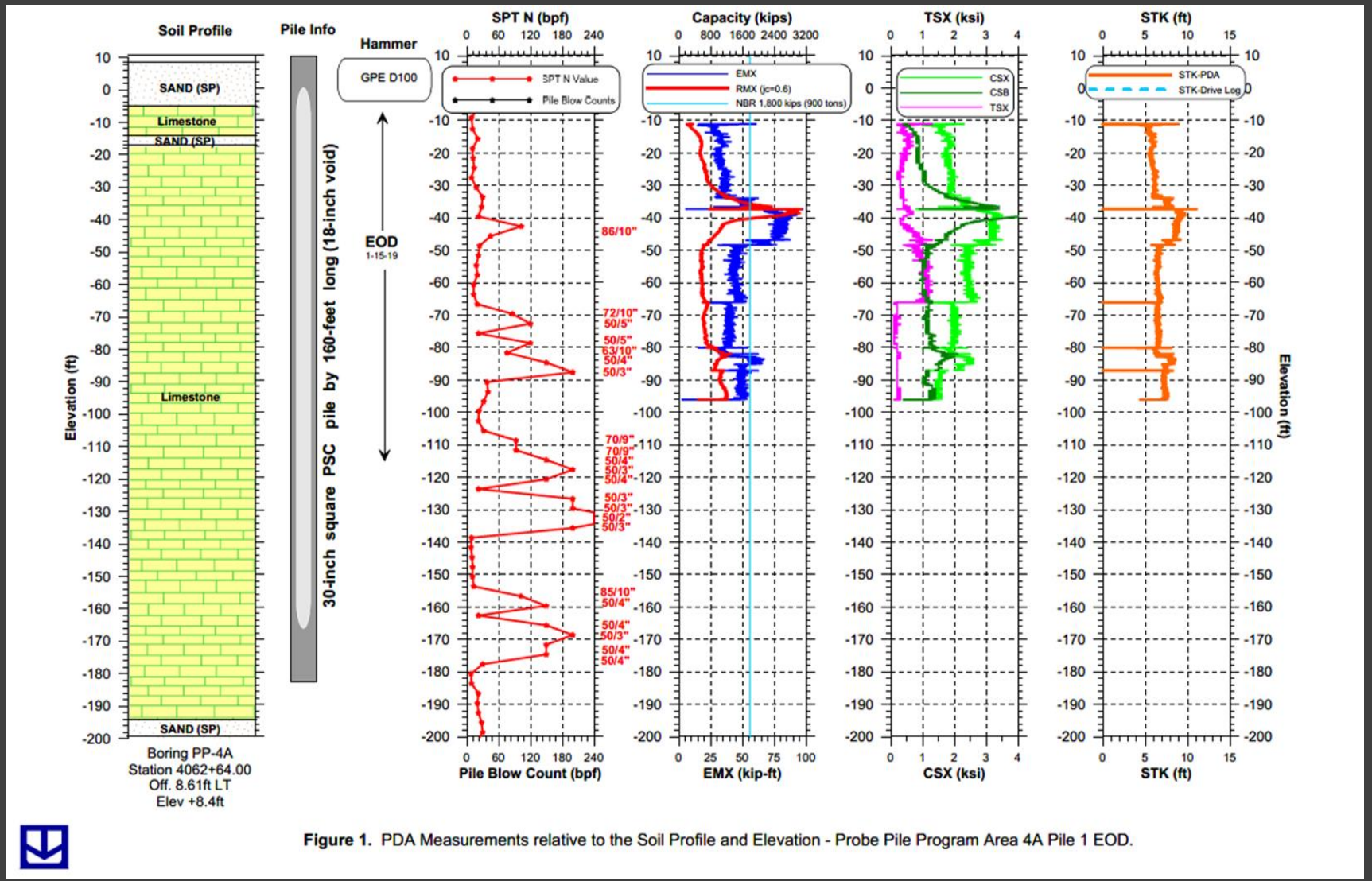
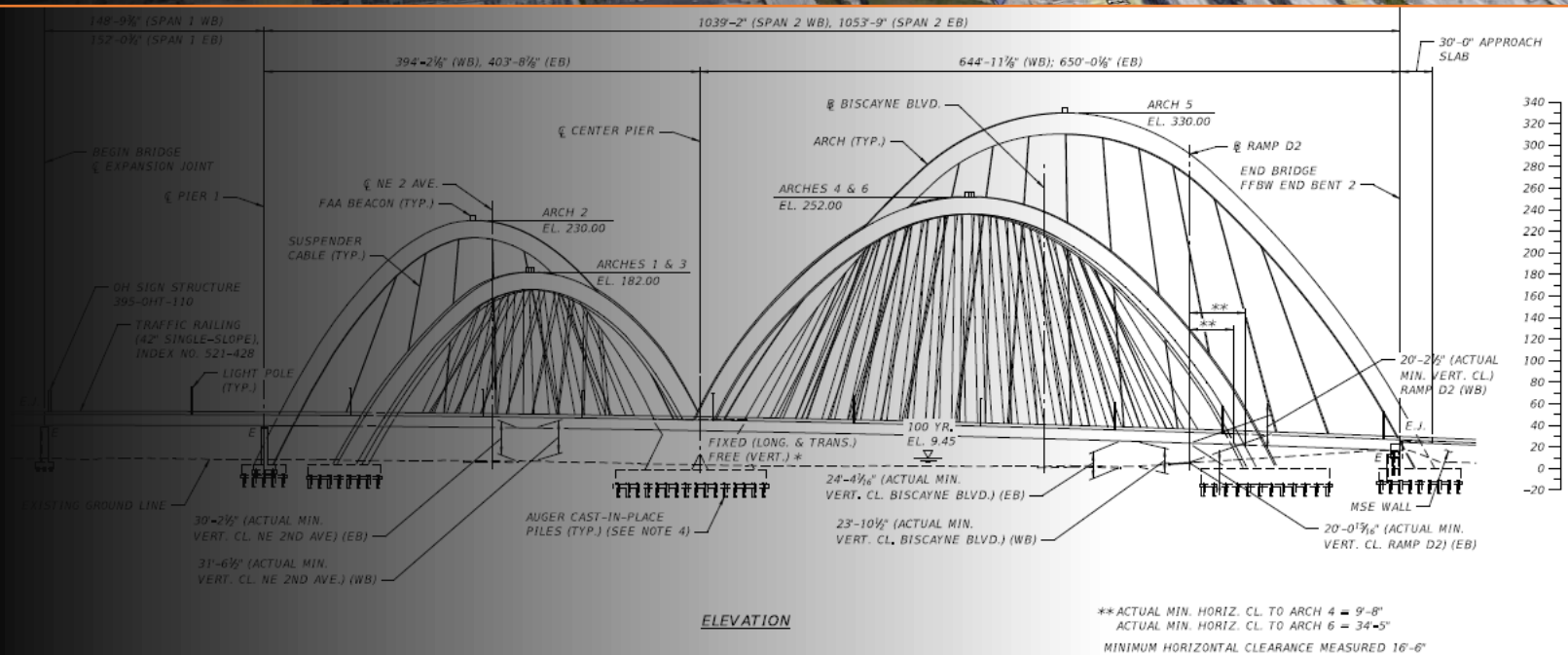


Figure 1. PDA Measurements relative to the Soil Profile and Elevation - Probe Pile Program Area 4A Pile 1 EOD.

Signature Bridge



DB Team Request to use ACIP Piles

- Required Development of a Design Methodology and Modified Special Provision (MSP) for ACIP Piles for Bridges.
- Major requirements amongst others
  - Resistance factors for ACIP design
  - Limit ACIP Pile diameters to not less than 30-inch
  - Representative Axial and Lateral Load Tests
  - Fixed Mast Rigs
  - Automated Monitoring Equipment (AME) & Data
  - Thermal Integrity Profiler (TIP) Testing
  - Proof Testing to FDL on 5% of installed piles
  - Full length reinforcing cage

Modified Special Provision (MSP) for ACIP for Bridges

- **455-39.2 Contractor's Operations:** For bridge foundations, use only fixed mast rigs…..
- **455-39.3 Monitoring Equipment:** Use an AME system to monitor the installation of all bridge foundation piles, including demonstration piles, load test piles and production piles ……..
- **455-44.2 Grouting:** For bridge foundations, continuously monitor grout volumes and pressures for every 1 foot of grouting, using the AME…..
- **455-44.3 Automatic Measurements and Recording:** Submit AME records to the Engineer and GFDEOR within 24 hours after the end of each day of production including all data from the drilling and grouting phases…. Provide electronic data in a format compatible with (or importable into) Microsoft Excel…
- **455-49 Load Tests and Pilot Holes:** Perform compression, tensile and lateral load tests at the locations indicated in the Plans…. Provide and install internal strain gauges throughout the length of the cage.
- **455-51.1 Thermal Integrity Testing Access Tubes:** For piles to be used in the foundation of bridges, provide 4 (or the quantity shown in the plans, if greater) Thermal Integrity Testing Access Tubes attached to the reinforcing cage of all auger cast piles in accordance with 455-16.4…… When shown in the Plans, embedded thermal sensors (wires) (Method B) may be substituted for tubes (Method A).

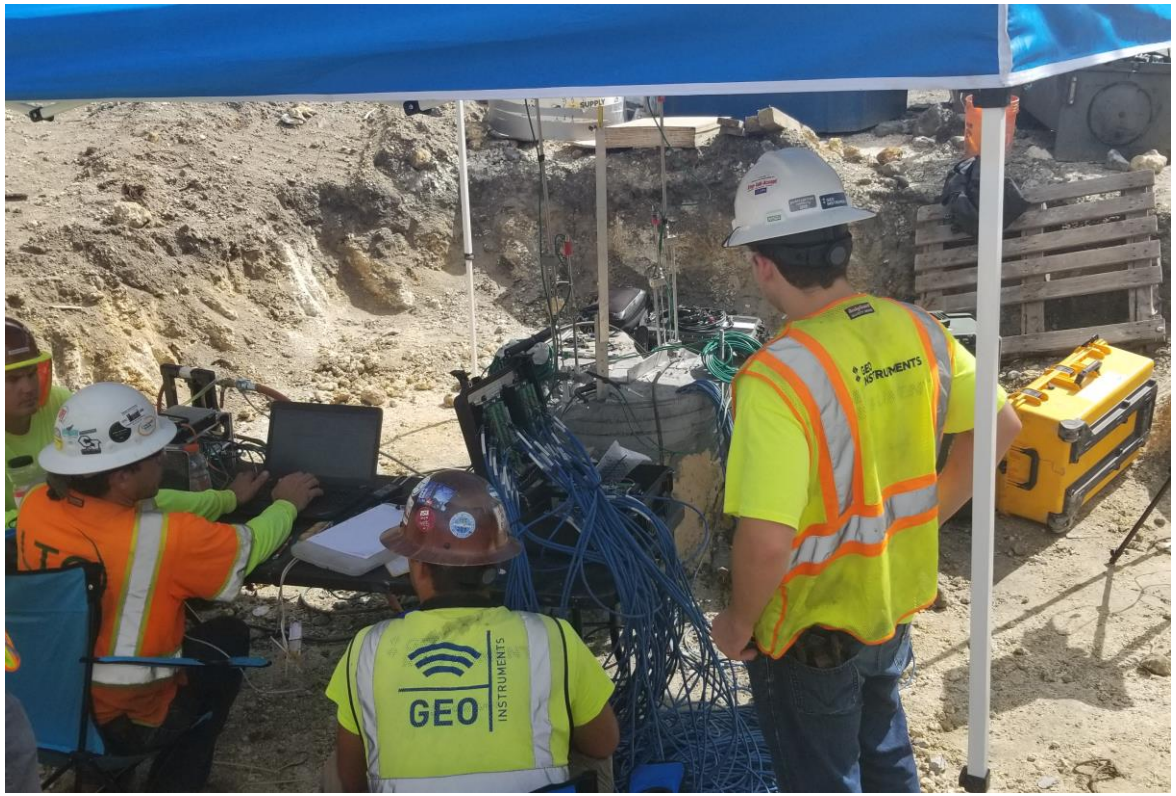
Modified Special Provision (MSP) for ACIP for Bridges

- **455-53 Proof Load Testing.**

Proof load tests shall be performed on at least one (1) or a minimum of five percent (5%) of production piles at each foundation unit (and more as required by the GFDEOR with concurrence by the Engineer) to demonstrate that the installed production piles meet the established load-deflection criteria. Proof load tests can be performed using static load tests, rapid load tests (RLT), or dynamic load tests (DLT)…..

- **455-54 Foundation Certification Packages.**

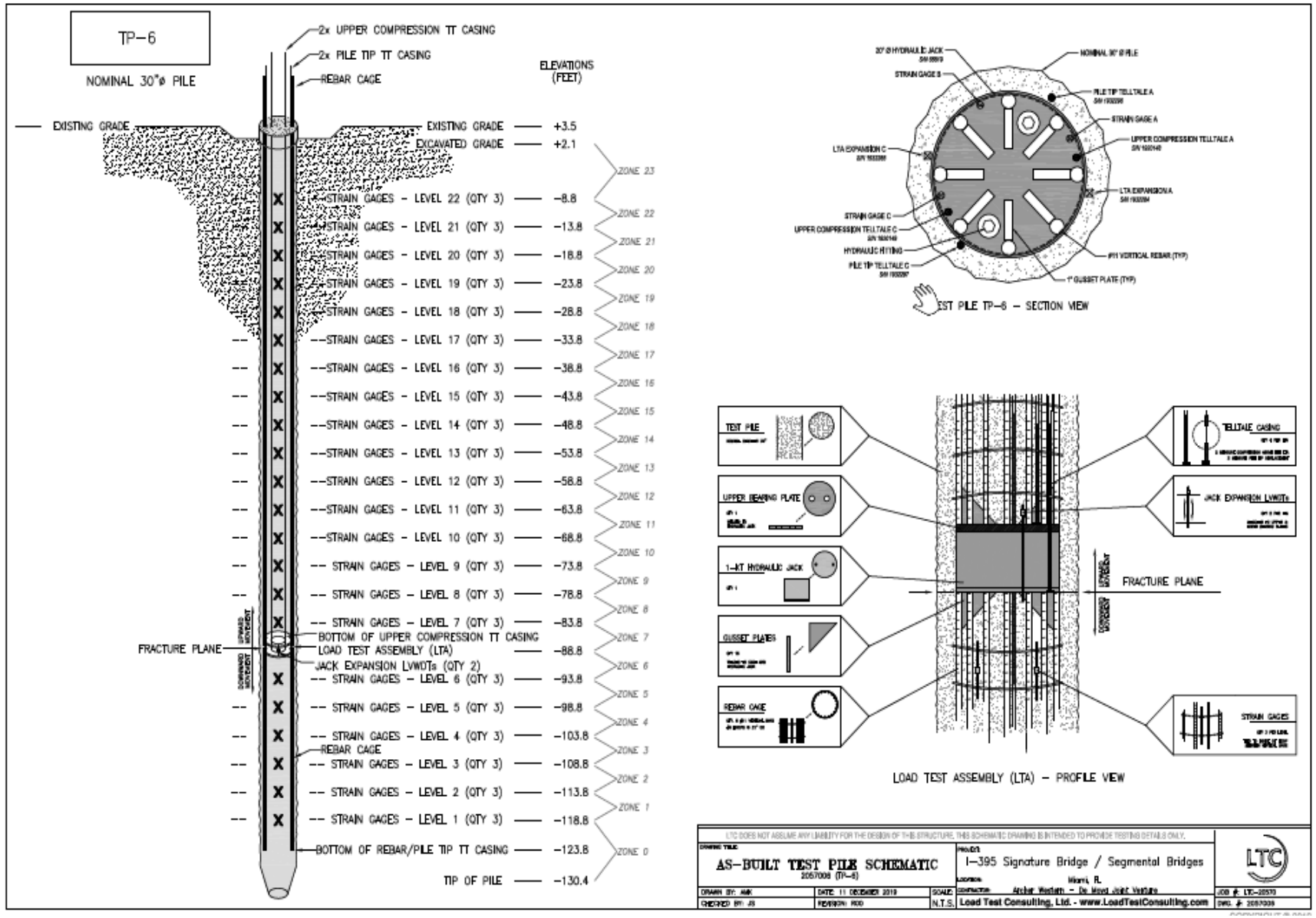
Submit certification packages signed and sealed by the GFDEOR to the Engineer certifying each foundation unit has the required axial capacity, torsional capacity, uplift capacity, overturning and lateral stability, integrity deficiencies have been corrected, and settlements will not affect the functionality of the structure. A separate Foundation Certification Package must be submitted for each foundation unit.

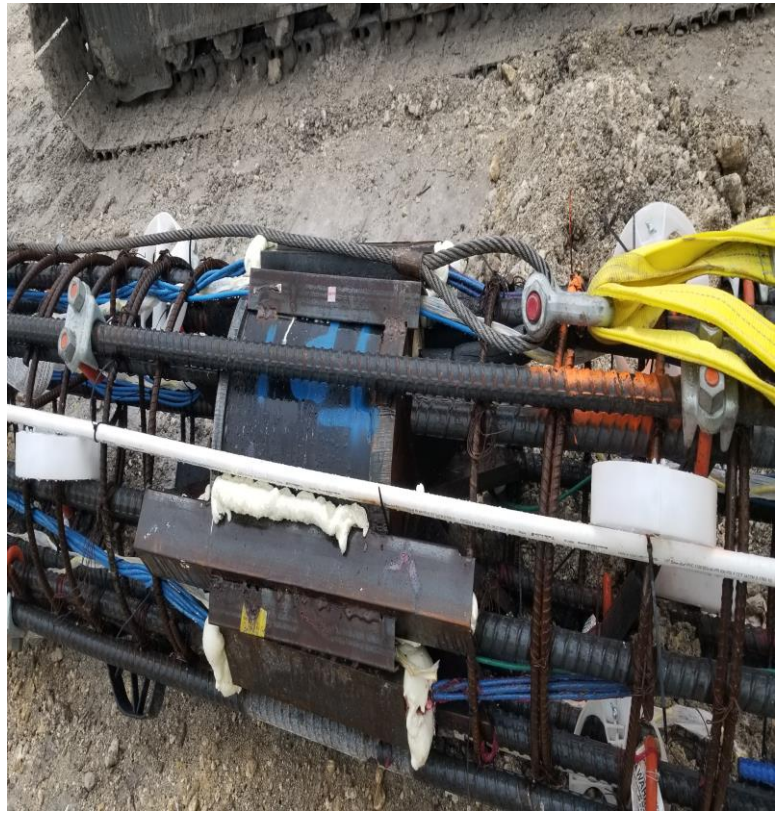


Axial Load Testing

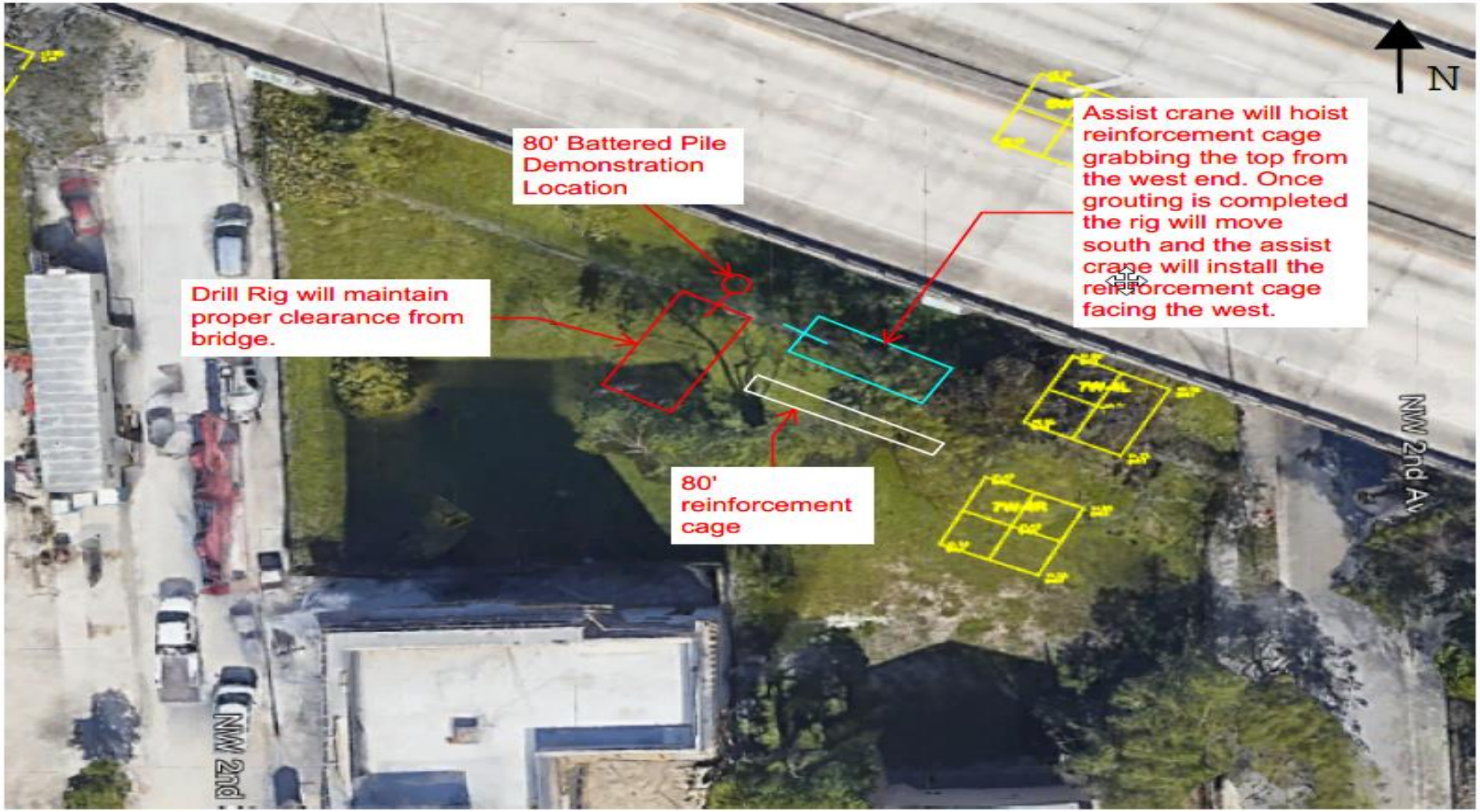
- Load testing performed in general compliance with ASTM D 8169 titled Standard Test Methods for Deep Foundations Under Bi-Directional Static Axial Compressive Load using the Quick Load Test Method (Procedure A).

Bi-Directional Load Test

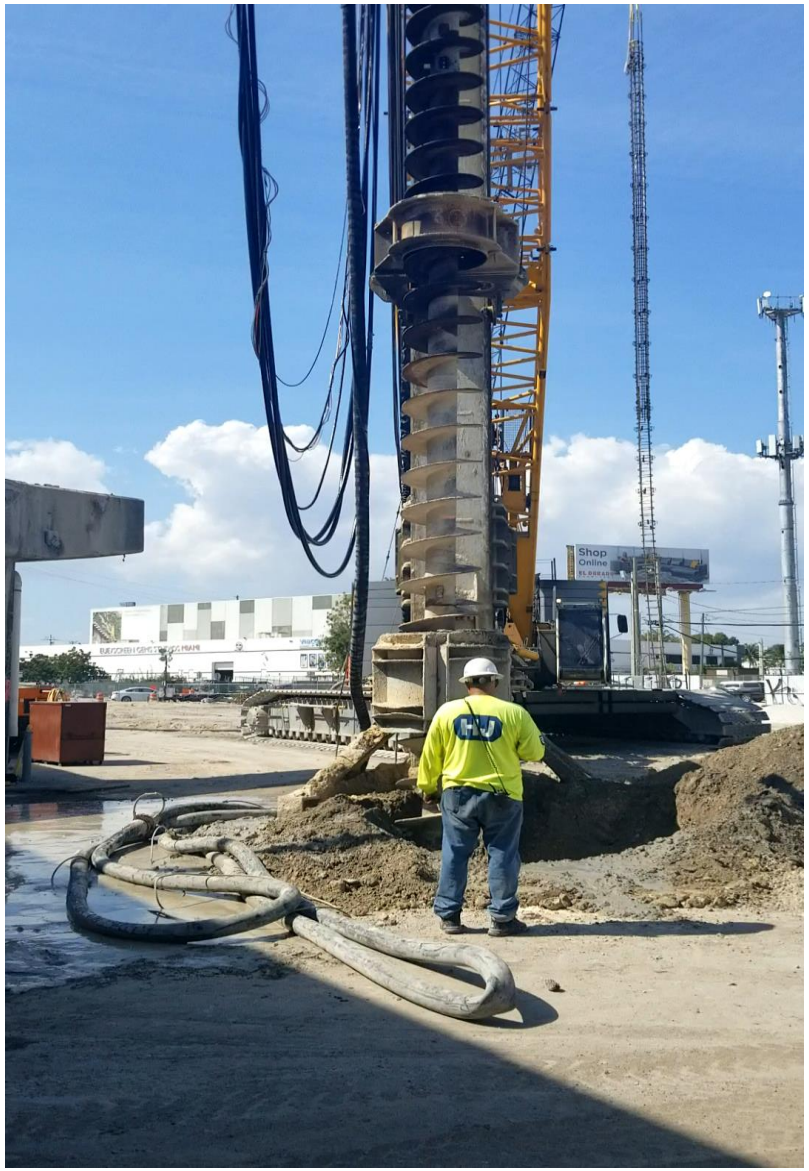




Demonstration Piles



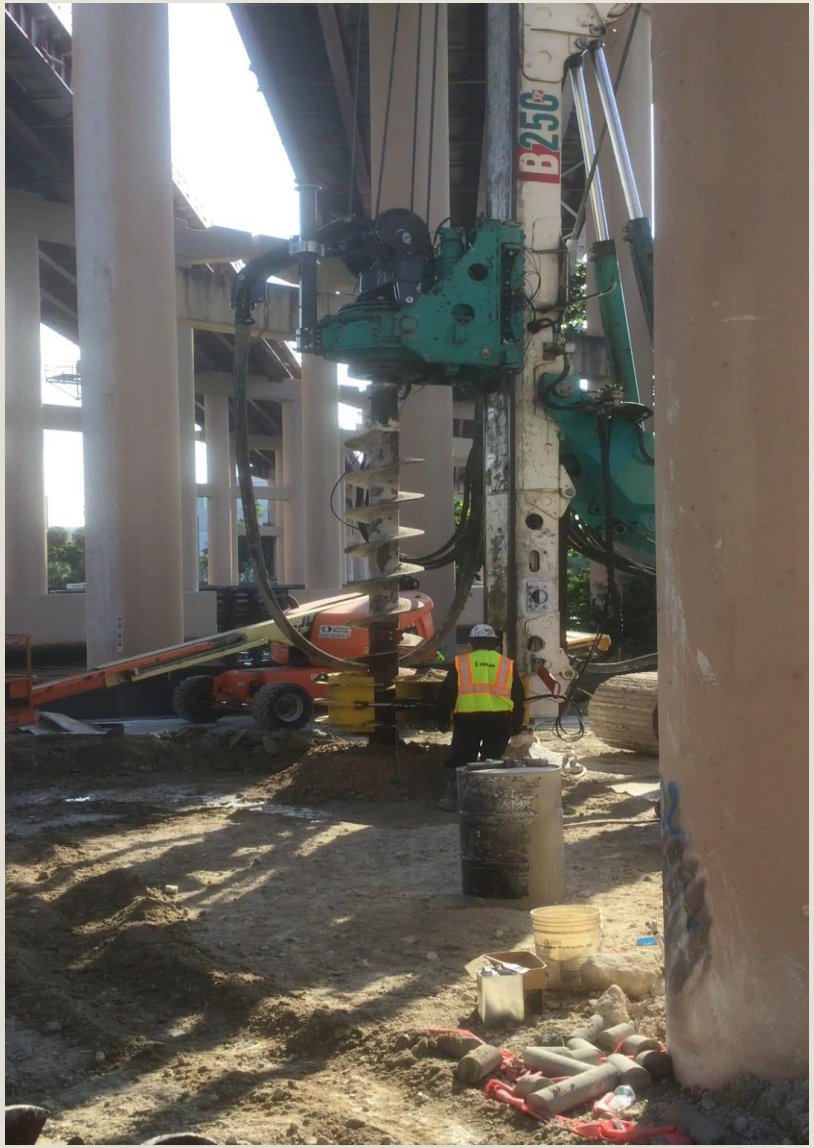
Auger Cast Pile Installation



Auger Cast Pile Installation

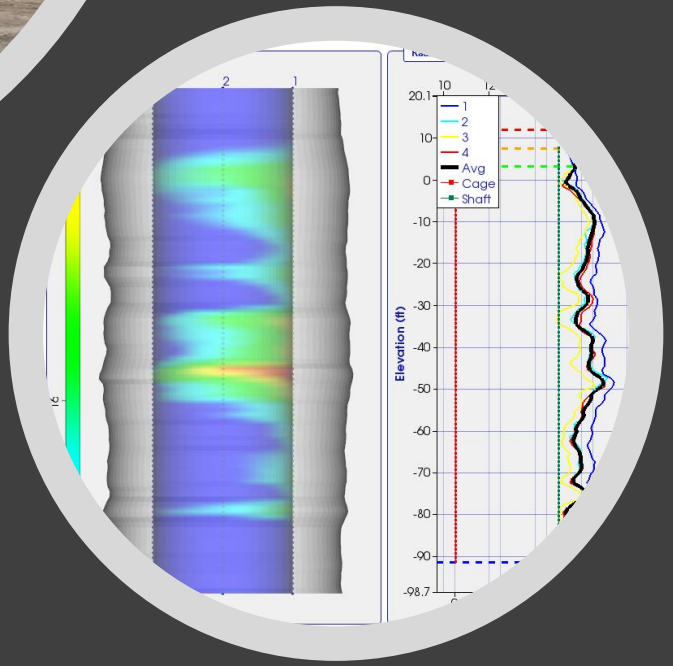
Auger Cast Pile Installation

Low Headroom Auger Cast Pile Installation



Low Headroom Auger Cast Pile Installation

Quality Control During Construction



- Auger Cast in-Place Pile installation Record
- AME Data Analysis
- Thermal Integrity Profiler (TIP) Testing
- Auger Cast Pile Coring
- Proof Testing to FDL

Auger Cast Pile Inspector Logs (ACP Form No. 700-011-03)

Florida Department of Transportation

Auger Cast-In-Place Pile Installation Record

Pile Number / ID: **28** | 700-011-03 Construction 04/2020 | Page: 1

PROJECT:

FPID Number:	251688-1-52-01	Structure No:	871305	Pile No:	28
Project Descr.:	I-395 from I-95 to McArthur Causeway Bridge	Pier No:	Center Pier	Pile Location:	STA. 1065+99.48
Contractor:	Archer Western-De Moya JV	Type of ACP:	Production	Installation Date:	4/8/20
Inspector Names & TIN's:	Jose Hernandez H65543389				

THEORETICAL: calculated OGF Vol. & Strokes

SEGMENTS (No. of Segments) ↓	OGF (%)	VOL (cu ft)	PUMP STROKES	THEOR. 100% Vol. (cu ft)
5-ft INCR above MGRD (2)	100	35.34	25	35.34
5-ft Bot INCR (24)	120	42.41	30	35.34
1-ft Bot INCR (0.5)	120	8.48	6	7.07
PILE Volumes & Stroke TOTALS:		1121.06	790	950.72
Theor. total OG target = 117.9 %		OGF vol.	Strokes	100% vol.

OGF= Overgrout Factor MGRD = Min. Grout Return Depth

	Segment Length (ft):	5.00
OGF	Reduced OGF (above 14 ft) depth:	1.00
OGF	OGF (Below 14 ft depth):	1.20
Head	MGRD = Initial Grout Head (ft):	14
Head	Theor. Initial Pump Count (strokes):	70
	Pressure Gage Location (descr.):	on-line hose
	Screen with ≤ 3/4" mesh at pump? (Y/N):	Y
	Grout Design Strength (psi):	8000
	Min. Tip EL (ft):	-130.00
	Battered Pile? N V= H=	
	Plumb Pile: Batter Ratio, R = 1.0000	

Drill Rig ID: LR1300

PUMP CALIBRATION

VOL of Container (filled) (cu ft):	5.68
STROKES to Fill Cont. (strokes):	4.00
PUMP CAL (cu ft/stroke):	1.42
Flowmeter Reading VOL (cu ft):	5.70
Pump strokes needed to prime:	40
Min.Flow cone test req. (sec) ≥	15

Nom. Bearing Resist. (tons):	1465
Min. Rock Socket Length (ft):	

INSTALLATION DATA

PLAN	Plan Top Elev. (ft, NGVD):	-14.80
	Plan/Authorized Pile Length (ft):	115.20
	Plan/Authorized Pile Tip Elev. (ft, NGVD):	-130.00
	Plan Pile Diameter (ft):	3.00
DRILLING	GSE (ft, NGVD):	3.58
	Drilling START (time):	9:23 PM
	Auger Rate (fpm):	1.84
	Drilling FINISH (time):	10:36 PM
	Drilling TIME (min.):	73
	Actual Pile Dia. (ft):	3.00
	Actual Drilled Pile Top Elev. (ft, NGVD):	3.58
	Excess Upper Length (above Plan Top) (ft):	18.38
	Actual Pile Length (Actual Drilled Depth) (ft):	134.50
	Actual Pile Tip Elev. (ft, NGVD):	-130.92

FEEDBACK

- Actual Pile Length (ft) & Segment Length (ft) input is complete.
- Actual Pile Dia. = Plan Pile Dia., meets Std Spec 455-44.1.
- Note: ACTUAL initial pump count OK, > or = THEORETICAL (Min. Req'd Grout Head)
- Actual Grout volume placed is OK. All incr. segments are > or = the min. Theoretical OGF volume req'd.
- Auger Depth @ Grout Return > or = the 'Min. Req'd Grout Head' (14 ft) input above.
- Reinf. Placement Time after Grout Placement = 6 min. (info. only)
- PASS - Flowmeter Reading VOL vs VOL of Container (< or = 3%) (0.35 %).
- Note: Qty of (26) 5-ft segments, in this 134.5-ft pile, with a bottom 4.5-ft partial segment.
- ACTUAL Tip Elev = or deeper than Plan/Authorized Tip Elev.

			Truck 1	Truck 2	Truck 3	Truck 4	Truck 5	Truck 6
GROUT	Plant No.:	87-564						
	Delivery Ticket No.:		1500	1501	1502	1503	1504	1505
	Batch (time):		9:15 PM	9:23 PM	9:41 PM	9:50 PM	9:56 PM	10:04 PM
	Arrive (time):		9:49 PM	10:07 PM	10:16 PM	10:27 PM	10:32 PM	10:35 PM
	Volume Delivered (cu yds):		8.0	8.0	8.0	8.0	8.0	8.0
	Flow Cone Test (sec):	(Flow Cone Test(s) PASSED ≥15 sec)	24	23	33	21	23	22
	Grout Temp. (°F):		87	82	85	84	83	83
	Grout Cylinders LOT (ID):		CAG60071Q	CAG60071Q	CAG60071Q	CAG60071Q	CAG60071Q	CAG60071Q
	START Depth (ft) (for each Truckload):		134.5	128	105	84	60	37
	Placement START (time):	10:47 PM	10:47 PM	10:53 PM	11:00 PM	11:07 PM	11:13 PM	11:19 PM
	Starting Pressure (psi):		380	380	380	380	350	350
	Priming Pump Count (strokes):	40						
	Actual Initial Pump Count (strokes):	80						
	Auger Depth @ Grout Return (ft):	61						
	Truck Empty (time):		10:53 PM	11:00 PM	11:07 PM	11:13 PM	11:19 PM	11:25 PM
	Placement FINISH (time):	11:29 PM	10:53 PM	11:00 PM	11:07 PM	11:13 PM	11:19 PM	11:25 PM
	Placement TIME (Start-to-Finish) (min.):	42	6	7	7	6	6	6
	Mixer TIME (Batch-to-Truck empty) (hrs.):		1.63	1.62	1.43	1.38	1.38	1.35
			Mixer TIME limit = 2.0 hrs, when agitated or mixed continually (Grout temp from 70 - 100 °F)	Mixer TIME limit = 2.0 hrs, when agitated or mixed continually (Grout temp from 70 - 100 °F)	Mixer TIME limit = 2.0 hrs, when agitated or mixed continually (Grout temp from 70 - 100 °F)	Mixer TIME limit = 2.0 hrs, when agitated or mixed continually (Grout temp from 70 - 100 °F)	Mixer TIME limit = 2.0 hrs, when agitated or mixed continually (Grout temp from 70 - 100 °F)	Mixer TIME limit = 2.0 hrs, when agitated or mixed continually (Grout temp from 70 - 100 °F)
STEEL	Reinf. Condition Satisfactory? (Y or N):	Y						
	Reinf. Placement START (time):	11:30 PM						
	Reinf. Placement FINISH (time):	11:35 PM						
	Use "Reinforcement and Spacers" section for additional information							
TEST	LOT Grout Strength Testing result(s) ≥ 8000 psi :							
	Does the Grout Meet the Minimum Required Strength? (Y or N) :							

FPID: 251688-1-52-01 | I-395 from I-95 to McArthur Causeway Bridge | Structure No: 871305 | Pier No: Center Pier | Pile No: 28 | Page: 2

Type of PUMP COUNT input = 'INCREMENTAL': I

DRILLING & GROUTING TABLE	DEPTH (ft) Below Top	DEPTH (ft) Top of Segment	SEGMENT EL (ft, NGVD)	SOIL Cond. (S, M, or H)	GROUT Pressure (psi)	PUMP COUNT INCR. (Per 5 ft)	PUMP COUNT ACCRUED (SUM)	GROUT VOLUMES INCREMENTAL Theor. (cu ft)	INCREMENTAL Actual (cu ft)	INCREMENTAL Actual % Theor.	ACCRUED Actual (cu ft)	DRILLING & GROUTING - Notes / Comments:
	0	(Pile TOP)	3.58	Soil Cond.: Start input at Pile TOP, Grout Pump Count: start input at Pile BOTTOM								Transitional OGF of 1.04 (104%) applies to the 15 - 10 ft segment only. Ground Pump Count required for Transitional Increment = 26 strokes
	5	0	-1.42	S	350	25	857	35.34	35.50	100 %	1216.94	
	10	5	-6.42	S	350	26	832	35.34	36.92	104 %	1181.44	
	15	10	-11.42	S	350	30	806	35.34	42.60	121 %	1144.52	
	20	15	-16.42	M	350	30	776	35.34	42.60	121 %	1101.92	
	25	20	-21.42	M	350	30	746	35.34	42.60	121 %	1059.32	
	30	25	-26.42	M	350	31	716	35.34	44.02	125 %	1016.72	
	35	30	-31.42	M	350	30	685	35.34	42.60	121 %	972.70	
	40	35	-36.42	H	350	32	655	35.34	45.44	129 %	930.10	
	45	40	-41.42	H	350	30	623	35.34	42.60	121 %	884.66	
	50	45	-46.42	H	350	33	593	35.34	46.86	133 %	842.06	
	55	50	-51.42	H	350	32	560	35.34	45.44	129 %	795.20	
	60	55	-56.42	H	350	33	528	35.34	46.86	133 %	749.76	
	65	60	-61.42	H	350	32	495	35.34	45.44	129 %	702.90	
	70	65	-66.42	H	350	30	463	35.34	42.60	121 %	657.46	
	75	70	-71.42	H	350	32	433	35.34	45.44	129 %	614.86	
	80	75	-76.42	H	350	33	401	35.34	46.86	133 %	569.42	
	85	80	-81.42	H	380	33	368	35.34	46.86	133 %	522.56	
	90	85	-86.42	H	380	33	335	35.34	46.86	133 %	475.70	
	95	90	-91.42	H	380	34	302	35.34	48.28	137 %	428.84	
	100	95	-96.42	H	380	35	268	35.34	49.70	141 %	380.56	
	105	100	-101.42	H	380	33	233	35.34	46.86	133 %	330.86	
	110	105	-106.42	H	380	33	200	35.34	46.86	133 %	284.00	
	115	110	-111.42	H	380	34	167	35.34	48.28	137 %	237.14	
	120	115	-116.42	H	380	33	133	35.34	46.86	133 %	188.86	
	125	120	-121.42	H	380	33	100	35.34	46.86	133 %	142.00	
	130	125	-126.42	H	380	34	67	35.34	48.28	137 %	95.14	
	134.5	130	-130.92	H	380	33	33	31.81	46.86	147 %	46.86	
		-										
		-										
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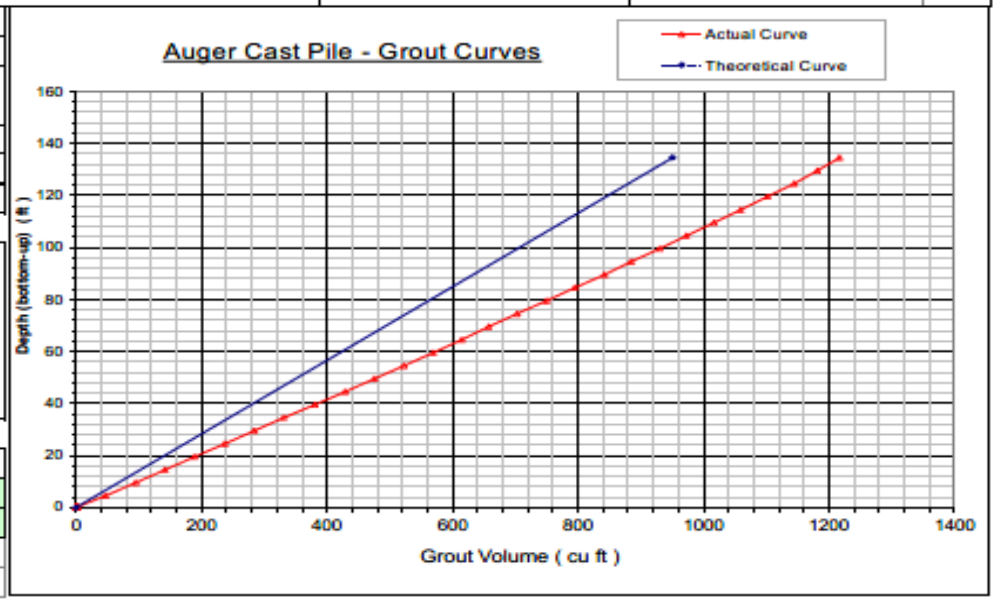
Auger Cast Pile Inspector Logs (ACP Form No. 700-011-03)

FPID : 251688-1-52-01	I-395 from I-95 to McArthur Causeway Bridge	Structure No: 871305	Pier No: Center Pier	Pile No: 28	Page: 3

GROUT VOLUME PLACEMENT RESULTS

SEGMENTS Above & Below MGRD (MGRD = 14-ft)	VOLUMES (cu ft) Actual Placed	VOLUMES (cu ft) Theor. Vol.	% THEORETICAL OGF %	% THEORETICAL Actual OG %	% THEORETICAL % Under or Over	ACCEPTANCE Min. % Placed	ACCEPTANCE P/F
Above 14-ft	106.5	99.0	100	107.6 %	7.6 %	100 %	Pass
Below 14-ft	1110.4	851.8	120	130.4 %	10.4 %	121 %	Pass
Total Pile	1216.9	950.7	(118)	(128)	Pile Pass/Fail:		Pass



Load Tests & Non-Destructive Integrity Testing:

- [ ] Thermal Integrity Testing: 455-51
- [ ] Compression Load Test: 455-49.1
- [ ] Tensile Load Test: 455-49.2

(Include Testing Notes, and reference Test Report(s), as applicable)

FINAL ACEPTANCE	Pile Not Yet Accepted
Accepted or Rejected ? (input "A" or "R"):	
Pile Acceped or Rejected (date):	
Comments:	

Avg. LOT Compressive Strength f'c av. for pay reduction		<<< -----(Enter Avg. LOT Comp. Strength to compute payment reduction)
Total Reduction in Payment (RC)(if applicable):	f'c av. not input	

(When grout acceptance test strength test is >500 psi below the required grout strength, refer to article 455-43)

Unit Cost of Pile (UC, $/ft): Equivalent Pile Length Reduction (PLR, ft):

(when separate payment for ACPs is provided, refer to article 455-43)

ADDITIONAL INFORMATION AND NOTES

REINFORCEMENT AND SPACERS

Long. Steel Rebar Diameter:	2.50	in	Long. Steel length:	135.58	ft	Tie Bar diameter:	0.63	in	# of Tie Bars:	207	Tie bar spacings (range if variable)	4 to 12	in		
# of Longitudinal Bars:	8		Spacer Diameter:	8	in	# spacer rows:	15		# spacers/row:	4	Total Spacers: 60				

	NOTES
1	Grout mix ACPG-114 was used. Grout was supplied by Archer Western.
2	Grout pump #26 was used.
3	Piling Contractor withdraw the auger to 120 feet below existing grade after reaching pile drilled tip elevation at 10:36 PM. Auger was lowered to pile drilled tip elevation at 10:43 PM.
4	A total of (120) strokes were pumped at the tip before beginning withdraw of auger. (40) strokes for prime and (80) strokes for initial head.
5	The reinforcement cage was lowered to the planned elevation under its own weight. Top of reinforcing steel elevation was verified by the Piling Contractor.
6	
7	
8	On date 4/9/2020 around two hours after installing CP-36, it was noticed that grout level had dropped below watertable and was measured to be aout 14.5 feet below grade.
9	Piling Contractor is aware and will correct the issue.
10	

Auger Cast Pile Inspector Logs (ACP Form No. 700-011-03)

Florida Department of Transportation

Auger Cast-In-Place Pile Installation Record

Pile Number / ID: **11** | 700-011-03 Construction 12/19 | Page: 1

PROJECT:

FPID Number:	251688-1-52-01	Structure No:	871199	Pile No:	11
Project Descr.:	I-395 from I-95 to McArthur Causeway Bridge	Pier No:	4-13	Pile Location:	STA. 4054+83.95
Contractor:	Archer Western-De Moya JV	Type of ACP:	Production	Installation Date:	1/15/20
Inspector Names & TIN's:	Gaetano Di Zio D20028061				

THEORETICAL: calculated OGF Vol. & Strokes

SEGMENTS (*) No. of Segments) ↓	OGF (%)	VOL (cu ft)	PUMP STROKES	THEOR. 100% Vol. (cu ft)
5-ft INCR above MGRD (2)	100	24.54	17	24.54
5-ft Bot INCR (19)	120	29.45	20	24.54
1-ft Bot INCR (1)	120	5.89	4	4.91
PILE Volumes & Stroke TOTALS:		642.06	422	544.87
Theor. total OG target = 117.8 %		OGF vol.	Strokes	100% vol.

OGF= Overgrout Factor MGRD = Min. Grout Return Depth

	Segment Length (ft):	5.00
OGF	Reduced OGF (above 12 ft) depth:	1.00
	OGF (Below 12 ft depth):	1.20
Hand	MGRD = Initial Grout Head (ft):	12
	Theor. Initial Pump Count (strokes):	39
	Pressure Gage Location (descr.):	on-line hose
	Screen with ≤ 3/4" mesh at pump? (Y/N):	Y
	Grout Design Strength (psi):	5500
	Min. Tip EL (ft):	-100.00
	Battered Pile? N V= H= Plumb Pile: Batter Ratio, R = 1.0000	

PUMP CALIBRATION

VOL of Container (filled) (cu ft):	6.09
STROKES to Fill Cont. (strokes):	4.00
PUMP CAL (cu ft/stroke):	1.52
Flowmeter Reading VOL (cu ft):	6.08
Pump strokes needed to prime:	34
Min.Flow cone test req. (sec) ≥	15

Nom. Bearing Resist. (tons):	859
Min. Rock Socket Length (ft):	

INSTALLATION DATA

PLAN: Plan Top Elev. (ft, NGVD):	-4.83
Plan/Authorized Pile Length (ft):	95.17
Plan/Authorized Pile Tip Elev. (ft, NGVD):	-100.00
Plan Pile Diameter (ft):	2.50
DRILLING: GSE (ft, NGVD):	9.33
Drilling START (time):	5:27 AM
Auger Rate (fpm):	4.1
Drilling FINISH (time):	5:54 AM
Drilling TIME (min.):	27
Actual Pile Dia. (ft):	2.50
Actual Drilled Pile Top Elev. (ft, NGVD):	9.33
Excess Upper Length (above Plan Top) (ft):	14.16
Actual Pile Length (Actual Drilled Depth) (ft):	111.00
Actual Pile Tip Elev. (ft, NGVD):	-101.67

FEEDBACK

- Actual Pile Length (ft) & Segment Length (ft) input is complete.
- Actual Pile Dia. = Plan Pile Dia., meets Std Spec 455-44.1.
- Note: ACTUAL initial pump count OK, > or = THEORETICAL (Min. Req'd Grout Head)
- Actual Grout Vol. placed < the OGF Theor. Vol. in 1 or more segments. Redrill & Regrout per Std Spec 455.
- Auger Depth @ Grout Return > or = the 'Min. Req'd Grout Head' (12 ft) input above.
- Reinf. Placement Time after Grout Placement = 7 min. (info. only)
- PASS - Flowmeter Reading VOL vs VOL of Container (< or = 3%) (-0.16 %).
- Note: Qty of (22) 5-ft segments, in this 111-ft pile, with a bottom 1-ft partial segment.
- ACTUAL Tip Elev = or deeper than Plan/Authorized Tip Elev.

GROUT			Truck 1	Truck 2	Truck 3	Truck 4	Truck 5	Truck 6
Plant No.:	87-554		24596	24597	24598	24599		
Delivery Ticket No.:			4:33 AM	4:49 AM	5:01 AM	5:13 AM		
Batch (time):			5:02 AM	5:14 AM	5:34 AM	5:48 AM		
Arrive (time):			8.0	8.0	8.0	6.0		
Volume Delivered (cu yds):			39	37	34	28		
Flow Cone Test (sec):	[Flow Cone Test(s) PASSED ≥15 sec]		79	79	78	77		
Grout Temp. (°F):			CAG6A0093Q	CAG6A0093Q	CAG6A0093Q	CAG6A0093Q		
Grout Cylinders LOT (ID):			111	100	71	37		
START Depth (ft) (for each Truckload):			6:15 AM	6:19 AM	6:24 AM	6:29 AM		
Placement START (time):		6:15 AM	400	600	560	560		
Starting Pressure (psi):								
Priming Pump Count (strokes): (low)		0						
Actual Initial Pump Count (strokes):		60						
Auger Depth @ Grout Return (ft):		41						
Truck Empty (time):			6:19 AM	6:24 AM	6:29 AM	6:33 AM		
Placement FINISH (time):		6:33 AM	6:19 AM	6:24 AM	6:29 AM	6:33 AM		
Placement TIME (Start-to-Finish) (min.):		18	4	5	5	4		
Mixer TIME (Batch-to-Truck empty) (hrs.):			1.77	1.58	1.47	1.33		
STEEL: Reinf. Condition Satisfactory? (Y or N):		Y	Mixer TIME limit = 2.0 hrs. when agitated or mixed continually (Grout temp from 70 - 100 °F)	Mixer TIME limit = 2.0 hrs. when agitated or mixed continually (Grout temp from 70 - 100 °F)	Mixer TIME limit = 2.0 hrs. when agitated or mixed continually (Grout temp from 70 - 100 °F)	Mixer TIME limit = 2.0 hrs. when agitated or mixed continually (Grout temp from 70 - 100 °F)		
Reinf. Placement START (time):		6:34 AM						
Reinf. Placement FINISH (time):		6:40 AM						
Use "Reinforcement and Spacers" section for additional information								
TEST: LOT Grout Strength Testing result(s) ≥ 5500 psi :								
Does the Grout Meet the Minimum Required Stength? (Y or N):								

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Type of PUMP COUNT input = 'INCREMENTAL' : I

DRILLING & GROUTING TABLE

DEPTH (ft) Below Top	Top of Segment	SEGMENT EL (ft, NGVD)	SOIL Cond. S, M, or H	GROUT Pressure (psi)	PUMP COUNT INCR. (Per 5 ft)	PUMP COUNT ACCRUED (SUM)	GROUT VOLUMES INCREMENTAL Theor. (cu ft)	INCREMENTAL Actual (cu ft)	INCREMENTAL Actual % Theor.	ACCRUED Actual (cu ft)	DRILLING & GROUTING - Notes / Comments:
0	(Pile TOP)	9.33	Soil Cond.: Start input at Pile TOP,	Grout Pump Count: start input at Pile BOTTOM.							Transitional OGF of 1.12 (112%) applies to the 15 - 10 ft segment only. Grount Pump Count required for Transitional Increment = 19 strokes
5	0	4.33	S	560	0	451	24.54	0.00	0 %	686.65	
10	5	-0.67	S	560	0	451	24.54	0.00	0 %	686.65	See Note 5
15	10	-5.67	M	560	19	451	24.54	28.93	118 %	686.65	
20	15	-10.67	M	560	20	432	24.54	30.45	124 %	657.72	
25	20	-15.67	H	560	20	412	24.54	30.45	124 %	627.27	
30	25	-20.67	H	560	22	392	24.54	33.50	136 %	596.82	
35	30	-25.67	H	560	23	370	24.54	35.02	143 %	563.33	
40	35	-30.67	H	560	22	347	24.54	33.50	136 %	528.31	
45	40	-35.67	H	560	20	325	24.54	30.45	124 %	494.81	
50	45	-40.67	H	560	21	305	24.54	31.97	130 %	464.36	
55	50	-45.67	H	560	22	284	24.54	33.50	136 %	432.39	
60	55	-50.67	H	560	22	262	24.54	33.50	136 %	398.90	
65	60	-55.67	H	560	22	240	24.54	33.50	136 %	365.40	
70	65	-60.67	H	560	25	218	24.54	38.06	155 %	331.91	
75	70	-65.67	H	600	22	193	24.54	33.50	136 %	293.84	
80	75	-70.67	H	600	21	171	24.54	31.97	130 %	260.35	
85	80	-75.67	H	600	23	150	24.54	35.02	143 %	228.38	
90	85	-80.67	H	600	22	127	24.54	33.50	136 %	193.36	
95	90	-85.67	H	600	25	105	24.54	38.06	155 %	159.86	
100	95	-90.67	H	600	27	80	24.54	41.11	167 %	121.80	
105	100	-95.67	H	600	23	53	24.54	35.02	143 %	80.69	
110	105	-100.67	H	600	25	30	24.54	38.06	155 %	45.68	
111	110	-101.67	H	600	5	5	4.91	7.61	155 %	7.61	

Auger Cast Pile Inspector Logs (ACP Form No. 700-011-03)

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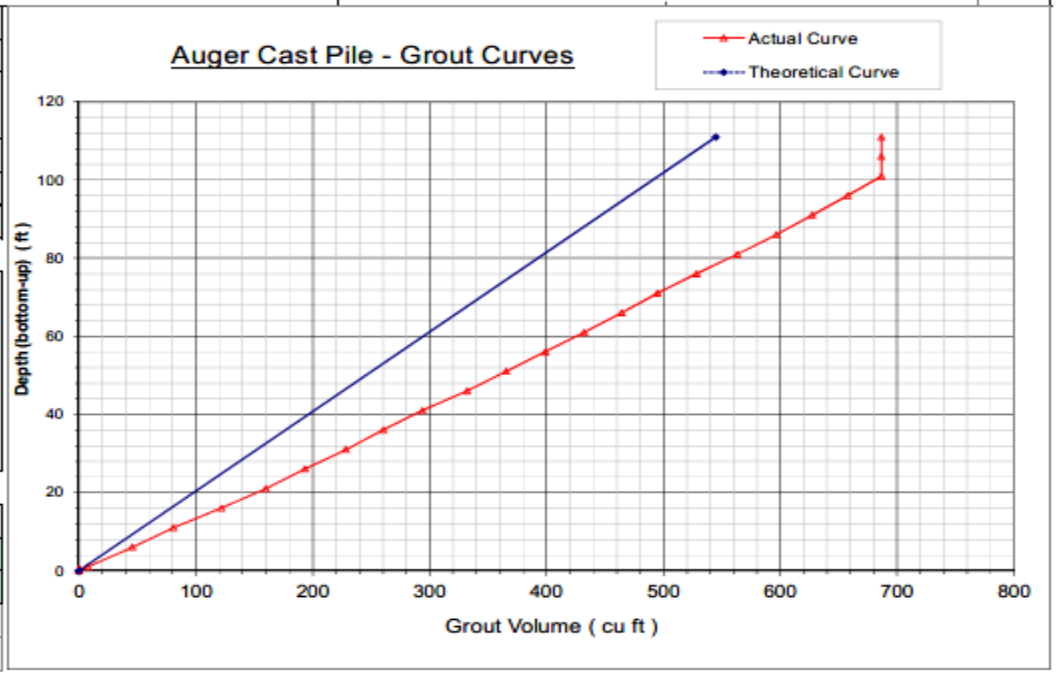
GROUT VOLUME PLACEMENT RESULTS

SEGMENTS Above & Below MGRD (MGRD = 12-ft)	VOLUMES (cu ft) Actual Placed	Theor. Vol.	% THEORETICAL OGF %	Actual OG %	% Under or Over	ACCEPTANCE Min. % Placed	P/F
Above 12-ft	11.6	58.9	100	19.6 %	-80.4 %	0 %	Fail
Below 12-ft	675.1	486.0	120	138.9 %	18.9 %	124 %	Pass
Total Pile	686.6	544.9	(118)	(126)	Pile Pass/Fail:		Fail



Load Tests & Non-Destructive Integrity Testing:

- [ ] Thermal Integrity Testing: 455-51
- [ ] Compression Load Test: 455-49.1
- [ ] Tensile Load Test: 455-49.2

(Include Testing Notes, and reference Test Report(s), as applicable)

FINAL ACEPTANCE	Pile Not Yet Accepted
Accepted or Rejected ? (input "A" or "R"):	
Pile Acceped or Rejected (date):	
Comments:	

Avg. LOT Compressive Strength f'c av. for pay reduction		<<< ----(Enter Avg. LOT Comp. Strength to compute payment reduction)
Total Reduction in Payment (RC)(if applicable):	f'c av. not input	

(When grout acceptance test strength test is >500 psi below the required grout strength, refer to article 455-43)

Unit Cost of Pile (UC, $/ft): Equivalent Pile Length Reduction (PLR, ft):

(when separate payment for ACPs is provided, refer to article 455-43)

ADDITIONAL INFORMATION AND NOTES

REINFORCEMENT AND SPACERS

Long. Steel Rebar Diameter:	1.41	in	Long. Steel length:	110.08	ft	Tie Bar diameter:	0.63	in	# of Tie Bars:	238	Tie bar spacings (range if variable)	5	in				
# of Longitudinal Bars:	4 to 8		Spacer Diameter:	8	in	# spacer rows:	21		# spacers/row:	4	Total Spacers: 84						

	NOTES
1	Grout mix MACPX4A was used. Grout was supplied by Archer Western.
2	Grout pump #23 was used.
3	Pump line was clogged during the initial head at 5:59 AM (14 strokes). The Contractor withdrew the auger and corrected this issues. Auger was reinserted at 6:06 AM.
4	A total of (60) strokes were pumped at the tip before beginning withdraw of auger for initial head. Prime not needed since the pump line was full of grout. Grout line priming performed in previous pile.
5	Contractor ran out of grout at approximately 10 feet below existing grade.
6	#5 stirrups @ 5" o.c. in lieu of the #6 stirrups @ 8" o.c. specified in the design plans were used as per RFI-00093 dated 01/02/20.
7	The reinforcement cage was lowered to the planned elevation under its own weight reaching the drilled tip of pile. Top of reinforcing steel elevation was verified by the Piling Contractor.
8	

Automated Monitoring Equipment (AME) & Data

1. auger rotation speed;
2. auger penetration and withdrawal rate;
3. torque delivered to the auger;
4. crowd force (downward thrust on auger) for bridge foundation
5. depth of the auger injection point;
6. grout injection rate;
7. volume of grout for each foot of pile;
8. cumulative volume of grout; and
9. grout pressure.

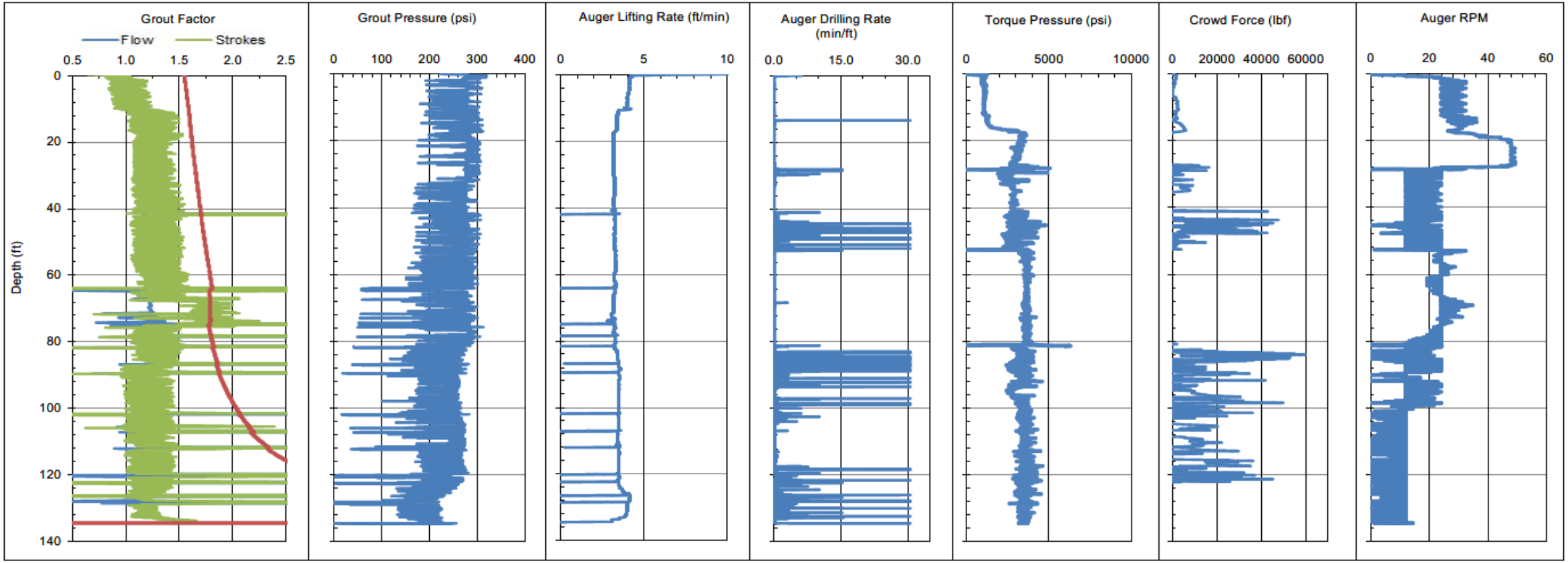
Automated Monitoring Equipment (AME) Data

HJ FOUNDATION
A KELLER COMPANY

Pile Installation Report

Miami Signature Bridge

Pile Name:	CP-56	**Target Grout Factor:**	1.46	**Crane #:**	LR1300	**Installation Date:**	3/23/2019
Job No.:	Miami Signature Br	**Total Grout Factor:**	1.55	**Gear Box #:**		**Diameter:**	36 IN
Install Method:	Auger Cast	**Pump #/Cal. Factor:**	26/1.42	**Power Unit #:**	23	**Length:**	134.48 FT



AME Drilling Data

	Time	Duration (min)	Gear Box RPM	Penetration Rate (ft/min)	Penetration	Depth (ft)	Gear Box Pres	Torque (ft-lbs)	Crowd Pressure (psi)	Thrust (lbs)
2	3/24/2020 1:33:19 AM	0	0	0	3.048	0	122.8469319	0	-28.2823515	-438.49
3	3/24/2020 1:33:20 AM	0.02	0	0.164042	6.096	0.0328084	74.1142647	0	4.351131	67.4599
4	3/24/2020 1:33:21 AM	0.03	0	1.968504	0.508	0.1312336	109.2133881	0	56.1295899	870.233
5	3/24/2020 1:33:22 AM	0.05	0	4.4947508	0.2224818	0.1968504	117.3354993	0	63.3814749	982.666
6	3/24/2020 1:33:23 AM	0.07	0	3.937008	0.254	0.1968504	125.8927236	0	-4.6412064	-71.957
7	3/24/2020 1:33:24 AM	0.08	0	1.2467192	0.8021053	0.1968504	75.8547171	0	-92.2439772	-1430.2
8	3/24/2020 1:33:25 AM	0.1	0	0	3.048	0.1968504	111.0988782	0	-126.6179121	-1963.1
9	3/24/2020 1:33:26 AM	0.12	0	0	3.048	0.1968504	102.1065408	0	-116.4652731	-1805.7
10	3/24/2020 1:33:27 AM	0.13	0	0	3.048	0.1968504	1245.43873	0	-116.4652731	-1805.7
11	3/24/2020 1:33:28 AM	0.15	0	0	3.048	0.1968504	705.8984859	0	-99.7859376	-1547.1
12	3/24/2020 1:33:29 AM	0.17	0	1.0498688	0.9525	0.2624672	445.1207013	0	-18.9999387	-294.58
13	3/24/2020 1:33:30 AM	0.18	8.4	4.0026248	0.2498361	0.4265092	901.6993809	0	72.3738123	1122.08
14	3/24/2020 1:33:31 AM	0.2	12	7.1194228	0.1404608	0.5577428	825.264513	0	116.4652731	1805.68
15	3/24/2020 1:33:32 AM	0.22	12	8.5958008	0.1163359	0.7217848	883.5696684	0	105.4424079	1634.78
16	3/24/2020 1:33:33 AM	0.23	20.4	9.1207352	0.1096403	0.8858268	955.6534053	0	88.472997	1371.69
17	3/24/2020 1:33:34 AM	0.25	24	9.5472444	0.1047423	1.0498688	1180.316803	0	103.9920309	1612.29
18	3/24/2020 1:33:35 AM	0.27	21.6	9.84252	0.1016	1.2139108	1003.515846	0	94.274505	1461.63
19	3/24/2020 1:33:36 AM	0.28	24	10.334646	0.0967619	1.3779528	989.8823025	0	116.9003862	1812.42
20	3/24/2020 1:33:37 AM	0.3	27.6	11.154856	0.0896471	1.6076116	998.2944891	0	105.2973702	1632.53
21	3/24/2020 1:33:38 AM	0.32	27.6	11.4501316	0.0873352	1.7716536	965.5159689	0	74.4043401	1153.56
22	3/24/2020 1:33:39 AM	0.33	26.4	10.2690292	0.0973802	1.9028872	902.2795317	0	39.8853675	618.383
23	3/24/2020 1:33:40 AM	0.35	30	8.7598428	0.1141573	2.0341208	1088.943052	0	16.3892601	254.099
24	3/24/2020 1:33:41 AM	0.37	24	8.2349084	0.1214343	2.1653544	934.1878257	0	32.1983694	499.204
25	3/24/2020 1:33:42 AM	0.38	32.4	8.3005252	0.1204743	2.3293964	1010.042543	0	37.2746889	577.907
26	3/24/2020 1:33:43 AM	0.4	24	8.3333336	0.12	2.46063	1015.118862	0	51.9234966	805.022
27	3/24/2020 1:33:44 AM	0.42	32.4	8.2349084	0.1214343	2.5918636	971.8976277	0	68.8929075	1068.12
28	3/24/2020 1:33:45 AM	0.43	24	8.1036748	0.1234008	2.7230972	1109.538405	0	82.671489	1281.74
29	3/24/2020 1:33:46 AM	0.45	32.4	7.9724412	0.1254321	2.8543308	905.7604365	0	73.3890762	1137.82
30	3/24/2020 1:33:47 AM	0.47	24	7.874016	0.127	2.9855644	1174.225219	0	75.8547171	1176.05
31	3/24/2020 1:33:48 AM	0.48	31.2	7.8083992	0.1280672	3.116798	1035.569178	0	49.4578557	766.795
32	3/24/2020 1:33:49 AM	0.5	25.2	7.7427824	0.1291525	3.2480316	1121.721572	0	48.2975541	748.805
33	3/24/2020 1:33:50 AM	0.52	28.8	7.7427824	0.1291525	3.3792652	981.0350028	0	39.7403298	616.134
34	3/24/2020 1:33:51 AM	0.53	27.6	7.8083992	0.1280672	3.5104988	1227.309017	0	40.9006314	634.123
35	3/24/2020 1:33:52 AM	0.55	26.4	7.8083992	0.1280672	3.6417324	1022.80586	0	38.4349905	595.896
36	3/24/2020 1:33:53 AM	0.57	28.8	7.8412076	0.1275314	3.772966	1097.210201	0	35.3891988	548.674
37	3/24/2020 1:33:54 AM	0.58	25.2	7.9068244	0.126473	3.9041996	1060.515662	0	33.7937841	523.939
38	3/24/2020 1:33:55 AM	0.6	31.2	8.1036748	0.1234008	4.0354332	1022.950898	0	28.1373138	436.241
39	3/24/2020 1:33:56 AM	0.62	24	8.3005252	0.1204743	4.1666668	1177.996199	0	23.3510697	362.035
40	3/24/2020 1:33:57 AM	0.63	32.4	8.4317588	0.1185992	4.3307088	1079.515601	0	22.6258812	350.792
41	3/24/2020 1:33:58 AM	0.65	24	8.694226	0.1150189	4.4619424	1105.187274	0	15.6640716	242.856
42	3/24/2020 1:33:59 AM	0.67	31.2	9.5472444	0.1047423	4.6587928	1106.347576	0	1.3053393	20.238

Pile Summary | **Drilling Data** | Grouting Data

AME Grouting Data

	Time	Duration (min)	Gear Box RPM	Withdrawal Rate (ft/min)	Withdrawal	Depth (ft)	Flow Meter Grout Flo	Flow Meter Grout Vol	Grout Factor (Flow	Grout Pressure (psi)	Pump Stroke	Pump Str	Pump Str	Grout Fac	Cumulati	Cumulative GF Meter
2	3/24/2020 2:35:40 AM	0	12	0	3.048	134.479992	28.76379872	0.194230685	1.49	64.5417765	0	8.47552	0	1.49	0	0
3	3/24/2020 2:35:41 AM	0.02	22.8	0	3.048	134.479992	28.02925358	0.660384329	1.49	150.9842457	0	-8.4755	0	1.49	0	0
4	3/24/2020 2:35:42 AM	0.03	15.6	0	3.048	134.479992	30.11635058	1.144195308	1.49	175.3505793	1	8.47552	1.41965	1.49	0	0
5	3/24/2020 2:35:43 AM	0.05	12	0	3.048	134.479992	31.74788833	1.663320957	1.49	197.3963097	1	76.6328	1.41965	1.49	0	0
6	3/24/2020 2:35:44 AM	0.07	14.4	0	3.048	134.479992	33.72550985	2.210698342	1.49	177.8162202	1	0	1.41965	1.49	0	0
7	3/24/2020 2:35:45 AM	0.08	24	0	3.048	134.479992	35.40648814	2.78985893	1.49	122.1217434	2	59.6818	2.8393	1.49	0	0
8	3/24/2020 2:35:46 AM	0.1	13.2	0	3.048	134.479992	35.57953003	3.379613919	1.49	178.9765218	2	25.4266	2.8393	1.49	0	0
9	3/24/2020 2:35:47 AM	0.12	12	0	3.048	134.479992	36.90383015	3.983494776	1.49	139.0911543	3	25.4266	4.25895	1.49	0	0
10	3/24/2020 2:35:48 AM	0.13	16.8	0	3.048	134.479992	35.65015937	4.587375633	1.49	192.6100656	3	59.6818	4.25895	1.49	0	0
11	3/24/2020 2:35:49 AM	0.15	21.6	0	3.048	134.479992	36.15869061	5.184193556	1.49	184.197879	3	0	4.25895	1.49	0	0
12	3/24/2020 2:35:50 AM	0.17	12	0	3.048	134.479992	36.16928501	5.79160588	1.49	200.5871391	4	76.6328	5.67507	1.49	0	0
13	3/24/2020 2:35:51 AM	0.18	12	0	3.048	134.479992	36.07040394	6.388423803	1.49	185.2131429	4	8.47552	5.67507	1.49	0	0
14	3/24/2020 2:35:52 AM	0.2	19.2	0	3.048	134.479992	36.57540372	6.995836127	1.49	104.137068	5	42.7308	7.09472	1.49	0	0
15	3/24/2020 2:35:53 AM	0.22	19.2	0	3.048	134.479992	35.6466279	7.59265405	1.49	184.3429167	5	42.7308	7.09472	1.49	0	0
16	3/24/2020 2:35:54 AM	0.23	12	0	3.048	134.479992	36.0315578	8.19300344	1.49	186.0833691	6	8.47552	8.51437	1.49	0	0
17	3/24/2020 2:35:55 AM	0.25	12	0	3.048	134.479992	35.7101943	8.796884297	1.49	208.4191749	6	76.6328	8.51437	1.49	0	0
18	3/24/2020 2:35:56 AM	0.27	22.8	0	3.048	134.479992	36.07040394	9.397233687	1.49	191.3047263	6	0	8.51437	1.49	0	0
19	3/24/2020 2:35:57 AM	0.28	16.8	0	3.048	134.479992	36.09865567	10.00111454	1.49	149.5338687	7	59.6818	9.93402	1.49	0	0
20	3/24/2020 2:35:58 AM	0.3	12	0	3.048	134.479992	35.43827135	10.594401	1.49	190.8696132	7	25.4266	9.93402	1.49	0	0
21	3/24/2020 2:35:59 AM	0.32	13.2	0	3.048	134.479992	36.0527466	11.19121892	1.49	172.4498253	7	0	9.93402	1.49	0	0
22	3/24/2020 2:36:00 AM	0.33	24	0	3.048	134.479992	34.94386597	11.78803685	1.49	217.55655	8	85.1084	11.3537	1.49	0	0
23	3/24/2020 2:36:01 AM	0.35	13.2	0	3.048	134.479992	34.87676809	12.3707289	1.49	196.2360081	8	0	11.3537	1.49	0	0
24	3/24/2020 2:36:02 AM	0.37	12	0	3.048	134.479992	35.51949509	12.96048389	1.49	119.8011402	9	51.2063	12.7733	1.49	0	0
25	3/24/2020 2:36:03 AM	0.38	16.8	0	3.048	134.479992	34.64722274	13.54317595	1.49	198.2665359	9	33.9021	12.7733	1.49	0	0
26	3/24/2020 2:36:04 AM	0.4	22.8	0	3.048	134.479992	35.41001961	14.12939947	1.49	202.3275915	9	0	12.7733	1.49	0	0
27	3/24/2020 2:36:05 AM	0.42	12	0	3.048	134.479992	33.84557973	14.71562299	1.49	31.3281432	10	85.1084	14.193	1.49	0	0
28	3/24/2020 2:36:06 AM	0.43	12	0	3.048	134.479992	29.83030175	15.23121717	1.49	141.1216821	11	33.9021	15.6091	1.49	0	0
29	3/24/2020 2:36:07 AM	0.45	19.2	0	3.048	134.479992	27.53131673	15.71502815	1.49	171.7246368	11	51.2063	15.6091	1.49	0	0
30	3/24/2020 2:36:08 AM	0.47	19.2	0	3.048	134.479992	26.31649208	16.15646153	1.49	16.2442224	12	68.1573	17.0287	1.49	0	0
31	3/24/2020 2:36:09 AM	0.48	12	0	3.048	134.479992	22.55194826	16.56258023	1.49	86.8775823	13	68.1573	18.4484	1.49	0	0
32	3/24/2020 2:36:10 AM	0.5	12	0	3.048	134.479992	21.54548017	16.9192584	1.49	196.2360081	13	33.9021	18.4484	1.49	0	0
33	3/24/2020 2:36:11 AM	0.52	21.6	0	3.048	134.479992	26.25292568	17.3253771	1.49	64.6868142	14	51.2063	19.868	1.49	0	0
34	3/24/2020 2:36:12 AM	0.53	16.8	0	3.048	134.479992	27.96568717	17.78093635	1.49	199.1367621	14	33.9021	19.868	1.49	0	0
35	3/24/2020 2:36:13 AM	0.55	12	0	3.048	134.479992	31.09456694	18.27887319	1.49	121.9767057	15	42.7308	21.2877	1.49	0	0
36	3/24/2020 2:36:14 AM	0.57	13.2	0	3.048	134.479992	32.24582518	18.80506178	1.49	203.05278	15	42.7308	21.2877	1.49	0	0
37	3/24/2020 2:36:15 AM	0.58	24	0	3.048	134.479992	34.15634882	19.36303356	1.49	198.5566113	16	16.951	22.7073	1.49	0	0
38	3/24/2020 2:36:16 AM	0.6	14.4	0	3.048	134.479992	34.46711792	19.93513122	1.49	223.7931711	16	68.1573	22.7073	1.49	0	0
39	3/24/2020 2:36:17 AM	0.62	12	0	3.048	134.479992	34.70725768	20.50722887	1.49	215.0909091	16	0	22.7073	1.49	0	0
40	3/24/2020 2:36:18 AM	0.63	15.6	0	3.048	134.479992	34.63309687	21.08992092	1.49	178.396371	17	68.1573	24.127	1.49	0	0
41	3/24/2020 2:36:19 AM	0.65	22.8	0	3.048	134.479992	33.81026506	21.65848711	1.49	211.755042	17	16.951	24.127	1.49	0	0
42	3/24/2020 2:36:20 AM	0.67	12	0	3.048	134.479992	34.9615233	22.2376477	1.49	159.54147	18	25.4266	25.5431	1.49	0	0
43	3/24/2020 2:36:21 AM	0.68	12	0	3.048	134.479992	34.01155868	22.80974535	1.49	214.655796	18	59.6818	25.5431	1.49	0	0
44	3/24/2020 2:36:22 AM	0.7	19.2	0	3.048	134.479992	34.50243259	23.38184301	1.49	218.8618893	18	0	25.5431	1.49	0	0

Pile Summary | Drilling Data | **Grouting Data**

AME Drilling Data Analysis (MWD)

	Enter Pile 7 AME Data	Time	Duration (min)	Gear Box RPM	Penetration Rate (ft/min)	Penetration	Depth (ft)	Gear Box Pres	Torque (ft-lbs)	Crowd Pressur	Thrust (lb
2	Pile ID	6/10/2022 10:20:10 PM	0	0	0	3.048	0	37.9998774	0	210.304665	3260.56
3	2-2W-7	6/10/2022 10:20:11 PM	0.02	0	0	3.048	0	65.5570404	0	199.5718752	3094.16
4	Top of Pile Elevation (ft)	6/10/2022 10:20:12 PM	0.03	0	0	3.048	0	50.3280819	0	195.2207442	3026.7
5	0.00	6/10/2022 10:20:13 PM	0.05	0	0	3.048	0	45.1067247	0	199.5718752	3094.16
6	Station	6/10/2022 10:20:14 PM	0.07	0	0	3.048	0	72.51885	0	209.7245142	3251.57
7	100+00.01	6/10/2022 10:20:15 PM	0.08	0	0	3.048	0	69.9081714	0	210.4497027	3262.81
8	Offset (ft)	6/10/2022 10:20:16 PM	0.1	0	0	3.048	0	68.0226813	0	232.06032	3597.86
9	10.0	6/10/2022 10:20:17 PM	0.12	0	0	3.048	0	107.7630111	0	237.4267149	3681.06
10	Select Drill Rig (1 or 2)	6/10/2022 10:20:18 PM	0.13	0	0	3.048	0	106.8927849	0	258.0220683	4000.37
11	2	6/10/2022 10:20:19 PM	0.15	0	0	3.048	0	324.7394103	0	256.4266536	3975.64
12	Drill Bit Diameter (in)	6/10/2022 10:20:20 PM	0.17	1.8	0	3.048	0	404.2200699	0	272.8159137	4229.74
13	30.0	6/10/2022 10:20:21 PM	0.18	3.8	0.2296588	4.3542857	0.0656168	610.3186416	0	528.3723411	8191.88
14	Baseline Hydraulic Pressures	6/10/2022 10:20:22 PM	0.2	5.8	2.2309712	0.4482353	0.2624672	750.4250598	0	754.9212285	11704.3
15	Torque, T_{BP} (psi)	6/10/2022 10:20:23 PM	0.22	7.8	5.085302	0.1966452	0.4593176	452.6626617	0	232.2053577	3600.11
16	0	6/10/2022 10:20:24 PM	0.23	10	5.9383204	0.1683978	0.5249344	644.2574634	0	517.9296267	8029.98
17	Crowd, F_{BP} (psi)	6/10/2022 10:20:25 PM	0.25	10.2	7.709974	0.1297021	0.6889764	572.3187642	0	372.6018513	5776.82
18	0	6/10/2022 10:20:26 PM	0.27	10.4	9.186352	0.1088571	0.8530184	801.1882548	0	721.8526329	11191.6
19		6/10/2022 10:20:27 PM	0.28	10.4	9.9409452	0.1005941	1.0826772	575.0744805	0	210.1596273	3258.31
20		6/10/2022 10:20:28 PM	0.3	10.6	8.1692916	0.1224096	1.148294	863.6995035	0	700.532091	10861
21		6/10/2022 10:20:29 PM	0.32	10.4	9.2847772	0.1077032	1.3451444	660.6467235	0	166.6483173	2583.72
22		6/10/2022 10:20:30 PM	0.33	10.4	8.5629924	0.1167816	1.3779528	1169.293937	0	1047.317232	16237.6
23		6/10/2022 10:20:31 PM	0.35	10	8.7270344	0.1145865	1.5748032	1080.675903	0	727.6541409	11281.5
24		6/10/2022 10:20:32 PM	0.37	10.2	7.0209976	0.1424299	1.6076116	927.5160915	0	492.8381046	7640.96
25		6/10/2022 10:20:33 PM	0.38	10	6.56168	0.1524	1.6732284	798.5775762	0	258.6022191	4009.37
26		6/10/2022 10:20:34 PM	0.4	10	5.2821524	0.1893168	1.7060368	844.2644517	0	398.2735242	6174.83
27		6/10/2022 10:20:35 PM	0.42	10	5.0196852	0.1992157	1.8372704	1085.172071	0	607.707963	9421.9
28		6/10/2022 10:20:36 PM	0.43	10.2	4.757218	0.2102069	1.9356956	708.3641268	0	248.7396555	3856.46
29		6/10/2022 10:20:37 PM	0.45	10	4.1338584	0.2419048	1.968504	835.5621897	0	384.2048673	5956.71
30		6/10/2022 10:20:38 PM	0.47	10.2	4.3635172	0.2291729	2.0341208	679.9367376	0	244.2434868	3786.75
31		6/10/2022 10:20:39 PM	0.48	10.2	4.0354332	0.2478049	2.0341208	755.0662662	0	371.7316251	5763.33
32		6/10/2022 10:20:40 PM	0.5	10.2	3.772966	0.2650435	2.132546	740.7075339	0	358.6782321	5560.95
33		6/10/2022 10:20:41 PM	0.52	10.2	3.2152232	0.3110204	2.1981628	674.7153804	0	209.7245142	3251.57
34		6/10/2022 10:20:42 PM	0.53	10.4	3.2152232	0.3110204	2.1981628	769.2799608	0	522.7158708	8104.19
35		6/10/2022 10:20:43 PM	0.55	10	2.952756	0.3386667	2.2637796	674.2802673	0	178.8314841	2772.6
36		6/10/2022 10:20:44 PM	0.57	10.2	3.0511812	0.3277419	2.3293964	791.7608043	0	372.3117759	5772.32
37		6/10/2022 10:20:45 PM	0.58	10.2	3.772966	0.2650435	2.4278216	827.7301539	0	315.1669221	4886.35
38		6/10/2022 10:20:46 PM	0.6	10.2	3.6417324	0.2745946	2.4934384	762.4631889	0	260.3426715	4036.35
39		6/10/2022 10:20:47 PM	0.62	10	3.7401576	0.2673684	2.5590552	846.8751303	0	390.8766015	6060.15
40		6/10/2022 10:20:48 PM	0.63	10.2	4.6587928	0.2146479	2.6902888	813.0813462	0	335.6172378	5203.41
41		6/10/2022 10:20:49 PM	0.65	10	5.4461944	0.1836145	2.788714	883.8597438	0	413.357445	6408.69
42		6/10/2022 10:20:50 PM	0.67	10	5.5446196	0.180355	2.9199476	913.5924723	0	339.8233311	5268.62

Agreement | Enter Drill Rig Data | **Enter AME Pile Data** | AME Pile Info | Strength Analysis | Pile Summary Report

AME Drilling Data Analysis (MWD)

Pile	Pile Segment	ΔZ Increment (cm)
7	1	1
e Threshold (psi)	e Reduction (psi/ft)	MWD Assessment
1,250	0.0	FDOT Quality Class 1

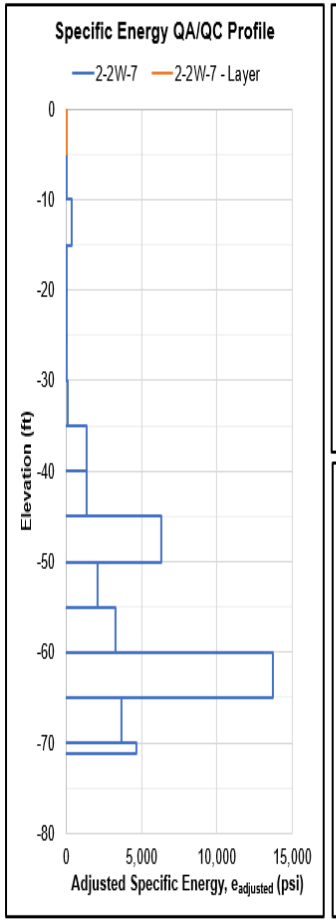
Pile Information

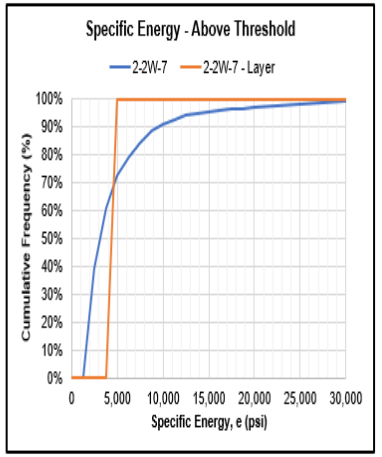
Pile ID	Pile Elevations (ft)		Pile Length (ft)	Layer Elevations (ft)		Drill Bit Diameter (ft)
	Top of Pile	Bottom of Pile		Top	Bottom	
2-2W-7	0.00	-71.23	71.23	0.00	-5.00	2.50

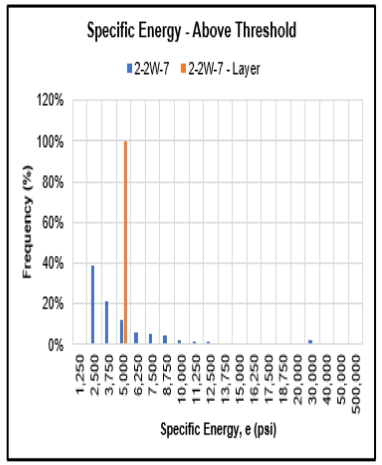
Pile Segments and Elevations

Segment	Elevation 1 (ft)	Elevation 2 (ft)
1	0.00	-5.00
2	-5.00	-10.00
3	-10.00	-15.00
4	-15.00	-20.00
5	-20.00	-25.00
6	-25.00	-30.00
7	-30.00	-35.00
8	-35.00	-40.00
9	-40.00	-45.00
10	-45.00	-50.00
11	-50.00	-55.00
12	-55.00	-60.00
13	-60.00	-65.00
14	-65.00	-70.00
15	-70.00	-71.23

Scroll to the right for additional analysis







Agreement | Enter Drill Rig Data | Enter AME Pile Data | AME Pile Info | **Strength Analysis** | Pile Summary Report

Pile	Pile Segment	ΔZ Increment (cm)
7	1	1
e Threshold (psi)	e Reduction (psi/ft)	MWD Assessment
1,250	0.0	FDOT Quality Class 1

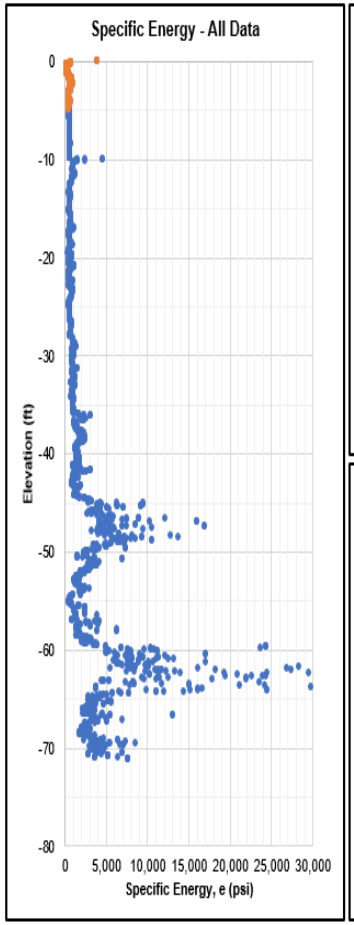
Pile Information

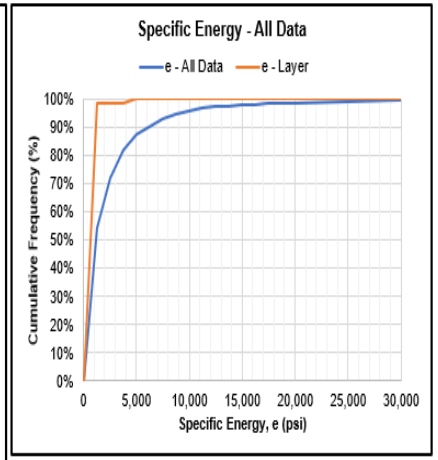
Pile ID	Pile Elevations (ft)		Pile Length (ft)	Layer Elevations (ft)		Drill Bit Diameter (ft)
	Top of Pile	Bottom of Pile		Top	Bottom	
2-2W-7	0.00	-71.23	71.23	0.0	-5.0	2.5

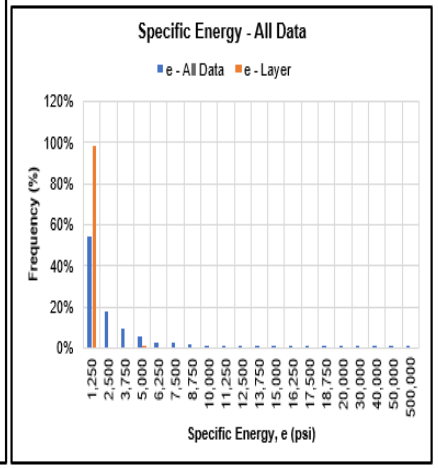
Pile Segments and Elevations

Segment	Elevation 1 (ft)	Elevation 2 (ft)
1	0.00	-5.00
2	-5.00	-10.00
3	-10.00	-15.00
4	-15.00	-20.00
5	-20.00	-25.00
6	-25.00	-30.00
7	-30.00	-35.00
8	-35.00	-40.00
9	-40.00	-45.00
10	-45.00	-50.00
11	-50.00	-55.00
12	-55.00	-60.00
13	-60.00	-65.00
14	-65.00	-70.00
15	-70.00	-71.23

Scroll to the right for additional analysis







Agreement | Enter Drill Rig Data | Enter AME Pile Data | AME Pile Info | **Strength Analysis** | Pile Summary Report

AME Drilling Data Analysis (MWD)

ACIP Pile - MWD Summary Report

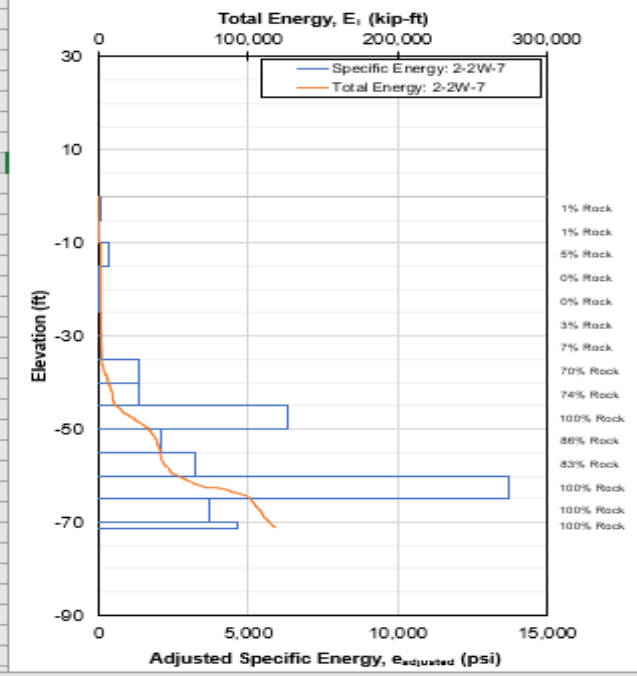
Project	Location	Engineer	Pile ID
I-395	Miami, Florida	Rodgers, McVay, Kelch	2-2W-7
Station	**Offset (ft)**	**Drill Rig**	**Drill Bit Diameter (in)**
100+00.01	10.00	Drill Rig B	30
Top of Pile Elevation (ft)	**Bottom of Pile Elevation (ft)**	**Depth Increment Analyzed (cm**	**MWD Assessment**
0	-71.23	1	FDOT Quality Class 1

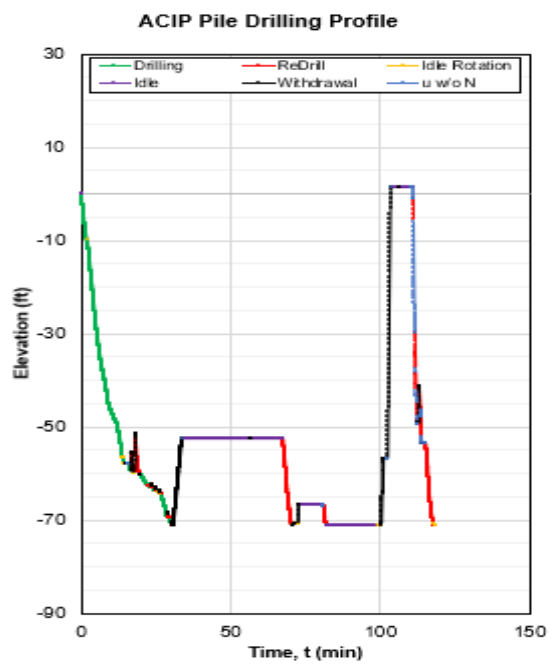
Pile 2-2W-7: Specific Energy, e (psi) - All Data	
Mean	2,776
Median	1,143
Standard Deviation	7,260
Coefficient of Variation (CV)	2.62
Maximum	272,678
Minimum	238
Number of Data Points	2,170

ile 2-2W-7: Specific Energy Above Threshold = 1250 p	
Mean	5,115
Median	3,101
Standard Deviation	10,221
Coefficient of Variation (CV)	2.00
Maximum	272,678
Minimum	1,251
Number of Data Points	998

ACIP Pile QA/QC	
Pile Length (ft)	71.23
Rock Socket (ft): 2-2W-7	32.74
Total Energy (kip-ft): 2-2W-7	118,389

Pile Installation Summary	
Drilling Time (min)	24.3
Total Time (min)	118.7
Efficiency (%)	20.5%





Agreement | Enter Drill Rig Data | Enter AME Pile Data | AME Pile Info | Strength Analysis | **Pile Summary Report**

Thermal Integrity Profiler (TIP)Testing (ASTM D 7949 Method B)

Required on all ACIP Piles

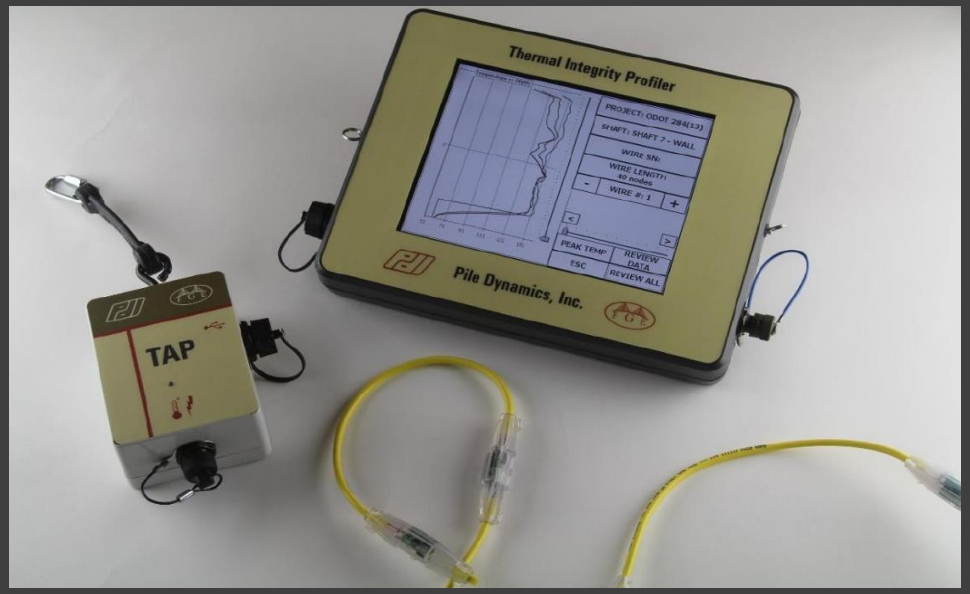
- Four (4) Thermal Integrity testing wires attached to reinforcing cage for each pile.
- Used in detecting anomalies;

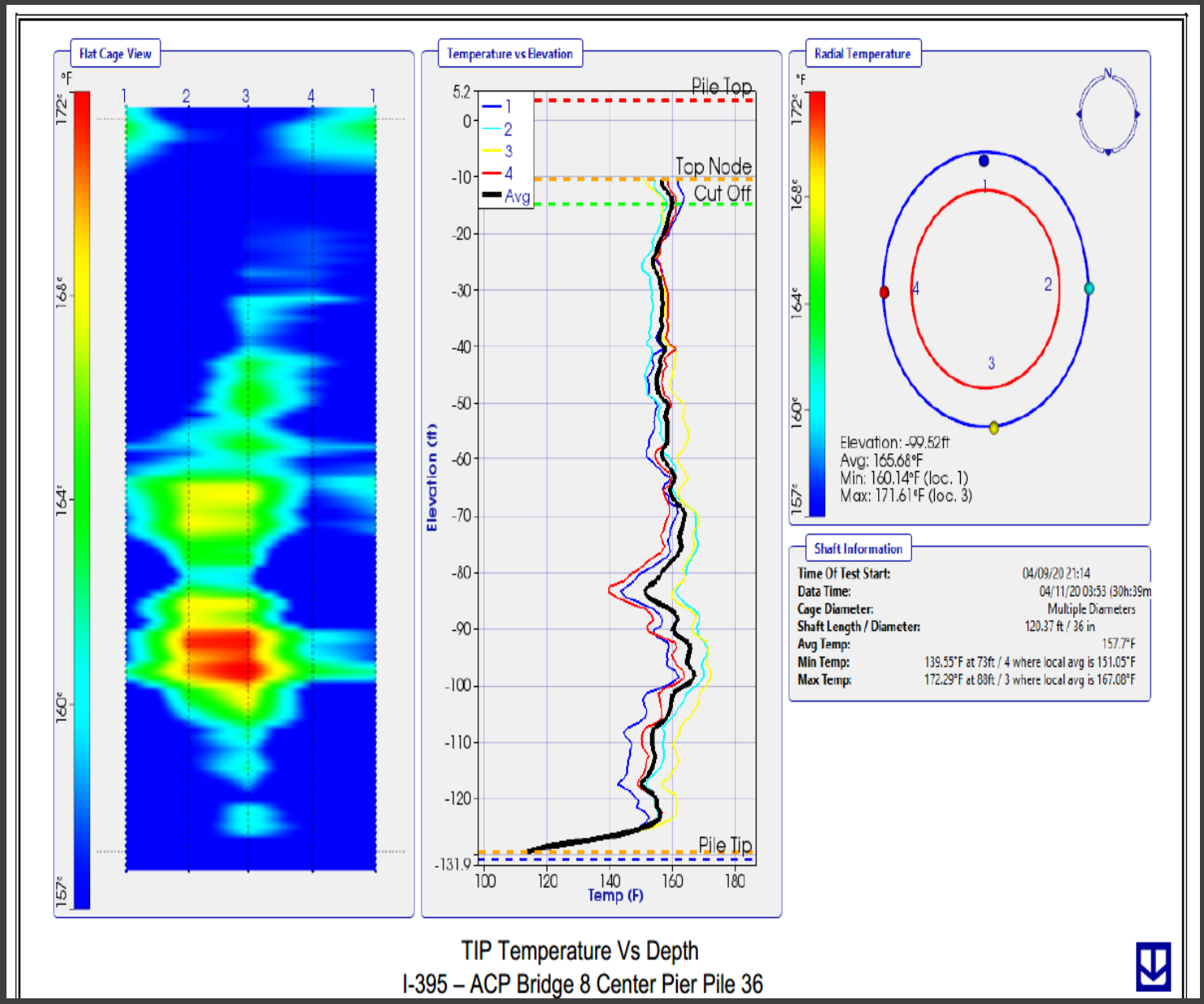
- Loss of pile section (diameter)

- Loss of grout cover to reinforcement,

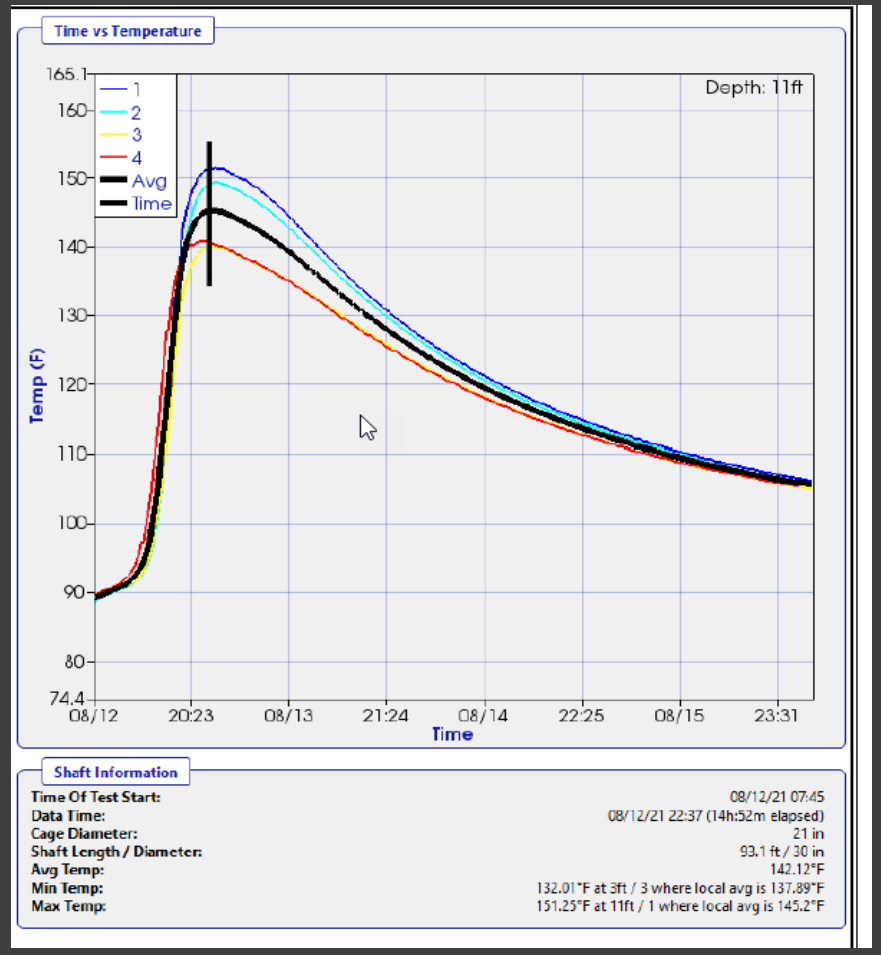
- Reinforcement cage alignment issues

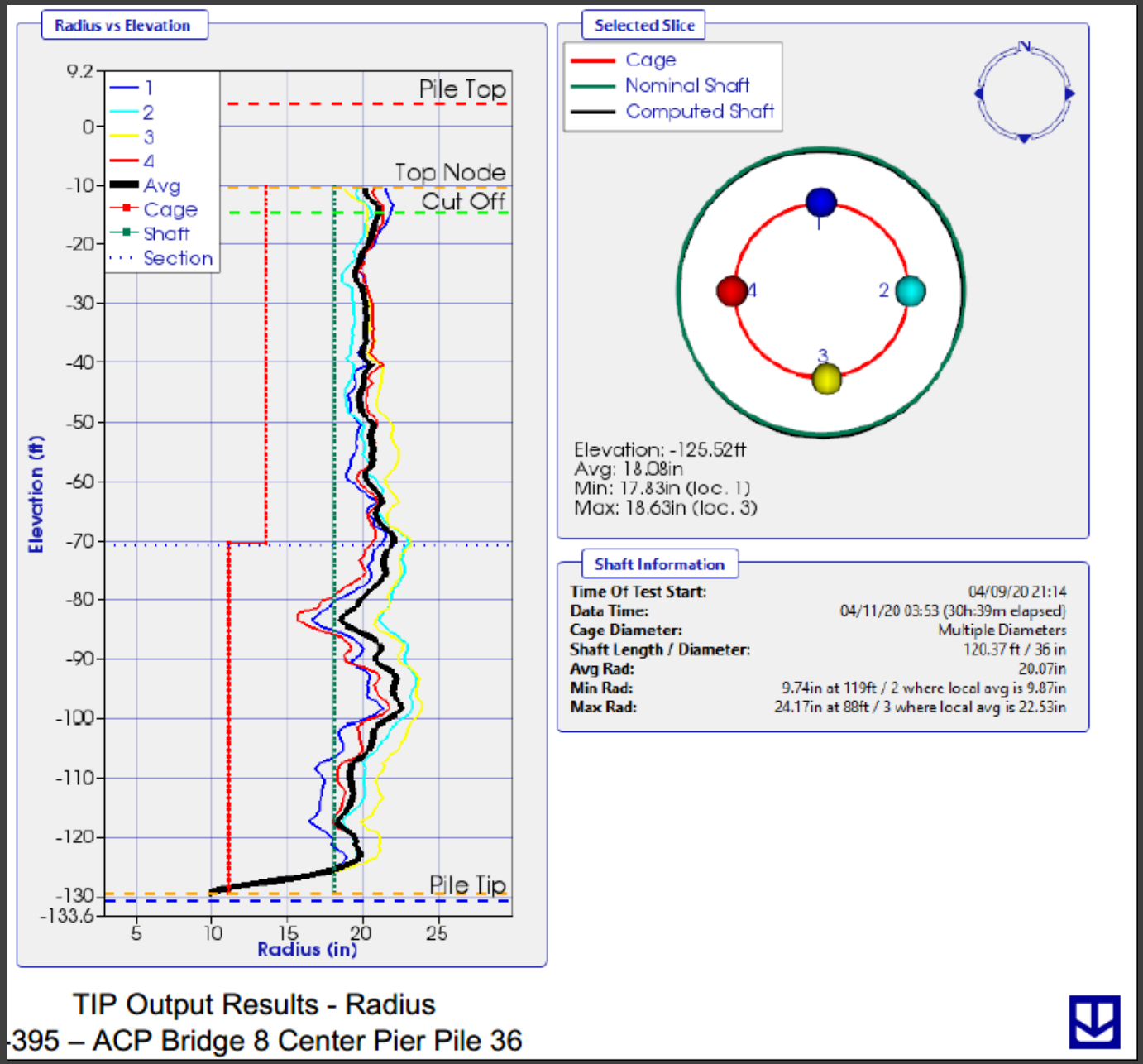
- Provided peak temperatures attained in a pile during grout hydration.





Thermal Integrity Profiler (TIP)Testing (ASTM D 7949 Method B)

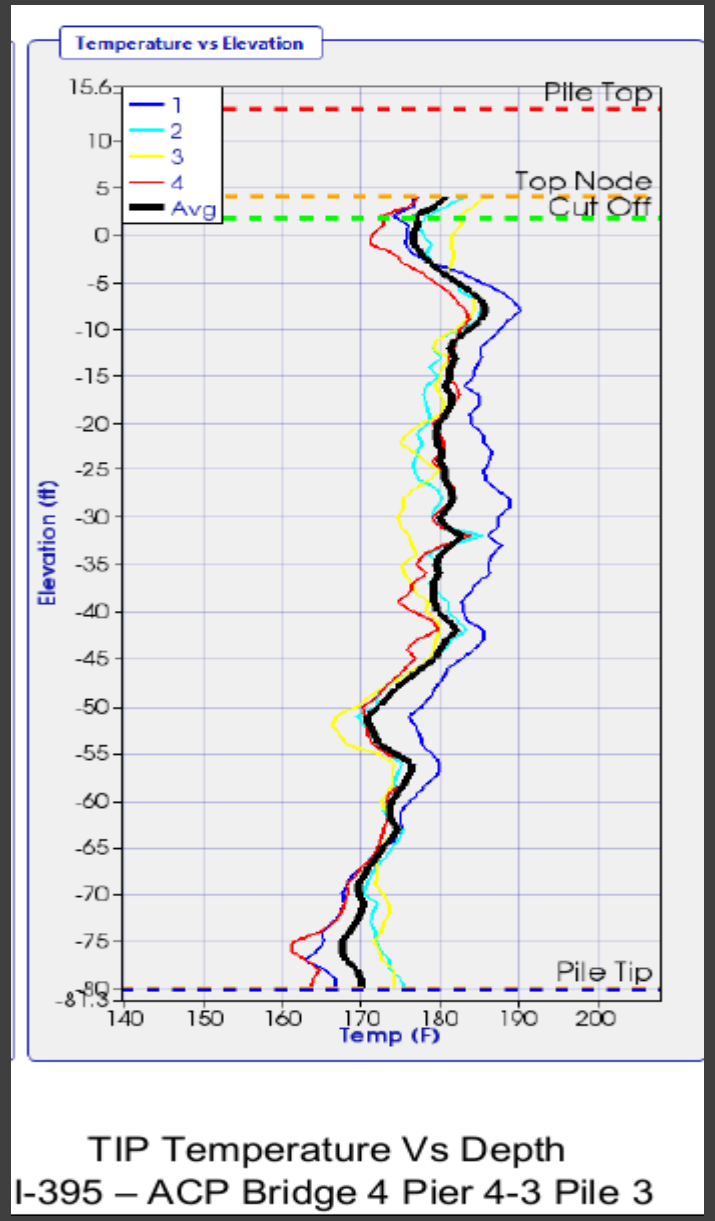




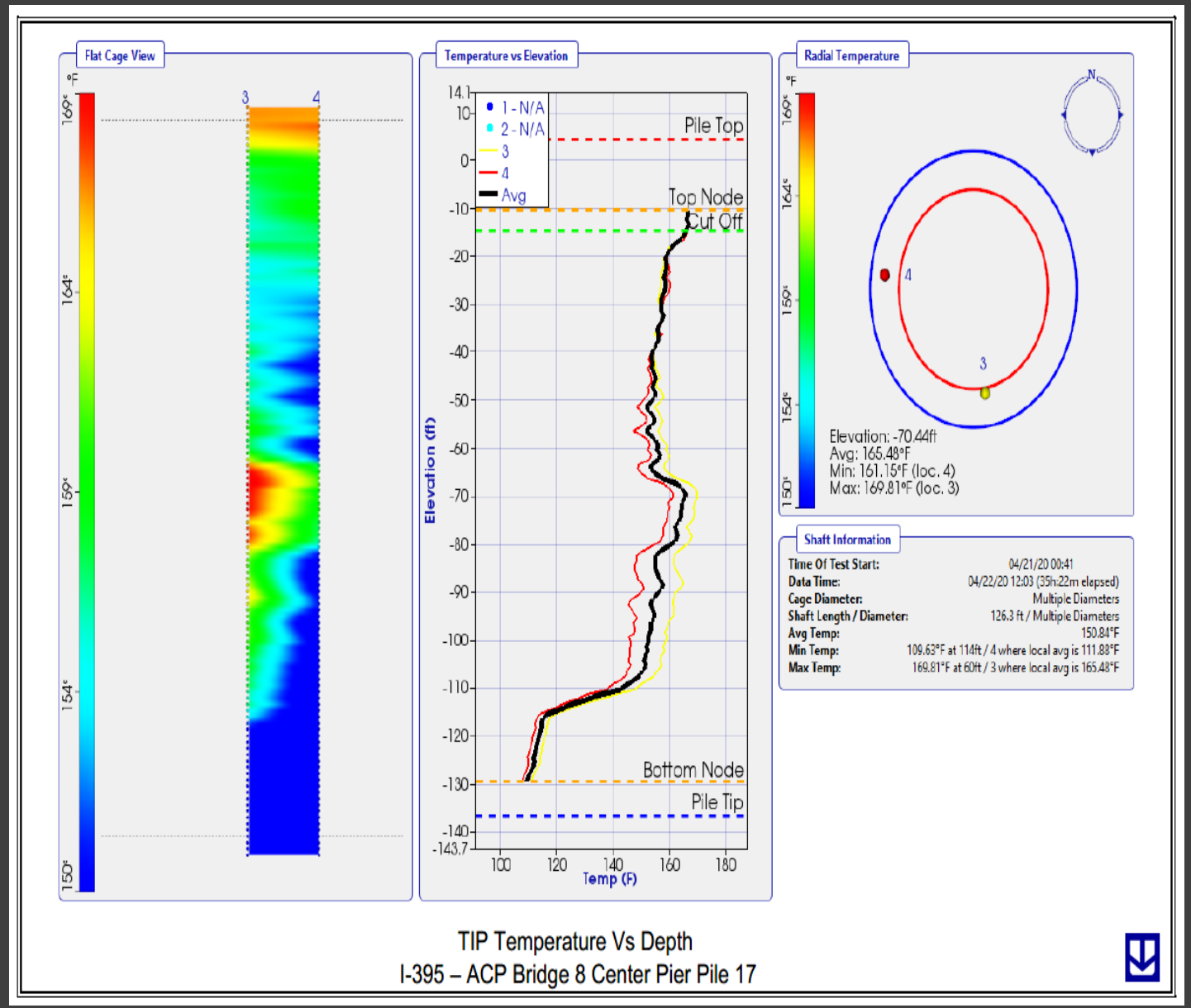
TIP Output Results - Radius

-395 – ACP Bridge 8 Center Pier Pile 36

Thermal Integrity Profiler (TIP)Testing (ASTM D 7949 Method B)

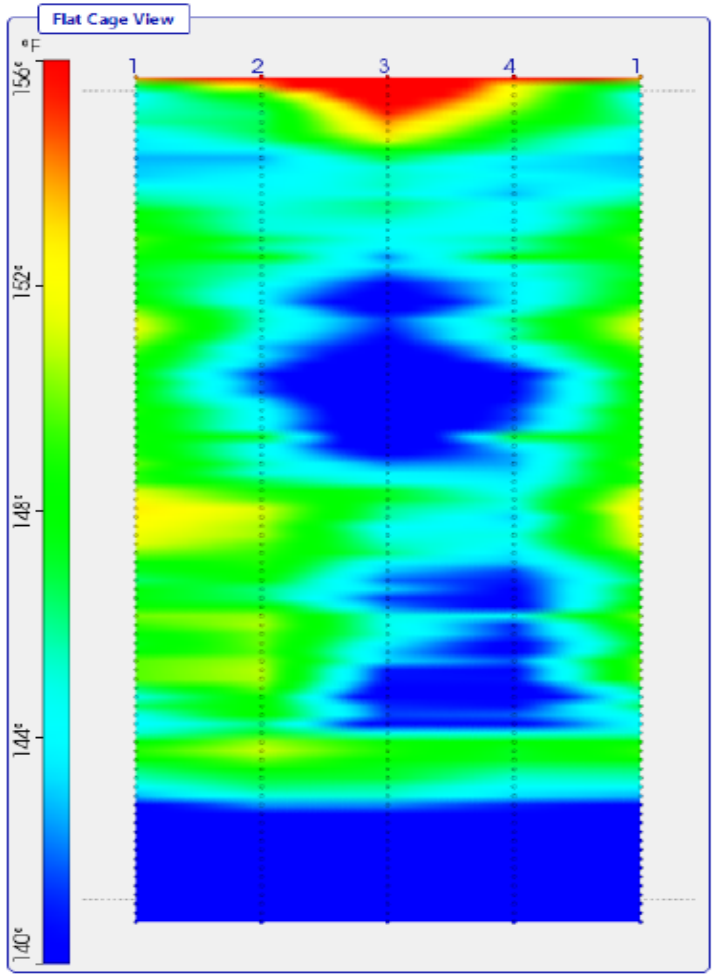


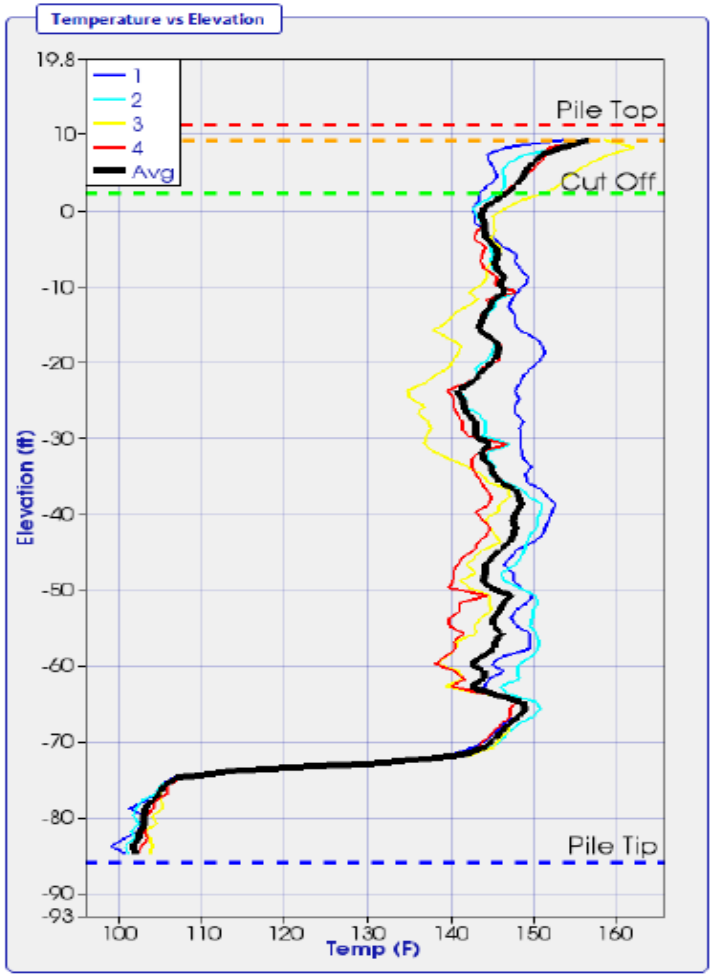
TIP Temperature Vs Depth
I-395 – ACP Bridge 4 Pier 4-3 Pile 3

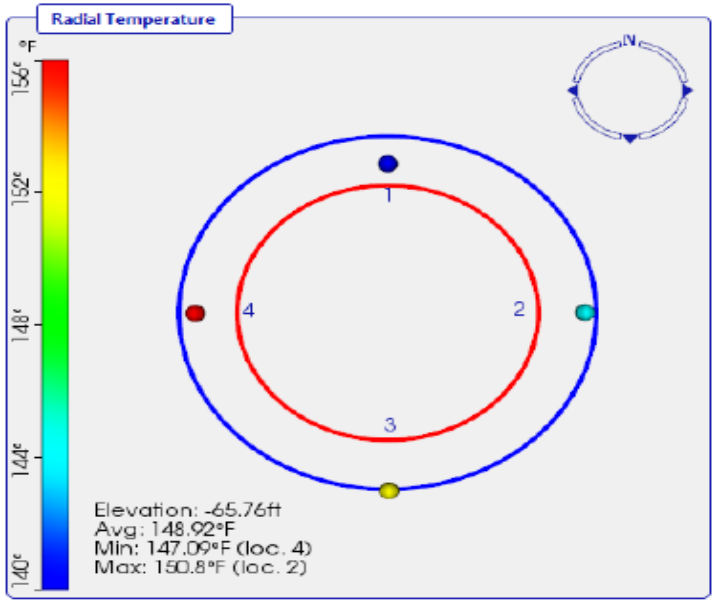


TIP Temperature Vs Depth
I-395 – ACP Bridge 8 Center Pier Pile 17

Thermal Integrity Profiler (TIP)Testing (ASTM D 7949 Method B)





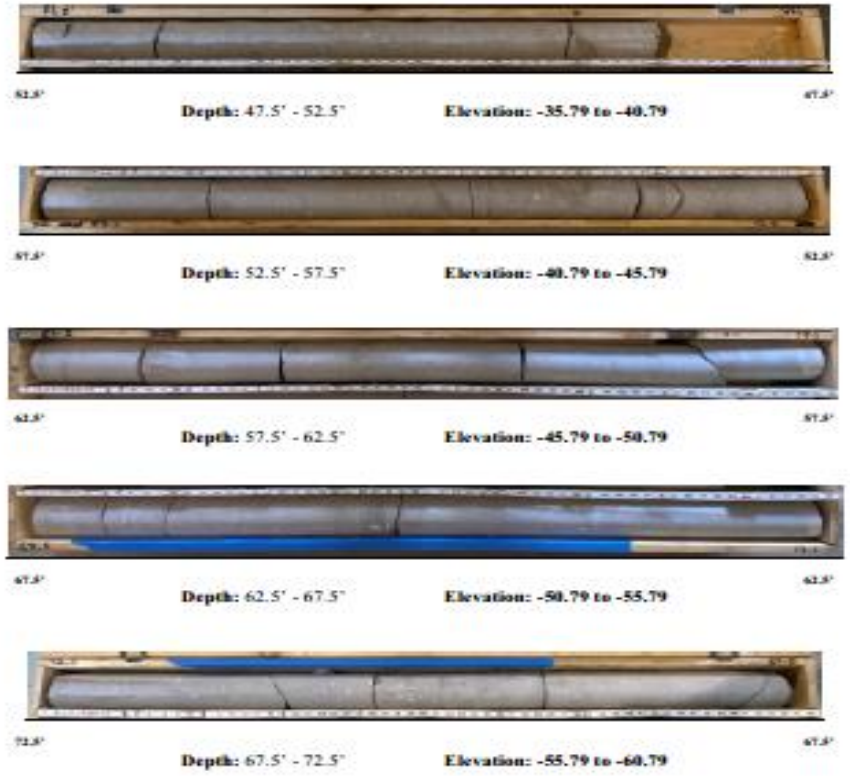


Shaft Information

Time Of Test Start:	06/03/20 06:34
Data Time:	06/04/20 08:27 (25h:53m elapsed)
Cage Diameter:	21 in
Shaft Length / Diameter:	95.05 ft / 30 in
Avg Temp:	140.8°F
Min Temp:	101.08°F at 88ft / 1 where local avg is 103.07°F
Max Temp:	156.88°F at 2ft / 3 where local avg is 152.3°F

TIP Temperature Vs Depth
I-395 – ACP Bridge 7W Pier 7W-4L Pile 8

Auger Cast Pile Coring



Depth: 47.5' - 52.5' Elevation: -35.79 to -40.79

Depth: 52.5' - 57.5' Elevation: -40.79 to -45.79

Depth: 57.5' - 62.5' Elevation: -45.79 to -50.79

Depth: 62.5' - 67.5' Elevation: -50.79 to -55.79

Depth: 67.5' - 72.5' Elevation: -55.79 to -60.79

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Grout Core Photographs
I-395/SR-836 Design-Build Project
Bridge 7, Pier 4L, Pile 6
Miami-Dade County, Florida

Project No. 2230.1800002 Sheet:

Depth: 72.5' - 77.5' Elevation: -60.79 to -65.79

Depth: 77.5' - 82.5' Elevation: -65.79 to -70.79

Depth: 82.5' - 87.25' Elevation: -70.79 to -75.54

Depth: 87.25' - 92.25' Elevation: -75.54 to -80.54

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Grout Core Photographs
I-395/SR-836 Design-Build Project
Bridge 7, Pier 4L, Pile 6
Miami-Dade County, Florida

Project No. 2230.1800002 Sheet:

Auger Cast Pile Coring

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Project No.: 2230.1800002.0000
Date: 9/2/2020

Compressive Strength Test Report (ASTM C42)

Client: Archer Western - de Moya Group Joint Venture
7230 NW 8th Street
Miami, FL 33126

Project: I-395/SR-836 Reconstruction Design-Build Project
Miami-Dade County, Florida

Location Bridge 7, Pier 4L, Pile No. 8

Date Cored: 8/26/2020
Date Tested: 9/2/2020

Core No.	Range in Elevation (Feet, NAVD88)	End Prep	Length (in)	Diameter (in)	Area (in²)	L/D	Correction Factor	Load (lbs)	Compressive Strength (psi)	Break Type
S1	-5.79 to -10.79	Cut / cap	8.25	3.88	11.82	2.13	1.00	82,080	6,942	3
S2	-35.79 to -40.79	Cut / cap	8.17	3.93	12.13	2.08	1.00	72,160	5,949	2
S6	-70.79 to -75.54	Cut / cap	8.35	3.95	12.25	2.11	1.00	83,580	6,821	2
S9	-75.54 to -80.54	Cut / cap	8.2	3.98	12.32	2.07	1.00	68,465	5,559	2
S11	-75.54 to -80.54	Cut / cap	8.11	3.98	12.32	2.05	1.00	79,800	6,479	3

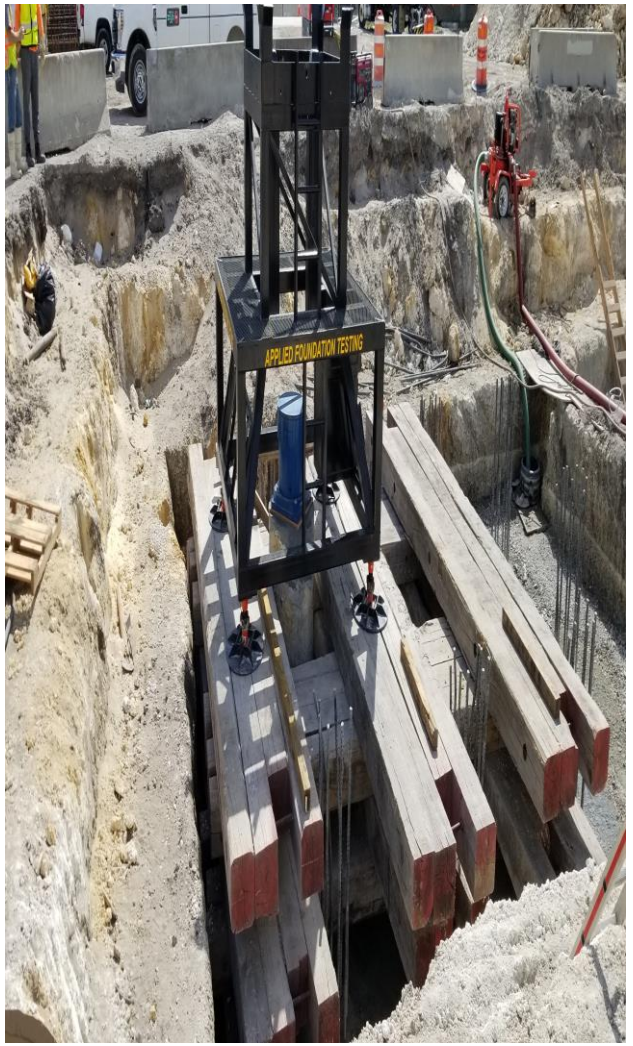
Notes:

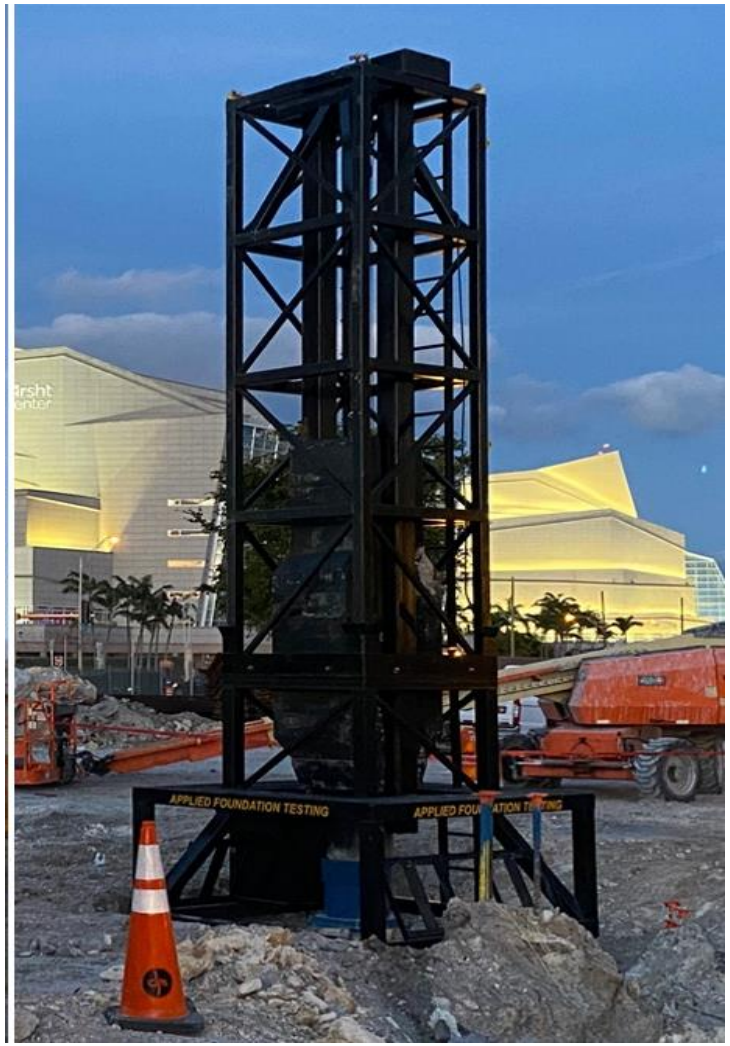
1) Concrete cores obtained in general accordance with ASTM C42.
2) Strength test performed in accordance with ASTM C42 and C39.
3) Cores were cut and capped in accordance with ASTM C617.

Proof Load Testing

- High Strain Dynamic Load Testing (ASTM D4945).
- Performed on 5% of production piles in a foundation unit.
- Piles loaded up to the Factored Design Load (FDL).

Summary of Dynamic Test Results (Detailed Results Attached)						
Blow Number	Early Unloading Method (RUO) (kips)	Max. Comp. Stress (ksi)	Max. Tip Comp. Stress (ksi)	Max. Tension Stress (ksi)	Maximum / Permanent Pier Top Displacement (inches)	Transferred Energy (k-ft) / Drop Height (feet)
1	342	0.4	0.2	0.0	0.010	1.1 / 1.0
2	550	0.7	0.3	0.0	0.005	2.7 / 3.0
3	751	1.1	0.4	0.1	0.005	6.0 / 4.0
4	1,241	1.5	0.5	0.2	0.005	12.9 / 5.0
5	1,539	2.2	0.7	0.4	0.005	26.7 / 6.83
False Blow - Ram Rebound						
				Total Displacement	0.030	





Proof Load Testing

APPLIED FOUNDATION TESTING
Specialty Geotechnical Services

Report of High-Strain Dynamic Pile Testing
Pier 7W-4L– Pile 8
I-395 Signature Bridge
Miami-Dade County, Florida
AFT Project No. 219100
August 27, 2020 | Page 3

Installation Records provided to AFT			Soil Boring provided to AFT		
Yes ☒	No ☐	Attached ☒	Yes ☒	No ☐	Attached ☒

Summary of Dynamic Test Results (Detailed Results Attached)

Blow Number	Maximum Case Method (RX1) (kips)	Max. Comp. Stress (ksi)	Max. Tip Comp. Stress (ksi)	Max. Tension Stress (ksi)	Maximum / Permanent Pier Top Displacement (inches)	Transferred Energy (k-ft) / Drop Height (feet)
1	407	0.6	0.3	0.0	0.005	1.9 / 1.0
2	809	1.3	0.6	0.1	0.005	7.5 / 3.0
3	1,309	2.0	1.0	0.3	0.005	22.3 / 4.0
				Total Displacement	0.015	

Summary of Signal Matching Results (Detailed Results Attached)

Blow Number	R_{ult} (kips)	R_{skn} (kips)	Approx. Blows per Foot(1)	Stroke (feet)	EMX (k-ft)	QS (in)	QT (in)	SS (s/ft)	ST (s/ft)	MQN(2)
3	1,320	1,296	2,400	4.0	22.3	0.13	0.08	0.40	0.40	2.60

1. Blows per foot equivalent – refer to data set presented in Appendix A
2. MQN – Match Quality Number

I-395 SIGNATURE BRIDGE; Pile: PIER 7W-4L - PILE 8 — Test: 25-Aug-2020 08:57
ACIP 30'' - 97-FT; Blow: 3 — CAPWAP(R) 2014-3
Applied Foundation Testing, Inc. — OP: AFT

CAPWAP SUMMARY RESULTS

Total CAPWAP Capacity: 1320.0; along Shaft 1296.3; at Toe 23.7 kips

Soil Sgmnt No.	Dist. Below Gages ft	Depth Below Grade ft	Ru kips	Force in Pile kips	Sum of Ru kips	Unit Resist. (Depth) kips/ft	Unit Resist. (Area) ksf	Quake in
				1320.0				
1	6.7	4.9	44.1	1275.9	44.1	8.97	1.14	0.18
2	10.1	8.3	60.7	1215.2	104.8	17.99	2.29	0.18
3	13.5	11.7	80.4	1134.8	185.2	23.83	3.03	0.18
4	16.9	15.0	80.6	1054.2	265.8	23.89	3.04	0.18
5	20.2	18.4	80.6	973.6	346.4	23.89	3.04	0.18
6	23.6	21.8	80.3	893.3	426.7	23.80	3.03	0.18
7	27.0	25.2	80.3	813.0	507.0	23.80	3.03	0.18
8	30.4	28.5	30.1	782.9	537.1	8.92	1.14	0.18
9	33.7	31.9	30.1	752.8	567.2	8.92	1.14	0.17
10	37.1	35.3	30.5	722.3	597.7	9.04	1.15	0.17
11	40.5	38.7	20.5	701.8	618.2	6.08	0.77	0.16
12	43.9	42.0	20.3	681.5	638.5	6.02	0.77	0.16
13	47.2	45.4	20.2	661.3	658.7	5.99	0.76	0.15
14	50.6	48.8	37.4	623.9	696.1	11.09	1.41	0.14
15	54.0	52.1	45.7	578.2	741.8	13.55	1.72	0.13
16	57.3	55.5	45.7	532.5	787.5	13.55	1.72	0.12
17	60.7	58.9	45.7	486.8	833.2	13.55	1.72	0.11
18	64.1	62.3	45.7	441.1	878.9	13.55	1.72	0.11
19	67.5	65.6	45.6	395.5	924.5	13.52	1.72	0.10
20	70.8	69.0	45.6	349.9	970.1	13.52	1.72	0.09
21	74.2	72.4	45.7	304.2	1015.8	13.55	1.72	0.09
22	77.6	75.8	45.2	259.0	1061.0	13.40	1.71	0.08
23	81.0	79.1	40.2	218.8	1101.2	11.92	1.52	0.08
24	84.3	82.5	40.2	178.6	1141.4	11.92	1.52	0.08
25	87.7	85.9	40.2	138.4	1181.6	11.92	1.52	0.07
26	91.1	89.3	40.2	98.2	1221.8	11.92	1.52	0.06
27	94.5	92.6	40.8	57.4	1262.6	12.09	1.54	0.05
28	97.8	96.0	33.7	23.7	1296.3	9.99	1.27	0.04
Avg. Shaft			46.3			13.50	1.72	0.13
Toe			23.7				4.83	0.08

Soil Model Parameters/Extensions		Shaft	Toe
Smith Damping Factor		0.40	0.40
Case Damping Factor		1.63	0.03
Damping Type		Viscous	Sm+Visc
Unloading Quake	(% of loading quake)	98	30
Unloading Level	(% of Ru)	35	

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Conclusion

The QA/QC methods discussed have effectively helped to ensured the integrity and quality of ACIP piles installed on the project.

The QA/QC methods have helped to proactively identify potential pile integrity issues which are then addressed before they become major project issues.

Dynamic Proof Load testing has proved to be an effective tool for the DB team to verify if anomalies in ACIP piles correlate structural deficiencies in capacity..

Acknowledgements

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Any questions?