Illinois Department of Transportation

Abbreviated Structure Geotechnical Report

Original Report Date: 1-12-18 **Proposed SN:** 046-0156/0157 **Route:** FAI-57 (I-57)
Revised Date: 6-22-18 **Existing SN:** 046-0008/0009 **Section:** [(139)VB]ES
Geotechnical Engineer: Michael Haley, Lin Engineering, Ltd. **County:** Kankakee
Structural Engineer: Michael Haley, Lin Engineering, Ltd. **Contract:** 66F74

Indicate the proposed structure type, substructure types, and foundation locations (attach plan and elevation drawing): The proposed structures are dual 3-span bridges with 36" PPC IL beams supported on integral abutments and multi-column piers. Piers and slope walls are located to avoid existing foundations and to provide adequate railroad clearances. Abutments are located to intersect the slope walls at 1:2 (V:H) slope. The bridges will each have back-to-back abutment lengths of 200'-3", out-to-out widths of 51'-1" and a 10°-54'-30" right ahead skew. Each substructure unit will be constructed approximately 12 feet wider to the outside to accommodate future widening. A preliminary TSL drawing is attached.

Discuss the existing boring data, existing plans foundation information, new subsurface exploration and need for any additional exploration to be provided with SGR Technical Memo (attach all data and subsurface profile plot): The existing structures built in 1954 are 5-span dual bridges with spill thru abutments and multi-column piers. The original bridges utilize spread footing foundations founded on rock. Rock elevations shown in pile driving records from the 1990 widening are in line with the rock elevations shown in the design plans. Soil borings from 2016 and rock cores from 2017 are attached, along with a subsurface soil profile plot.

Provide the location and maximum height of any new soil fill or magnitude of footing bearing pressure. Estimate the amount and time of the expected settlement. Indicate if further testing, analysis, and/or ground improvement/treatment is necessary: The proposed abutments will be constructed on embankment approximately 13.3 ft higher than existing grade at the north abutment and 25.1 ft higher at the south abutment. The anticipated settlement at the north abutment is 0.07 inches, while the anticipated settlement at the south abutment is 0.43 inches. These settlements are not expected to create significant downdrag forces on the proposed piles. No soil remediation or settlement monitoring is required.

Identify any new cuts or fill slope angles and heights. Estimate the factor of safety against slope failure. Indicate if further testing, analysis or ground improvement/treatment is necessary: The proposed abutments and slopewalls will provide fill situations at each end of the structures. Preliminary stability analyses using Bishop's method were performed for each abutment. According to AASHTO LRFD 11.6.2.3, the required resistance factor for slope stability is 0.65 which is equivalent to a factor of safety of 1.5. The slope stability models for each abutment rendered factors of safety over 3.0.

Indicate at each substructure, the 100-year and 200-year total scour depths in the Hydraulics report, the non-granular scour depth reduction, the proposed ground surface, and the recommended foundation design scour elevations: Preliminary analysis shows that scour is not a concern at this location.

DESIGN SCOUR ELEVATION TABLE

Event / Limit State	Design Scour Elevations (ft.)				
	N. Abut.	Pier 1	Pier 2	S. Abut.	Item 113
Q100	660.2	638.8	637.5	660.3	8
Q200	660.2	638.8	637.5	660.3	
Design	660.2	638.8	637.5	660.3	
Check	660.2	638.8	637.5	660.3	

Determining the seismic soil site class, the seismic performance zone, the 0.2 and 1.0 second design spectral accelerations and indicate if that the soils are liquefiable: Based on IDOT Design Guide LRFD Soil Site Class Definition, Soil Site Class C controls. The Design Spectral Acceleration at 1.0 sec (SD1) is 0.072g and at 0.2 sec (SDS) is 0.125g. These values are based on a 1000 year design return period earthquake. According to AASHTO LRFD 3.10.6 the Seismic Performance Zone is 1. Liquefaction analysis is not required for SPZ 1.

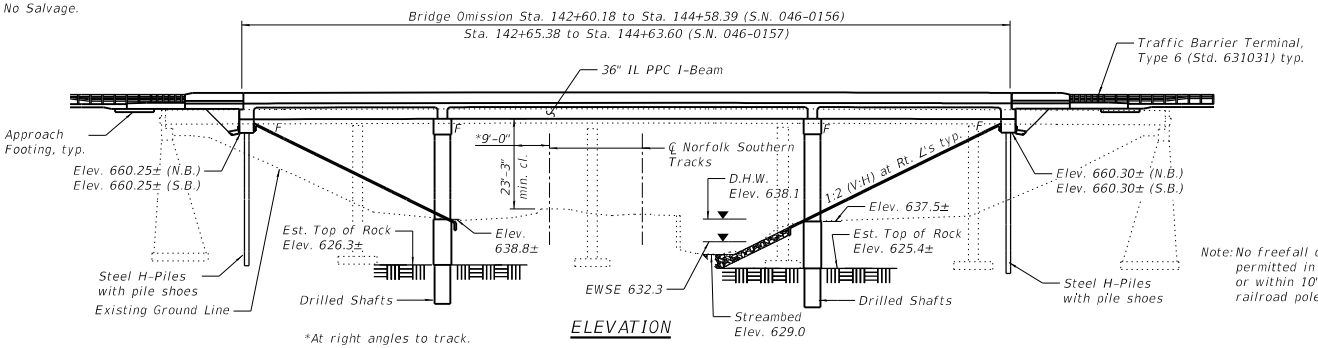
Confirm feasibility of the proposed foundation or wall type and provide design parameters. Attach a pile design table indicating feasible pile types, various nominal required bearings, factored resistances available and corresponding estimated lengths at locations where piles will be used. Provide factored bearing resistance and unit sliding resistance at various elevations and confirm no ground improvement/treatment is necessary where spread footings are proposed. Estimated top of rock elevations as well as preliminary factored unit side and tip resistance values shall be indicated when drilled shafts are proposed: Due to IDOT's strong desire for a jointless structure, integral abutments will be provided. Per IDOT Integral Abutment Pile Selection Design Guide, all metal shell and H-pile types are permissible at this location. However, H-piles are preferred since these piles will likely be driven to rock. See attached spreadsheets for estimated pile lengths and

capacities. The estimated factored design loads are 1300 kips at the abutments and 5260 kips at the piers. Due to the shallow bedrock elevations, either spread footings or drilled shafts are preferred at the piers. Considering the excavation required for spread footings along with railroad horizontal clearance requirements, the spread footings are not recommended, leaving drilled shafts as the preferred choice at the piers. Per AGMU 12.0, a Geotechnical Design Memorandum will be required for the drilled shafts during the design phase. Preliminary analysis shows the limestone layers at elevation 616.0 will provide a nominal unit side resistance (qs) of 32 ksf and a nominal unit tip resistance (qp) of 3375 ksf. Per AASHTO 10.8.3.5.4b, the side resistance is controlled by the compressive strength of the concrete shaft. Resistance factors of 0.50 and 0.55 shall be used for the tip and side resistances respectively when calculating the factored resistances for Strength. Only side or tip resistance should be considered during design, not both simultaneously. Rock elevations will be approximately 626.3 at Pier 1 and 625.4 at Pier 2.

Calculate the estimated water surface elevation and determine the need for cofferdams (type 1 or 2), and seal coat: Construction of the substructure units can be performed using conventional methods without a need for water diversion or cofferdams.

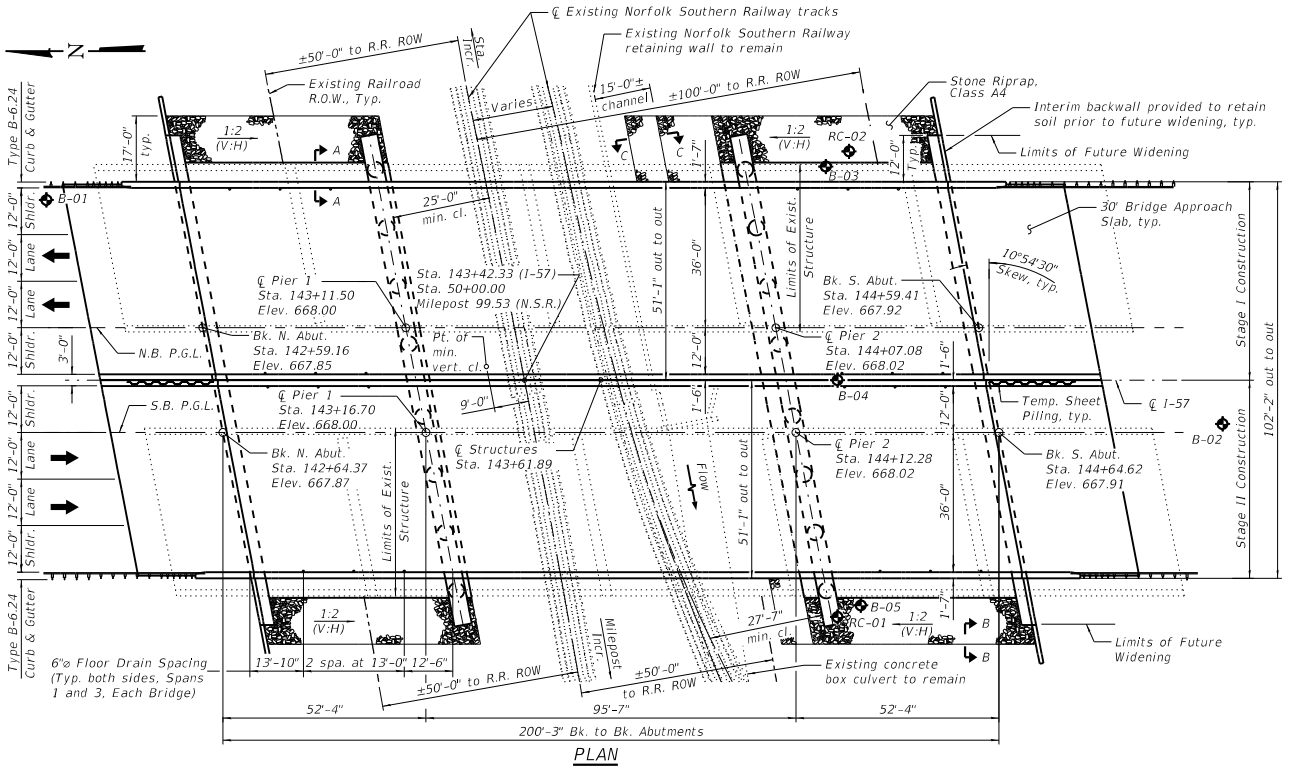
Assess the need for sheeting or soil retention or temporary construction slope and provide recommendation for other construction concerns: Temporary soil retention will be required to retain soil between the two structures during construction. Preliminary design shows Temporary Sheet Piling is feasible and is recommended. However, if it is determined during design phase that the embedment is expected to be within a soil layer with Qu larger than 4.5 tsf, a Temporary Soil Retention System would be required. Pile shoes are recommended for driving piles into limestone layers. Due to the consistent rock elevation data provided in the borings, no test piles are recommended. Rather, the proposed pile lengths shall be extended by two feet to accommodate any variations encountered in the field.

Bench Mark (BM 145): Chiseled "□" top of curb at southeast end of east parapet wall SN 046-0008, Sta. 145+03, 54' Left, Elev. 665.963.
Existing Structures: S.N. 046-0008 (N.B.) and S.N. 046-0009 (S.B.), built in 1954 as F.A. Rte 26, Section 139-VB-VF, at station 143+72. The bridge decks were replaced and structures widened in 1990 under F.A.I. Rte 57, Section 139VBR. The existing dual structures are 5-span bridges with rolled steel beams supported on spill-thru counterfort abutments and multi-column concrete piers on spread footings. 259'-8" back to back abutments, 43'-2" out to out deck with a 10°-54'-30" right ahead skew. Structures to be removed and replaced. Traffic shall be maintained utilizing crossovers during construction.
No Salvage.

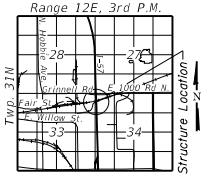


ELEVATION

Note: No freefall deck drains will be permitted in the span over tracks or within 10' of crossarms of a railroad pole line.



PLAN



LOCATION SKETCH

WATERWAY INFORMATION

Drainage Area = 2.51 sq. mi. Exist. Low Grade Elev. 641.07 @ Sta. 158+00
Prop. Low Grade Elev. 641.07 @ Sta. 158+00

Flood	Freq. Yr.	Q C.F.S.	Opening Ft² Exist.	Opening Ft² Prop.	Nat. H.W.E.	Head - Ft. Exist.	Head - Ft. Prop.	Headwater El. Exist.	Headwater El. Prop.
	10	229	0	0	635.6	0.0	0.0	635.6	635.6
Design	50	355	0	0	638.1	0.0	0.0	638.1	638.1
Base	100	418	0	0	638.9	0.0	0.0	638.9	638.9
Scour Check	200	485	1	2	639.4	0.1	0.1	639.4	639.5
Max. Calc.	500	582	12	12	639.8	0.1	0.1	639.8	639.9

Exist. 10-year velocity = 5.0 fps Prop. 10-year velocity = 5.0 fps

DESIGN SCOUR ELEVATION TABLE

Event / Limit State	Design Scour Elevations (ft.) N. Abut.	Pier 1	Pier 2	S. Abut.	Item 113
0100	660.2	638.8	637.5	660.3	8
0200	660.2	638.8	637.5	660.3	
Design	660.2	638.8	637.5	660.3	
Check	660.2	638.8	637.5	660.3	

LOADING HL-93

Allow 50#/sq. ft. for future wearing surface.

DESIGN SPECIFICATIONS

2017 AASHTO LRFD Bridge Design Specifications, 8th Edition

DESIGN STRESSES

FIELD UNITS

f'c = 3,500 psi
f'c = 4,000 psi (Superstructure Concrete)
fy = 60,000 psi (Reinforcement)

PRECAST PRESTRESSED UNITS

f'c = 8,500 psi
f'ci = 7,000 psi
fpu = 270,000 psi (0.6" ∅ low lax. strands)
fpbt = 202,300 psi (0.6" ○ low lax. strands)

SEISMIC DATA

Seismic Performance Zone (SPZ) = 1
Design Spectral Acceleration at 1.0 sec. (SD1) = 0.072 g
Design Spectral Acceleration at 0.2 sec. (SDS) = .0.125 g
Soil Site Class = C

HIGHWAY CLASSIFICATION

F.A.I. Rte. 57
Functional Class: Interstate
ADT: 31,392 (2021); 37,152 (2041)
ADTT: 7,409 (2021); 8,768 (2041)
DHV: 3,139 (2021); 3,715 (2041)
Design Speed: 75 m.p.h.
Posted Speed: 70 m.p.h.
Two-Way Traffic
Directional Distribution: 50:50

GENERAL PLAN & ELEVATION
I-57 OVER NORFOLK SOUTHERN RAILWAY & DRAINAGE DITCH
F.A.I. RTE 57 - SEC. [(139)VBJES
KANKAKEE COUNTY
STATION 143+61.89
STRUCTURE NO. 046-0156 (N.B.)
STRUCTURE NO. 046-0157 (S.B.)

LIN ENGINEERING, LTD.
Consulting Engineers
Springfield, Illinois

USER NAME =	DESIGNED - MTH	REVISED -	
	CHECKED - VPT	REVISED -	
PLOT SCALE =	DRAWN - CGY	REVISED -	
PLOT DATE =	CHECKED - MTH	REVISED -	

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET 1 OF 2 SHEETS

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
57	[(139)VBJES	KANKAKEE		
		CONTRACT NO. 66F74		
		ILLINOIS FED. AID PROJECT		

MODEL: Default
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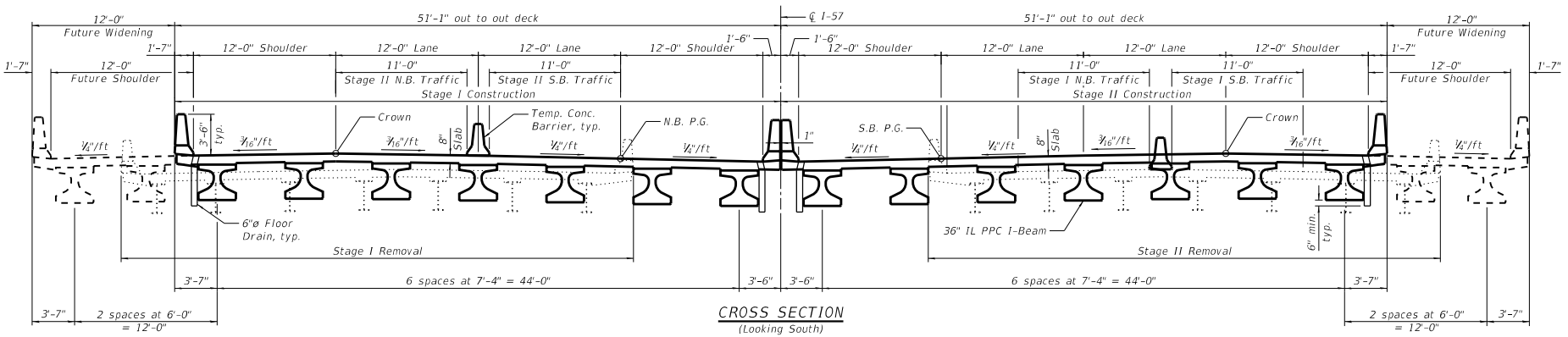
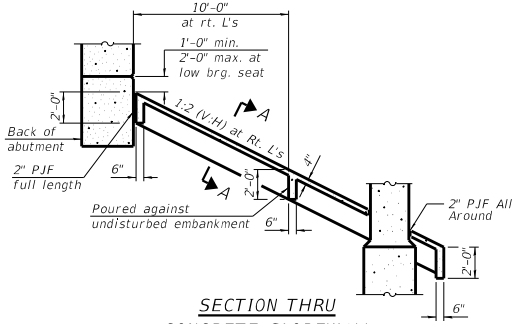
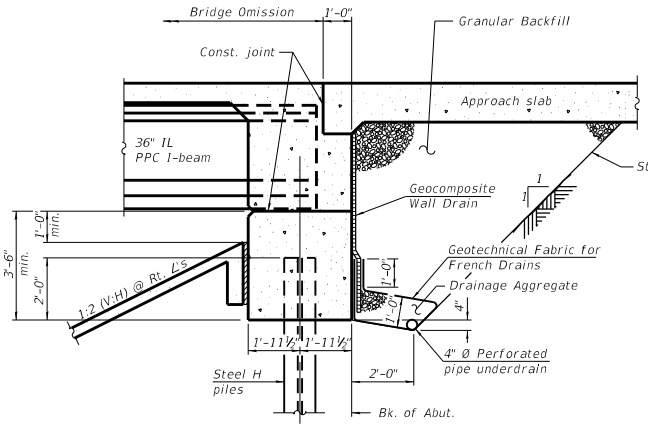


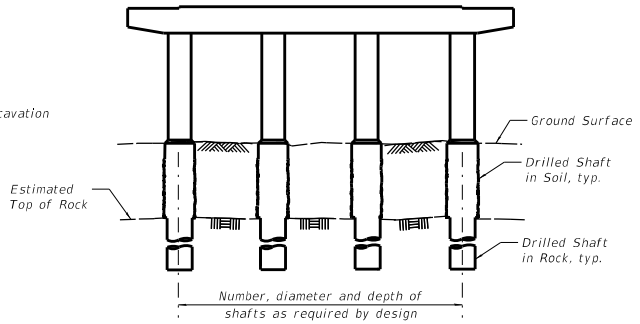
CROSS SECTION
(Looking South)



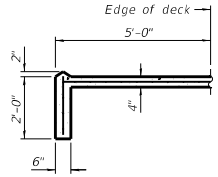
SECTION THRU CONCRETE SLOPEWALL



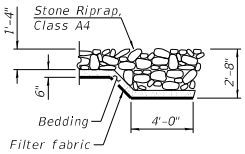
SECTION THRU INTEGRAL ABUTMENT
(Horiz. dim. @ Rt. L's)



PIER SKETCH



SECTION A-A



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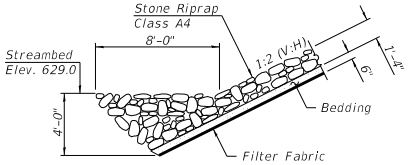
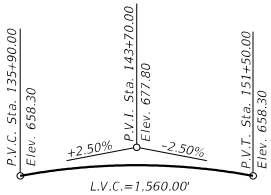


SECTION C-C
(within open channel only)



I- 57 PROFILE GRADE
(Along inside edge of pavement)

NORTH TRACK (MAIN)

SOUTH TRACK (SIDING)

TOP OF RAIL ELEVATIONS
NORFOLK SOUTHERN RAILWAY

GENERAL DATA
I-57 OVER NORFOLK SOUTHERN RAILWAY & DRAINAGE DITCH
F.A.I. RTE 57 - SEC. [(139)VB]ES
KANKAKEE COUNTY
STATION 143+61.89
STRUCTURE NO. 046-0156 (N.B.)
STRUCTURE NO. 046-0157 (S.B.)

MODEL: Default
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LIN ENGINEERING, LTD. Consulting Engineers Springfield, Illinois

USER NAME =	DESIGNED - MTH	REVISED -	
	CHECKED - VPT	REVISED -	
PLOT SCALE =	DRAWN - CGY	REVISED -	
PLOT DATE =	CHECKED - MTH	REVISED -	

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET 2 OF 2 SHEETS

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
57	[(139)VB]ES	KANKAKEE		
		CONTRACT NO. 66F74		
		ILLINOIS	FED. AID PROJECT	

Illinois Department of Transportation
Division of Highways
IDOT

SOIL BORING LOG

Date 11/2/16

ROUTE FAI-57 (I-57) **DESCRIPTION** I-57 over Con-Rail Corp. Railroad, 0.9 miles North of IL 17 **LOGGED BY** Larry Myers

SECTION 139VBR **LOCATION** NW 1/4, **SEC.** 34, **TWP.** 31N, **RNG.** 12E, 3rd **PM**,
Latitude 41.132399, **Longitude** -87.836033

COUNTY Kankakee **DRILLING METHOD** Hollow Stem Auger **HAMMER TYPE** CME Automatic

STRUCT. NO. 046-0008/0009
Station 143+72

BORING NO. 01 (N. Abut. NBL)
Station 142+12
Offset 47.0 ft Lt.
Ground Surface Elev. 665.93 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 630.9 ft ▼
Upon Completion 630.9 ft ▽
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Augered Bituminous Shoulder, Gravel Fill, Black Silty Clay Loam Fill
				663.43
	3			Stiff to Very Stiff Black Silty Clay Loam / Silty Loam with Minor Gray & Brown Silty Clay Loam - all Fill
	3 3	2.0 P	19	
-5				
	2			
	2 2	1.0 P	20	
	1			
	2 2	1.3 P	22	
-10				
	1			
	2 3	1.3 P	22	
				654.43
				Very Stiff Brown & Gray Silty Clay Fill with some Layers of Black Silty Clay Loam Fill
	2			
	2 4	2.1 B	25	
-15				
	2			
	2 4	2.0 P	26	
	4			
	4 5	3.8 B	21	
				646.43
-20				

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
	4			Very Stiff to Hard Gray, Black & Brown Sandy Clay Loam & Sandy Loam with Sand Seams - Fill *(continued)*
	5 7	3.4 S	14	
	3			
	4 7	4.0 P	16	
-25				
	4			
	5 6	3.5 P	17	
	5			
	6 10	5.1 S	16	
				636.43
-30				Very Stiff Gray & Brown Sandy Clay Loam / Sandy Loam
	5			
	6 6	3.9 S	17	
				633.93
	4			Medium Gray & Brown Fine to Coarse Sand - Minor Loam Layers - Free Water @ 35 Ft.
	5 6		17	
-35				
	7			
	10 13		21	
				628.43
	100/4"			628.10 Dense Gray Weathered Limestone Auger Refusal @ 38 Ft.
			12	
				End of Boring
-40				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

BBS, form 137 (Rev. 8-99)

SOIL BORING 046-0008,0009.GPJ IL_DOT.GDT 1/24/17

Illinois Department of Transportation
Division of Highways
IDOT

SOIL BORING LOG

Date 11/3/16

ROUTE FAI-57 (I-57) **DESCRIPTION** I-57 over Con-Rail Corp. Railroad, 0.9 miles North of IL 17 **LOGGED BY** Larry Myers

SECTION 139VBR **LOCATION** NE 1/4, **SEC.** 33, **TWP.** 31N, **RNG.** 12E, 3rd **PM**,
Latitude 41.131521, **Longitude** -87.836207

COUNTY Kankakee **DRILLING METHOD** Hollow Stem Auger **HAMMER TYPE** CME Automatic

STRUCT. NO. 046-0008/0009
Station 143+72

BORING NO. 02
Station 145+27
Offset 10.0 ft Rt.
Ground Surface Elev. 665.51 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter Dry ft
Upon Completion Dry ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Material Description
				Augered Black Silty Clay Loam Fill & Gray / Brown Silty Clay Loam Fill
663.01				
	2			Very Stiff to Hard Gray & Brown Silty Clay Loam Till Fill with some Black Silty Clay Loam Layers
	4 4	3.5 P	15	
-5				
	3			
	4 5	4.0 B	17	
658.51				
	3			Very Stiff to Hard Gray & Brown Sandy Clay Loam, Loam Fill & some Sand & Gravel Fill @ 20 Ft.
	4 5	4.4 S	19	
-10				
	3			
	4 6	3.4 B	16	
	4			
	5 6	3.8 S	17	
-15				
	3			
	5 7	4.2 S	17	
	4			
	5 7	4.2 S	14	
-20				
	5			Very Stiff to Hard Gray & Brown Sandy Clay Loam, Loam Fill & some Sand & Gravel Fill @ 20 Ft. *(continued)*
	5 9	4.5 P	13	
	5			
	6 5	4.5 P	18	
-25				
	5			
	6 7	3.5 P	15	
638.51				
	5			Hard to Very Stiff Black, Gray & Brown Silty Clay Loam & Sandy Clay Loam Fill
	5 6	4.0 P	17	
-30				
	4			
	5 7	4.0 P	17	
	4			
	5 6	4.0 P	20	
631.01				
-35				Very Stiff Gray & Black Silty Clay Loam
	3			
	5 5	3.2 B	24	
	3			
	4 5	3.0 B	19	
626.51				
-40				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

BBS, form 137 (Rev. 8-99)

SOIL BORING 046-0008,0009.GPJ IL_DOT.GDT 1/24/17

Illinois Department of Transportation
Division of Highways
IDOT

SOIL BORING LOG

Date 11/3/16

ROUTE FAI-57 (I-57) **DESCRIPTION** I-57 over Con-Rail Corp. Railroad, 0.9 miles North of IL 17 **LOGGED BY** Larry Myers

SECTION 139VBR **LOCATION** NE 1/4, **SEC.** 33, **TWP.** 31N, **RNG.** 12E, 3rd **PM**,
Latitude 41.131521, **Longitude** -87.836207

COUNTY Kankakee **DRILLING METHOD** Hollow Stem Auger **HAMMER TYPE** CME Automatic

STRUCT. NO. 046-0008/0009
Station 143+72

BORING NO. 02
Station 145+27
Offset 10.0 ft Rt.
Ground Surface Elev. 665.51 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter Dry ft
Upon Completion Dry ft
After Hrs. ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Gray Limestone Gravel in Gray Silty Loam / Silty Clay Loam Matrix *(continued)*		8		
	624.51	12		9
Dense Gray Limestone	624.34	100/2"		
End of Boring	-45			
	-50			
	-55			
	-60			

SOIL BORING 046-0008,0009.GPJ IL_DOT.GDT 1/24/17

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

Illinois Department of Transportation
Division of Highways
IDOT

SOIL BORING LOG

Date 11/22/16

ROUTE FAI-57 (I-57) **DESCRIPTION** I-57 over Con-Rail Corp. Railroad, 0.9 miles North of IL 17 **LOGGED BY** Larry Myers

SECTION 139VBR **LOCATION** NW 1/4, **SEC.** 34, **TWP.** 31N, **RNG.** 12E, 3rd **PM**,
Latitude 41.131812, **Longitude** -87.835977

COUNTY Kankakee **DRILLING METHOD** Hollow Stem Auger **HAMMER TYPE** CME Automatic

STRUCT. NO. 046-0008/0009
Station 143+72

BORING NO. 03 (Pier)
Station 144+20
Offset 55.0 ft Lt.
Ground Surface Elev. 638.08 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 628.1 ft ▼
Upon Completion 628.1 ft ▽
After Hrs. ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Augered Black & Brown Silty Clay Loam / Silty Loam Fill with Oversize Stone 0 - 3 Ft.				
633.08	-5	3		
Stiff to Very Stiff Black & Brown Silty Loam, Silty Clay Loam Fill with Gravel Pieces & Debris		2 2	2.5 P	16
631.08		4		
Loose to Medium Brown Loamy Sand with Layers of Brown Sandy Clay Loam / Sandy Loam (Fill ?)		5 5		13
628.58				
Very Stiff Gray Silt / Silty Loam with Limestone Gravel Pieces and Sand & Gravel Pockets	-10	4 6 9	3.5 P	16
625.08		18		
624.91		100/2"		13
Dense Gray Limestone - Weathered Surface				
End of Boring	-15			
	-20			

SOIL BORING 046-0008,0009.GPJ IL_DOT.GDT 1/24/17

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

BBS, form 137 (Rev. 8-99)

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SOIL BORING LOG

Date 11/22/16

ROUTE FAI-57 (I-57) **DESCRIPTION** I-57 over Con-Rail Corp. Railroad, 0.9 miles North of IL 17 **LOGGED BY** Larry Myers

SECTION 139VBR **LOCATION** NE 1/4, **SEC.** 33, **TWP.** 31N, **RNG.** 12E, 3rd **PM**, **Latitude** 41.131782, **Longitude** -87.836172

COUNTY Kankakee **DRILLING METHOD** Hollow Stem Auger **HAMMER TYPE** CME Automatic

STRUCT. NO. 046-0008/0009
Station 143+72

BORING NO. 04 (Pier)
Station 144+23
Offset 0.0 ft Centerline
Ground Surface Elev. 638.49 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 626.5 ft ▼
Upon Completion 626.5 ft ▽
After Hrs. ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Augered CA6, Black Silty Clay Loam / Silty Loam Fill with Heavy Gravel Pieces & Sand Layers - Fill				
633.49	-5			
Stiff Gray & Black Silt, Silty Clay Loam Fill with Gravel Pieces		2		
		3 3	1.5 P	15
631.49				
Soft Brown, Gray & Black Silty Loam, Silty Clay Loam with Sand Layers & Gravel Pieces - (Fill?)		WH		
		1 2	0.5 P	26
	-10			
		WH		
		2 2	0.5 P	16
▽▼ 625.99				
625.57		100/5"		9
Gray Limestone - Weathered Surface				
End of Boring				
	-15			
	-20			

SOIL BORING 046-0008,0009.GPJ IL_DOT.GDT 1/24/17

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

Illinois Department of Transportation
Division of Highways
IDOT

SOIL BORING LOG

Date 11/22/16

ROUTE FAI-57 (I-57) **DESCRIPTION** I-57 over Con-Rail Corp. Railroad, 0.9 miles North of IL 17 **LOGGED BY** Larry Myers

SECTION 139VBR **LOCATION** NE 1/4, **SEC.** 33, **TWP.** 31N, **RNG.** 12E, 3rd **PM**,
Latitude 41.131764, **Longitude** -87.836406

COUNTY Kankakee **DRILLING METHOD** Hollow Stem Auger **HAMMER TYPE** CME Automatic

STRUCT. NO. 046-0008/0009
Station 143+72

BORING NO. 05
Station 144+29
Offset 58.0 ft Rt.
Ground Surface Elev. 638.70 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 626.2 ft ▼
Upon Completion 626.2 ft ▽
After Hrs. ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Augered Black & Brown Silty Clay Loam Fill with Large Gravel & Oversize Gravel Pieces				
633.70	-5			
Stiff Black & Brown Silty Clay Loam, Silty Loam Fill with Gravel & Debris		2		
		2 3	1.5 P	20
631.70				
Very Stiff Brown & Gray Silt, Silty Loam, Silty Clay with Limestone Gravel Pieces		3		
		5 7	3.0 P	17
629.20				
Medium Brown Fine to Coarse Loamy Sand with Layers of Brown Sandy Clay Loam / Sandy Loam	-10	4		
		5 9		17
626.20 ▼				
Gray Limestone - Weathered Surface		61		
625.53		100/2"		9
End of Boring				
	-15			
	-20			

SOIL BORING 046-0008,0009.GPJ IL_DOT.GDT 1/24/17

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
Illinois Department of Transportation

ROCK CORE LOG

Date 11/24/17

ROUTE FAI-57 (I-57) **DESCRIPTION** I-57 over Con-Rail Corp. Railroad, 0.9 miles North of IL 17 **LOGGED BY** Larry Myers

SECTION 139VBR **LOCATION** NE 1/4, **SEC.** 33, **TWP.** 31N, **RNG.** 12E, 3rd **PM**,
Latitude 41.13179, **Longitude** -87.836406

COUNTY Kankakee **CORING METHOD** Split Barrel Wire Line

STRUCT. NO. 046-0008/0009
Station 143+72

BORING NO. RC 01
Station 144+23
Offset 61.0 ft Rt.
Ground Surface Elev. 638.78 ft

CORING BARREL TYPE & SIZE N W/L 2
Core Diameter 1.9 in
Top of Rock Elev. 625.78 ft
Begin Core Elev. 625.78 ft

	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
Dense Gray Limestone, Horizontally Fractured. Vertical Fracturing to 15 ft. Tight Joints	625.78	1	90	20	5.6	697.3 692.7
	-15	2	100	43	4.4	724.0 759.5 719.7 723.7 676.6
	-20	3	95	52	4.8	713.6 657.2
	-25					741.7
End of Boring	610.78					
	-30					

ROCK CORE 046-0008,0009.GPJ IL_DOT.GDT 3/6/18

Color pictures of the cores Yes
Cores will be stored for examination until Construction Complete
The "Strength" column represents the uniaxial compressive strength of the core sample (ASTM D-2938)

BBS, form 138 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
Illinois Department of Transportation

ROCK CORE LOG

Date 11/24/17

ROUTE FAI-57 (I-57) **DESCRIPTION** I-57 over Con-Rail Corp. Railroad, 0.9 miles North of IL 17 **LOGGED BY** Larry Myers

SECTION 139VBR **LOCATION** NW 1/4, **SEC.** 34, **TWP.** 31N, **RNG.** 12E, 3rd **PM**,
Latitude 41.131812, **Longitude** -87.83596

COUNTY Kankakee **CORING METHOD** Split Barrel Wire Line

STRUCT. NO. 046-0008/0009
Station 143+72

BORING NO. RC 02
Station 144+26
Offset 59.0 ft Lt.
Ground Surface Elev. 638.45 ft

CORING BARREL TYPE & SIZE N W/L 2
Core Diameter 1.9 in
Top of Rock Elev. 624.45 ft
Begin Core Elev. 624.45 ft

	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
Dense Gray Limestone - Horizontally Fractured with Loose to Tight Joints	624.45	1	93	0	4.6	
	-15					
19 Ft. to 20.5 Ft. Layers of Gray Interclays up to several inches thick.		2	100	38	10.2	
Note: Coring time affected by Interclay Layers jammed in barrel and had to be cleaned out.	-20					761.3
						678.9
		3	100	72	3.8	729.5
	-25					770.6
						673.3
						704.3
						692.9
						716.4
						697.1
	609.45					694.0
End of Boring	-30					

ROCK CORE 046-0008,0009.GPJ IL_DOT.GDT 3/6/18

Color pictures of the cores Yes
Cores will be stored for examination until Construction Complete
The "Strength" column represents the uniaxial compressive strength of the core sample (ASTM D-2938)

I-57 over R x R in Kankakee

SN 046-0008 / 0009 11-24

Hole #1

Depth 13 Ft to 23 Ft

Box 1 of 2

Start 13.7

16.9

12.5

17.8

12.2

18.5

19

21.4

22.7

12/11/2017

I-57 over KKR in Kankakee

SN 046-0008 / 0009

Hole #1 11-24-2017

Depth 23 Ft to 28 FT

Box 2 of 2

Start Run 3

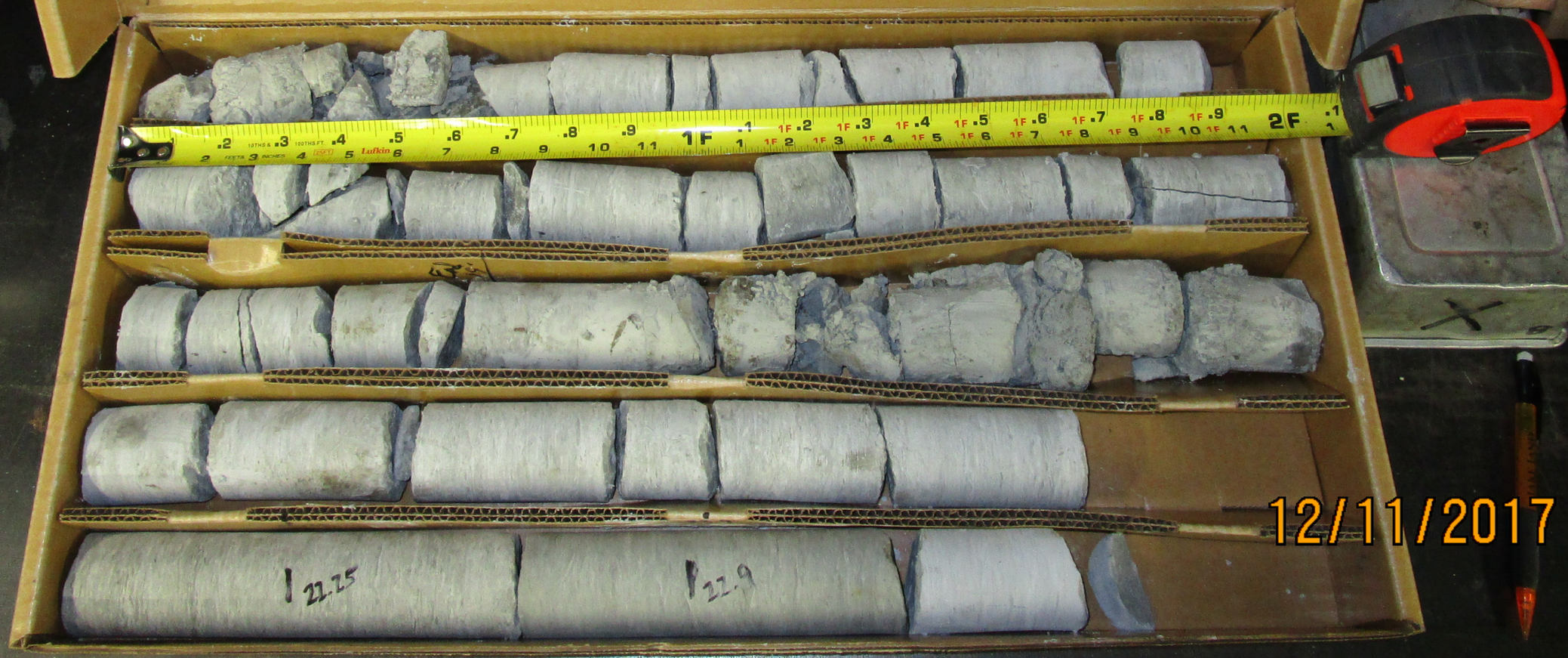
125.5

126.6

127.4

12/11/2017

I-57 over R x R in Kankakee
SN 046-0008 / 0009
Hole #2 11-24-2017
Depth 14 Ft. to 23.5 Ft.
Box 1 of 2



12/11/2017

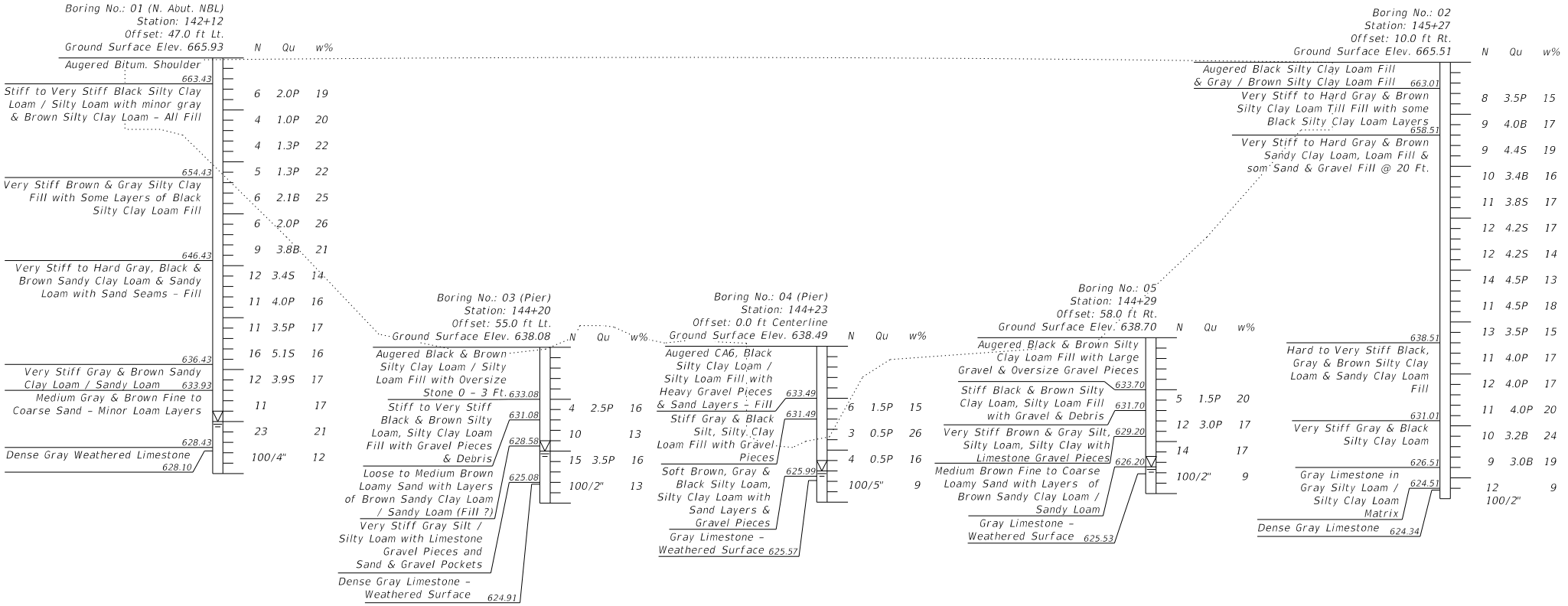
I-57 over R×R in Kankakee

SN 046-0008 / 0009

Hole #2 11-24-2017

Depth 23.5 Ft to 29 Ft

Box #2 of 2


Boring No.: 01 (N. Abut. NBL)
Station: 142+12
Offset: 47.0 ft Lt.
Ground Surface Elev. 665.93
N Qu w%
Augered Bitum. Shoulder
663.43
Stiff to Very Stiff Black Silty Clay Loam / Silty Loam with minor gray & Brown Silty Clay Loam – All Fill
6 2.0P 19
4 1.0P 20
4 1.3P 22
654.43
5 1.3P 22
Very Stiff Brown & Gray Silty Clay Fill with Some Layers of Black Silty Clay Loam Fill
6 2.1B 25
6 2.0P 26
646.43
9 3.8B 21
Very Stiff to Hard Gray, Black & Brown Sandy Clay Loam & Sandy Loam with Sand Seams – Fill
12 3.4S 14
11 4.0P 16
11 3.5P 17
636.43
16 5.1S 16
Very Stiff Gray & Brown Sandy Clay Loam / Sandy Loam
633.93
12 3.9S 17
Medium Gray & Brown Fine to Coarse Sand – Minor Loam Layers
11 17
628.43
23 21
Dense Gray Weathered Limestone
628.10
100/4" 12
Boring No.: 03 (Pier)
Station: 144+20
Offset: 55.0 ft Lt.
Ground Surface Elev. 638.08
N Qu w%
Augered Black & Brown Silty Clay Loam / Silty Loam Fill with Oversize Stone 0 – 3 Ft.
633.08
4 2.5P 16
Stiff to Very Stiff Black & Brown Silty Loam, Silty Clay Loam Fill with Gravel Pieces & Debris
631.08
10 13
628.58
15 3.5P 16
Loose to Medium Brown Loamy Sand with Layers of Brown Sandy Clay Loam / Sandy Loam (Fill ?)
625.08
100/2" 13
Very Stiff Gray Silt / Silty Loam with Limestone Gravel Pieces and Sand & Gravel Pockets
Dense Gray Limestone – Weathered Surface
624.91
Boring No.: 04 (Pier)
Station: 144+23
Offset: 0.0 ft Centerline
Ground Surface Elev. 638.49
N Qu w%
Augered CA6, Black Silty Clay Loam / Silty Loam Fill with Heavy Gravel Pieces & Sand Layers – Fill
633.49
6 1.5P 15
Stiff Gray & Black Silt, Silty Clay Loam Fill with Gravel Pieces
631.49
3 0.5P 26
625.99
4 0.5P 16
Soft Brown, Gray & Black Silty Loam, Silty Clay Loam with Sand Layers & Gravel Pieces
100/5" 9
Gray Limestone – Weathered Surface
625.57
Boring No.: 05
Station: 144+29
Offset: 58.0 ft Rt.
Ground Surface Elev. 638.70
N Qu w%
Augered Black & Brown Silty Clay Loam Fill with Large Gravel & Oversize Gravel Pieces
633.70
Stiff Black & Brown Silty Clay Loam, Silty Loam Fill with Gravel & Debris
631.70
5 1.5P 20
12 3.0P 17
Very Stiff Brown & Gray Silt, Silty Loam, Silty Clay with Limestone Gravel Pieces
629.20
14 17
626.20
Medium Brown Fine to Coarse Loamy Sand with Layers of Brown Sandy Clay Loam / Sandy Loam
100/2" 9
Gray Limestone – Weathered Surface
625.53
Boring No.: 02
Station: 145+27
Offset: 10.0 ft Rt.
Ground Surface Elev. 665.51
N Qu w%
Augered Black Silty Clay Loam Fill & Gray / Brown Silty Clay Loam Fill
663.01
Very Stiff to Hard Gray & Brown Silty Clay Loam Till Fill with some Black Silty Clay Loam Layers
658.51
8 3.5P 15
9 4.0B 17
Very Stiff to Hard Gray & Brown Sandy Clay Loam, Loam Fill & som Sand & Gravel Fill @ 20 Ft.
9 4.4S 19
10 3.4B 16
11 3.8S 17
12 4.2S 17
12 4.2S 14
14 4.5P 13
11 4.5P 18
638.51
13 3.5P 15
Hard to Very Stiff Black, Gray & Brown Silty Clay Loam & Sandy Clay Loam Fill
11 4.0P 17
12 4.0P 17
631.01
11 4.0P 20
Very Stiff Gray & Black Silty Clay Loam
10 3.2B 24
626.51
9 3.0B 19
Gray Limestone in Gray Silty Loam / Silty Clay Loam Matrix
624.51
12 9
100/2"
Dense Gray Limestone
624.34

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== North Abutment
REFERENCE BORING ========== B-01
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 662.31 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 660.31 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ====== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 1300 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 64.00 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ======= 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 162.50 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 60.94 KIPS

PILE TYPE AND SIZE ========== Steel HP 12 X 53
Plugged Pile Perimeter========== 3.967 FT. Unplugged Pile Perimeter========== 5.800 FT.
Plugged Pile End Bearing Area========== 0.983 SQFT. Unplugged Pile End Bearing Area========= 0.108 SQFT.

MAX. REQUIRED BEARING & RESISTANCE for Selected Pile, Soil Profile, & Losses

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req.d Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
418 KIPS	**418** KIPS	**230** KIPS	**36** FT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED SIDE RESIST. (KIPS)	NOMINAL PLUGGED END BRG. RESIST. (KIPS)	NOMINAL PLUGGED TOTAL RESIST. (KIPS)	NOMINAL UNPLUG'D SIDE RESIST. (KIPS)	NOMINAL UNPLUG'D END BRG. RESIST. (KIPS)	NOMINAL UNPLUG'D TOTAL RESIST. (KIPS)	NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
659.43	0.88	1.00			2.5		16.3	3.6		***5.1***	5	0	0	3	3
656.93	2.50	1.00			7.0	13.8	23.3	10.3	1.5	***15.4***	15	0	0	8	5
654.43	2.50	1.00			7.0	13.8	45.5	10.3	1.5	***27.4***	27	0	0	15	8
651.93	2.50	2.10			11.9	28.9	56.0	17.4	3.2	***44.7***	45	0	0	25	10
649.43	2.50	2.00			11.5	27.6	92.4	16.9	3.0	***64.2***	64	0	0	35	13
646.43	3.00	3.80	9		21.7	52.4	108.6	31.7	5.7	***95.4***	95	0	0	52	16
643.93	2.50	3.40	12		16.6	46.9	133.5	24.3	5.1	***120.6***	121	0	0	66	18
641.43	2.50	4.00	11		18.8	55.1	***145.4***	27.5	6.0	147.3	145	0	0	80	21
638.93	2.50	3.50	11		17.0	48.2	184.4	24.8	5.3	***174.6***	175	0	0	96	23
636.43	2.50	5.10	16		20.6	70.3	***188.5***	30.1	7.7	202.9	188	0	0	104	26
633.93	2.50	3.90	12		18.4	53.7	***180.1***	27.0	5.9	226.9	180	0	0	99	28
631.43	2.50		11	Medium Sand	2.0	26.9	***211.5***	2.9	2.9	233.0	212	0	0	116	31
628.43	3.00		23	Medium Sand	5.0	56.3	405.1	7.3	6.2	***261.0***	261	0	0	144	34
627.43	1.00			Limestone	98.8	245.0	504.0	144.5	26.8	***405.5***	405	0	0	223	34.9
626.43	1.00			Limestone	98.8	245.0	602.8	144.5	26.8	***550.0***	~~550~~	~~0~~	~~0~~	~~302~~	~~35.9~~
625.43	1.00			Limestone	98.8	245.0	701.6	144.5	26.8	***694.5***	~~694~~	~~0~~	~~0~~	~~382~~	~~36.9~~
624.43	1.00			Limestone		245.0			26.8						

Pile Design Table for North Abutment utilizing Boring #B-01

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Metal Shell 12"Φ w/.25" walls		
106	58	16
132	72	18
151	83	21
185	102	23
201	110	26
244	134	28
312	171	31
Metal Shell 14"Φ w/.25" walls		
102	56	13
129	71	16
160	88	18
182	100	21
225	124	23
241	132	26
296	163	28
386	212	31
Metal Shell 14"Φ w/.312" walls		
102	56	13
129	71	16
160	88	18
182	100	21
225	124	23
241	132	26
296	163	28
386	212	31
Metal Shell 16"Φ w/.312" walls		
78	43	10
124	68	13
154	85	16
191	105	18
214	118	21
267	147	23
282	155	26
350	192	28
466	256	31
Metal Shell 16"Φ w/.375" walls		
78	43	10
124	68	13
154	85	16
191	105	18
214	118	21
267	147	23
282	155	26
350	192	28
466	256	31
782	430	34
Steel HP 8 X 36		
110	60	23
116	64	26
117	64	28
131	72	31
175	96	34
286	157	36

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 10 X 42		
101	55	18
114	63	21
144	79	23
146	80	28
168	92	31
218	120	34
335	184	35
Steel HP 10 X 57		
103	57	18
117	64	21
147	81	23
149	82	28
172	95	31
226	124	34
454	250	36
Steel HP 12 X 53		
95	52	16
121	66	18
145	80	21
175	96	23
180	99	28
212	116	31
261	144	34
418	230	36
Steel HP 12 X 63		
98	54	16
123	68	18
147	81	21
178	98	23
182	100	28
214	118	31
269	148	34
497	273	36
Steel HP 12 X 74		
99	55	16
125	69	18
149	82	21
181	99	23
184	101	28
217	119	31
276	152	34
589	324	37

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 12 X 84		
101	55	16
127	70	18
152	84	21
183	101	23
187	103	28
221	121	31
282	155	34
664	365	37
Steel HP 14 X 73		
78	43	13
116	64	16
146	80	18
178	98	21
211	116	23
219	121	28
263	145	31
319	175	34
578	318	36
Steel HP 14 X 89		
81	44	13
118	65	16
149	82	18
181	100	21
215	118	23
222	122	28
267	147	31
329	181	34
705	388	37
Steel HP 14 X 102		
82	45	13
120	66	16
151	83	18
183	101	21
218	120	23
225	124	28
270	149	31
337	185	34
810	445	37
Steel HP 14 X 117		
85	46	13
122	67	16
154	85	18
186	102	21
222	122	23
228	125	28
274	151	31
347	191	34
Precast 14"x 14"		
82	45	10
130	72	13
164	90	16
204	112	18
231	127	21

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== South Abutment
REFERENCE BORING ========== B-02
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 662.36 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 660.36 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ====== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== ft

MAX. REQUIRED BEARING & RESISTANCE for Selected Pile, Soil Profile, & Losses

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req.d Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
418 KIPS	**418** KIPS	**230** KIPS	**37** FT.

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 1300 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 64.00 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ======= 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 162.50 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 60.94 KIPS

PILE TYPE AND SIZE ========== Steel HP 12 X 53
Plugged Pile Perimeter========== 3.967 FT. Unplugged Pile Perimeter========== 5.800 FT.
Plugged Pile End Bearing Area========== 0.983 SQFT. Unplugged Pile End Bearing Area========= 0.108 SQFT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED SIDE RESIST. (KIPS)	NOMINAL PLUGGED END BRG. RESIST. (KIPS)	NOMINAL PLUGGED TOTAL RESIST. (KIPS)	NOMINAL UNPLUG'D SIDE RESIST. (KIPS)	NOMINAL UNPLUG'D END BRG. RESIST. (KIPS)	NOMINAL UNPLUG'D TOTAL RESIST. (KIPS)	NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
658.51	1.85	1.00			5.2		19.0	7.6		***9.1***	9	0	0	5	4
656.01	2.50	1.00			7.0	13.8	26.0	10.3	1.5	***19.4***	19	0	0	11	6
653.51	2.50	1.00			7.0	13.8	33.1	10.3	1.5	***29.7***	30	0	0	16	9
651.01	2.50	1.00			7.0	13.8	40.1	10.3	1.5	***40.0***	40	0	0	22	11
648.51	2.50	1.00			7.0	13.8	***47.2***	10.3	1.5	50.3	47	0	0	26	14
646.01	2.50	1.00			7.0	13.8	***54.2***	10.3	1.5	60.6	54	0	0	30	16
643.51	2.50	1.00			7.0	13.8	109.5	10.3	1.5	***76.2***	76	0	0	42	19
641.01	2.50	4.50	11		20.6	62.0	116.3	30.1	6.8	***104.9***	105	0	0	58	21
638.51	2.50	3.50	13		17.0	48.2	140.2	24.8	5.3	***130.5***	130	0	0	72	24
636.01	2.50	4.00	11		18.8	55.1	159.0	27.5	6.0	***157.9***	158	0	0	87	26
633.51	2.50	4.00	12		18.8	55.1	***177.8***	27.5	6.0	185.4	178	0	0	98	29
631.01	2.50	4.00	11		18.8	55.1	***185.6***	27.5	6.0	211.7	186	0	0	102	31
628.51	2.50	3.20	10		15.9	44.1	***198.7***	23.2	4.8	234.7	199	0	0	109	34
626.51	2.00	3.00			12.1	41.3	414.5	17.7	4.5	***274.7***	275	0	0	151	36
625.51	1.00			Limestone	98.8	245.0	513.3	144.5	26.8	***419.2***	~~419~~	~~0~~	~~0~~	~~231~~	~~36.9~~
624.51	1.00			Limestone	98.8	245.0	612.2	144.5	26.8	***563.7***	~~564~~	~~0~~	~~0~~	~~310~~	~~37.9~~
623.51	1.00			Limestone		245.0			26.8						

Pile Design Table for South Abutment utilizing Boring #B-02

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Metal Shell 12"Φ w/.25" walls		
98	54	19
115	63	21
140	77	24
163	90	26
187	103	29
203	112	31
221	122	34
Metal Shell 14"Φ w/.25" walls		
70	39	16
121	67	19
140	77	21
170	93	24
197	108	26
224	123	29
242	133	31
263	145	34
Metal Shell 14"Φ w/.312" walls		
70	39	16
121	67	19
140	77	21
170	93	24
197	108	26
224	123	29
242	133	31
263	145	34
Metal Shell 16"Φ w/.312" walls		
82	45	16
147	81	19
166	91	21
202	111	24
233	128	26
264	145	29
283	156	31
306	168	34
Metal Shell 16"Φ w/.375" walls		
82	45	16
147	81	19
166	91	21
202	111	24
233	128	26
264	145	29
283	156	31
306	168	34
782	430	36
Steel HP 8 X 36		
109	60	29
116	64	31
126	69	34
185	102	36
286	157	38

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 10 X 42		
109	60	24
125	69	26
140	77	29
148	82	31
160	88	34
229	126	36
335	184	37
Steel HP 10 X 57		
90	49	21
111	61	24
128	70	26
144	79	29
152	83	31
163	90	34
238	131	36
454	250	38
Steel HP 12 X 53		
105	58	21
130	72	24
158	87	26
178	98	29
186	102	31
199	109	34
275	151	36
418	230	37
Steel HP 12 X 63		
107	59	21
133	73	24
161	88	26
180	99	29
188	103	31
201	110	34
283	156	36
497	273	38
Steel HP 12 X 74		
109	60	21
135	74	24
163	90	26
183	101	29
190	105	31
204	112	34
290	160	36
589	324	39

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 12 X 84		
110	61	21
137	75	24
165	91	26
186	102	29
193	106	31
207	114	34
296	163	36
664	365	39
Steel HP 14 X 73		
93	51	19
127	70	21
158	87	24
191	105	26
223	122	29
229	126	31
244	134	34
335	184	36
578	318	38
Steel HP 14 X 89		
96	53	19
130	71	21
161	89	24
194	107	26
226	124	29
233	128	31
248	136	34
346	190	36
705	388	39
Steel HP 14 X 102		
98	54	19
131	72	21
163	90	24
197	108	26
229	126	29
236	130	31
251	138	34
354	194	36
810	445	39
Steel HP 14 X 117		
100	55	19
134	74	21
166	91	24
200	110	26
232	128	29
239	131	31
254	140	34
364	200	36
Precast 14"x 14"		
89	49	16
155	85	19
178	98	21
216	119	24
251	138	26