STRUCTURE GEOTECHNICAL REPORT

001-0034

Existing SN 001-0032

IL 96 (24th St.) over Cedar Creek
Adams County

D-96-060-14

Contract 72G89

Prepared By: Brian Laningham
IDOT Region 4 District 6
Geotechnical Unit
217-782-6709

Checked By: BKL

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D-6 Geotechnical Engr.
Lic. #062-053757

Date: March 16, 2015

Date: July, 11, 2016
(Revised)
April 8, 2016

Prepared For: Ryan Phelps
Klingner & Associates
217-223-3670

Attachments: Preliminary TSL
Subsurface Profile
Boring Logs
Special Provisions

For Information Only

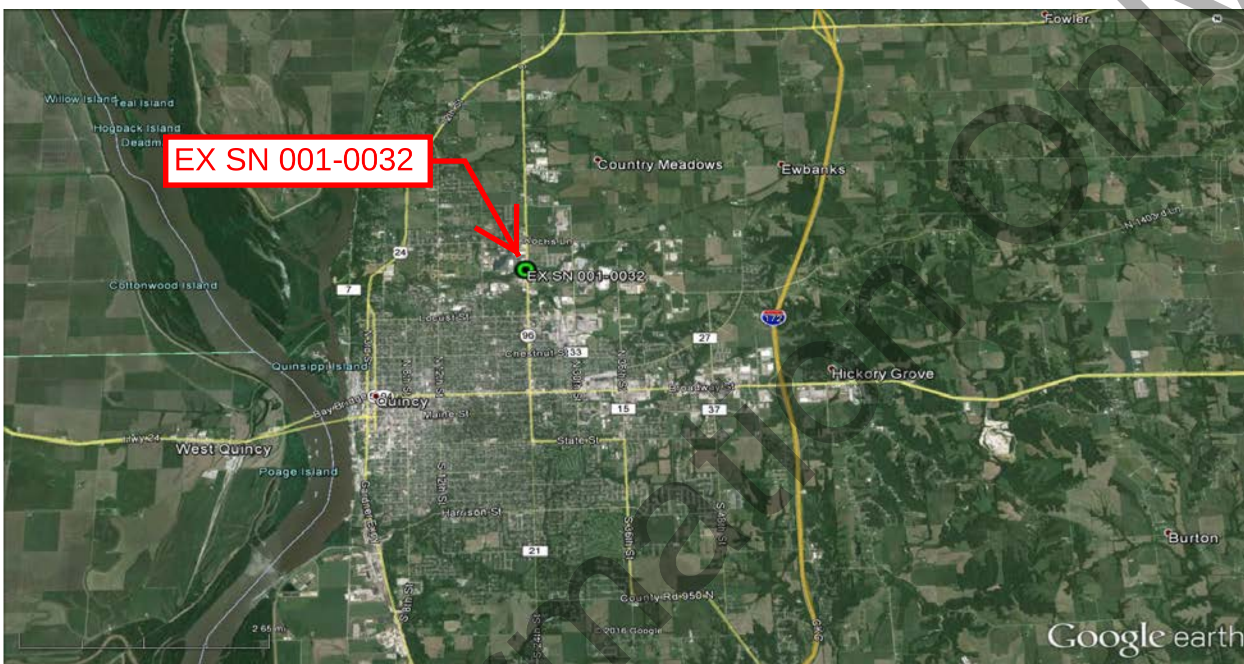
This Report has been prepared based on a preliminary TSL from February 18, 2016. Contact the author if there are any questions regarding this Report or if there are modifications to structure location, size, geometry, or vertical alignment.

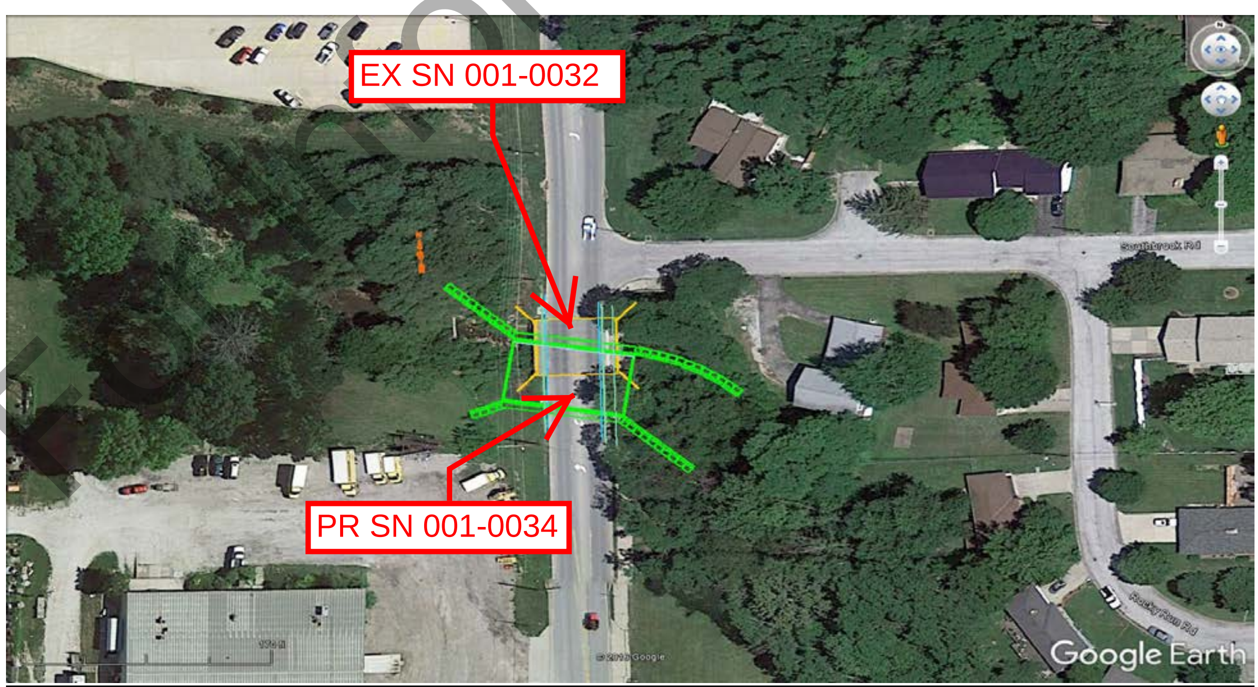
Electronic copies of boring logs are available upon request for inclusion in the plans. Calculations are also available upon request.

This Report has been prepared according to the 2014 IDOT Bureau of Bridges and Structures Bridge Manual and AASHTO LRFD Bridge Design Specifications 7th Edition – 2014 with 2016 Interims.

Project Description and Proposed Structure Information

The project includes replacing an existing 44'-0" long and 56'-2" wide single span bridge on closed abutments with a new 48'-0" span 3 – sided arch structure with an 84'-0" out to out width. The proposed structure will be founded on spread footing placed on hard Limestone bedrock. Work will be completed under road closure.





For Information Only

Site Investigation

The project is located approximately 1.65 miles north of the IL 96 / IL 104 intersection on IL 96.

The original structure was built in 1935. The existing structure is a single span reinforced concrete rigid frame on closed abutments. The overall length measures 44'-0" back-to-back of abutments with a 56'-2" out-to-out width.

Water flows from the east to west. There is no evidence of scour or undermining of the existing footing and wingwalls.

The existing roadway is located on approximately +/-12 ft. of fill with on 3H:1V slopes on both the east and west side of the road . The SE and SW quadrants of the roadway have no ditches (flood plain), the NE quadrant has storm sewer, and the NW quadrant has an open ditch running from north to south. No embankment slope stability problems have been observed, and there is no evidence of approach settlement problems.

No borings exist for the existing structure. Borings were advanced by the District 6 drill crew using hollow stem auger methods according to AASHTO T 206 and the IDOT Geotechnical Manual. Borings were filled with cuttings immediately after drilling to allow traffic on the roadway. The boring data indicates mostly Silty Clay Loam and Sand over Weathered Limestone. Limestone was encountered at elevations 563.60' and 566.30' for the South and North abutments respectively. The compression strengths for the Limestone samples range from: 466.2 – 1,411.2 tsf for the South abutment and 205.0 – 1,271.7 tsf for the North Abutment.

Geotechnical Evaluation

Settlement: There is proposed profile change of 1.70' at mid-span of the structure, however, because bedrock is shallow and the existing overburden is relatively stiff, settlement should not be a problem.

Slope Stability: There is no evidence of any slope stability problems with the existing cross slopes. No slope stability analysis is needed due to the project being constructed under a road closure.

Seismic Considerations: The following table shows recommended seismic design data based on a 1000 year return period event.

Seismic Performance Zone (SPZ)	1
Spectral Acceleration at 1 second (S_{D1})	0.083g
Design Spectral Acceleration at 0.2 Seconds (S_{DS})	0.134g
Soil Site Class	C

Scour: Scour elevations for a 100 and 500 year event was determined by the District 6 Hydraulics unit. The following table shows recommended design scour elevations at each substructure unit. The design scour elevation at the footings is equal to the top of rock elevation. Some adjustment to the footing elevations may be made during final design.

For Information Only

Event/Limit State	Design Scour Elevations (ft.)		Item 113
	South Footing	North Footing	
Q_{100}	563.60'	566.30'	5
Q_{200}	563.60'	566.30'	
Design	561.60'	564.30'	
Check	561.60'	564.30'	

Mining Activity: ISGS records indicate no mines in the proposed project area.

Foundation Evaluation

Vertical and Horizontal Loading

Preliminary maximum factored loads, provided by the structure designer, are approximately 42 kips/ft. vertical and 20 kips/ft. horizontal at the arch legs. Do to Limestone bedrock being relatively shallow with strengths ranging from 600 to 670 tsf in the top two feet, spread footing were analyzed and recommended.

Spread Footing

Because the roadway is 17' – 18' above the stream bed, the footings will need a stem wall to support the arch to achieve the required hydraulic opening and minimize the amount of fill over the top of the arch. The footing thicknesses were estimate at 1.5' for both, with 5.60' and 8.40' wall height for the North and South footings respectively. The wall thickness was estimated at 2.33'. The footing widths were calculated to 6.50' and 7.00' for the South and North footings, respectively. The bottoms of footings elevation are 561.60' and 564.60' for the South and North footings, respectively.

Lateral Loading

As mentioned above, the structural designer has provided the maximum factored loads for the arch based on final completion of the project. However, reviews of various stages of construction were analyzed to provide the structural designer with an adequate footing size. The stages were as follows:

Stage #1 – Footing walls backfilled with arch placed on the stem wall,
Stage #2 – Backfilling to the haunch of the arch,
Stage #3 - Completely backfilled to the top of the roadway (max. loading)
Stage #4 – Fully loaded with complete scour loss.

In these analyses some basic design parameters were estimated, these are listed below.

Unit Wt. of concrete = γ_{conc} = 150 pcf
Unit Wt. of soil = γ_{dry} = 120 pcf (Typical D6 unit wt. for FA = 110 pcf. and CA = 120 pcf.)
Angle of internal friction angle = ϕ = 30 & 35 degrees
Angle of internal wall friction = δ = 15 degrees
Angle of backfill = β = 0 degrees
All backfilled material is assumed to be free draining (No hydrostatic pressure)

For Information Only

From these parameters, the coefficients of earth pressures were calculated. See table below.

Earth Pressure Coefficients	30 Degrees	35 Degrees
Active, Ka	0.303	0.248
At Rest, Ko	0.50	0.43
Passive, Kp	5.0	6.60

In this analysis, a Contech 48' x 12' ConSpan Arch was used for estimating preliminary loads on the stem walls and footings. The arch legs are 16" thick with a 12" thick arch top. For Stage #1 & #2 the unfactored vertical and horizontal loads on each leg are 5.36 kips/ft. and 3.83 kips/ft. respectively. A load factor of 1.50 was then applied to the unfactored loads. For Stage #3 & #4 the factored loads provided by the structural design were used in the analysis.

At-Rest earth pressures were used in estimating the footing dimensions for each leg of the arch. The heel/toe dimensions were adjusted to keep the "Reaction Forces Resultant within the middle 9/10B for footing placed on rock, as mention in Section 11.63.3 – Eccentric Limits, of AASHTO LRFD Bridge Design Specifications. As expected Stage #1 was the most critical stage of construction, this is due in part to the footing not being completely backfill with material.

Because Stage #1 is a temporary condition, the structural designer may choose to reduce the footing size based on the Stage #3 or #4 conditions to make a more economical footing. The structural designer may also choose to use Passive earth pressure to reduce the footing. This would require the stem wall to move (flex) to mobilize Passive resistance. Depending on the amount of movement of the wall, the pressure will go from At-Rest to full Passive. For this particular structure the structural designer should assume movement based on a Dense Sand Backfill. See Table below:

Table C3.11.1-1—Approximate Values of Relative Movements Required to Reach Active or Passive Earth Pressure Conditions (Clough and Duncan, 1991)

Type of Backfill	Values of Δ/H	
	Active	Passive
Dense sand	0.001	0.01
Medium dense sand	0.002	0.02
Loose sand	0.004	0.04
Compacted silt	0.002	0.02
Compacted lean clay	0.010	0.05
Compacted fat clay	0.010	0.05

The tables below show the amount of deflection require to go from At-Rest to Full Passive earth pressure for each stem wall. Depending on what earth pressures the structural designer utilizes this will have a direct effect on the footing dimensions. These pressures are only for Stage #1 condition. The structural designer should contact the D#6 Geotechnical engineer if more earth pressures are requested for different stages of construction.

For Information Only

South Leg					
ϕ = 30 degrees			ϕ = 35 degrees		
Deflection (ft.)	Load (k/ft.)		Deflection (ft.)	Load (k/ft.)	
0.00	2.1	K_o	0.00	1.8	K_o
0.01	4.5		0.01	5.1	
0.02	6.9		0.02	8.4	
0.03	9.3		0.03	11.8	
0.04	11.7		0.04	15.1	
0.05	14.1		0.05	18.4	
0.06	16.5		0.06	21.7	
0.07	18.9		0.07	25.0	
0.08	21.2	K_p	0.08	28.3	K_p

North Leg					
ϕ = 30 degrees			ϕ = 35 degrees		
Deflection (ft.)	Load (k/ft.)		Deflection (ft.)	Load (k/ft.)	
0.00	0.9	K_o	0.00	0.8	K_o
0.01	2.4		0.01	2.8	
0.02	3.8		0.02	4.8	
0.03	5.2		0.03	6.7	
0.04	6.6		0.04	8.7	
0.05	8.0		0.05	10.7	
0.06	9.4	Kp	0.06	12.6	K_p

K_o = At-Rest Earth Pressure
K_p = Full Passive Earth Pressure

Because the footings will be keyed into Limestone bedrock, no problems with sliding or bearing capacity are anticipated. Granular material shall be utilized as backfill for the structure.

Wingwalls

After extensive discussion with the Bureau of Bridges and Structures, District #6, and structural designer, a Precast Modular Wall system was selected as the preferred wingwall type. This selection is based the proximity of shallow limestone, and the speed of construction for this type of wall.

Because the wingwall configuration is proprietary to the Arch manufacturer/supplier, the backslope angle should be taken into consideration by the structural designer and supplier. Clean crushed Limestone aggregate such as CA-07 or CA-11 should be used as Porous Granular Backfill to help provide drainage from behind the wingwalls. The density of the material ranges from 100 – 115 pcf with an average effective Phi angle of 40 degrees.

The Modular Wall system shall be set on a 6” leveling pad base. CA-06 shall be use as the leveling pad material. The density of this material ranges from 120 – 140 pcf with an average effective Phi angle of 40 degrees.

Approach Pavement

For Information Only

Because this will be a buried structure, no approach pavement is required.

Construction Considerations

Stage Construction: This project will be constructed under a road closure.

Ground Improvement: No ground improvement is required.

Foundation Construction: The spread footings shall be keyed in and poured into rock to a minimum thickness of the footing base. If during construction the footing base is over dug, it shall be capped with poured concrete to prevent the possibility scour.

Depending on the presents of water, A cofferdam Type 1 will need to be utilized during construction to divert water.

Note: *The Illinois Department of Transportation, District 6 understands that Three-Sided Arch Structures are proprietary to various vendors and suppliers. The use of the Contech system mentioned above was used only for theoretical analysis. The Dept. does not support any one vendor or supplier. The analysis was performed to provide the structural designer with design recommendations for the supporting stem walls and footings. It will be the contractor's choice to select an Arch supplier. This information may be adjusted to meet the supplier specifications.*

The following is a list of spreadsheets and software programs that were used in the geotechnical analysis:

- Seismic Site Class Determination Spreadsheet by BBS (Modified 12/10/10)

For Information Only

Benchmark: Chiseled "□" on Northeast wingwall of existing S.N. 001-0032, Sta. 30+26.8, 31.4 feet right of ℄, NAVD 88 Elev. 584.924.

Existing S.N. 001-0032: The existing structure was originally built in 1935 as S.A. Route 1, Section K-B-1-WPMS at Station 30+05. The bridge was modified in 2000 by adding a microsilica concrete overlay, concrete parapet and steel railing to accommodate a future bike path under Section 11 B-2. The existing bridge is a single span reinforced concrete rigid frame on closed concrete abutments. The overall length measures 44'-0" back-to-back of abutments with a 56'-2" out-to-out width.

The existing structure shall be removed and replaced with a three sided precast concrete structure.

Road closure shall be used during construction. Traffic to be detoured.

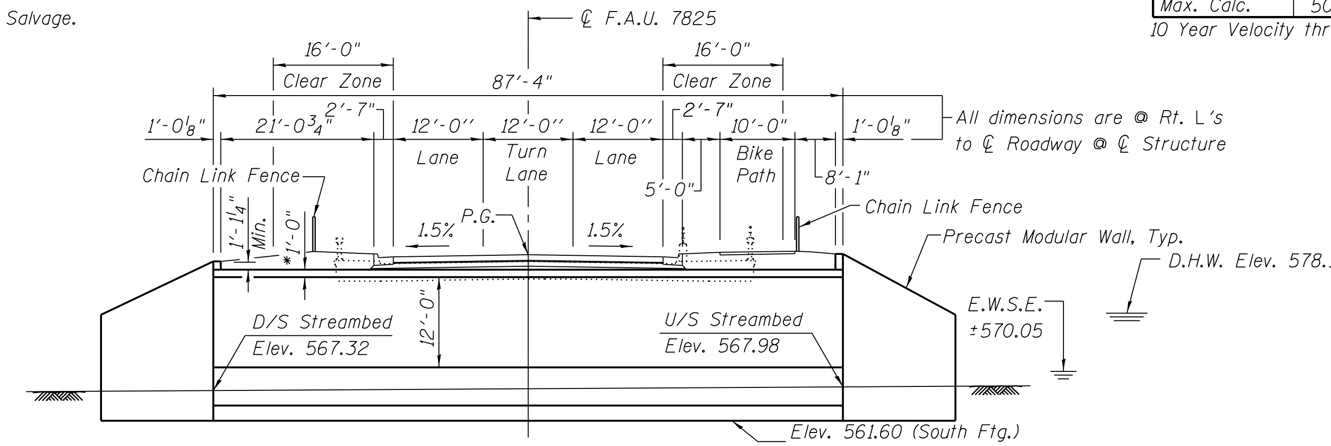
No Salvage.

WATERWAY INFORMATION

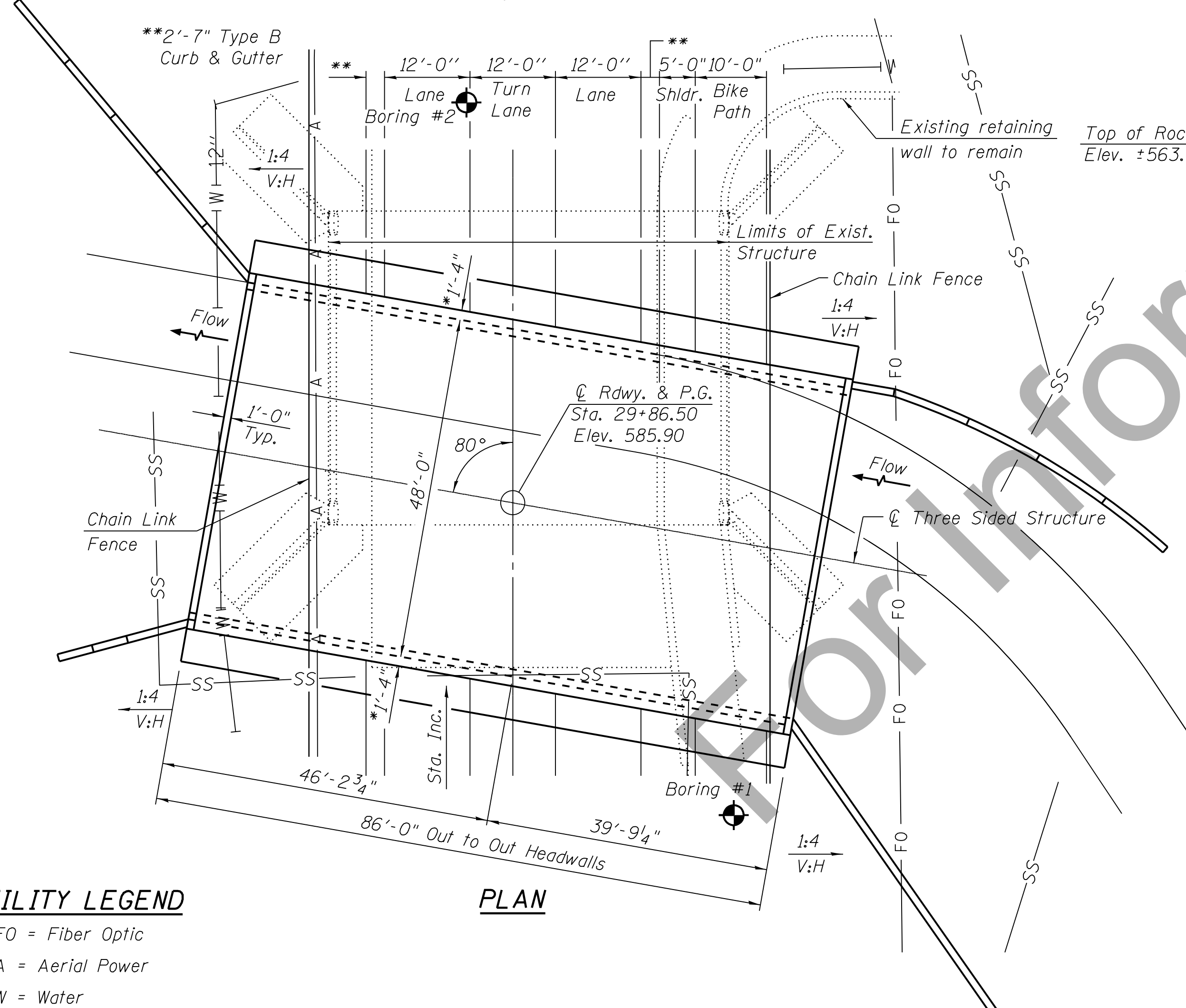
Drainage Area = 3.6 mi.² Exist. Overtopping Elev. 583.93 @ Sta. 29+62

Flood	Freq. Yr.	Q C.F.S.	Opening Sq. Ft. Exist.	Opening Sq. Ft. Prop.	Nat. H.W.E.	Head - Ft. Exist.	Head - Ft. Prop.	Headwater El. Exist.	Headwater El. Prop.
	10	1,642	288	273	576.7	0.1	0.2	576.8	576.9
Design	50	2,558	346	339	578.1	0.4	0.4	578.5	578.5
Base	100	2,966	366	359	578.6	0.5	0.5	579.1	579.1
Scour Design	200	3,227	377	371	578.9	0.6	0.6	579.5	579.5
Overtopping	>500								
Max. Calc.	500	4,004	405	399	579.6	1.1	1.0	580.6	580.5

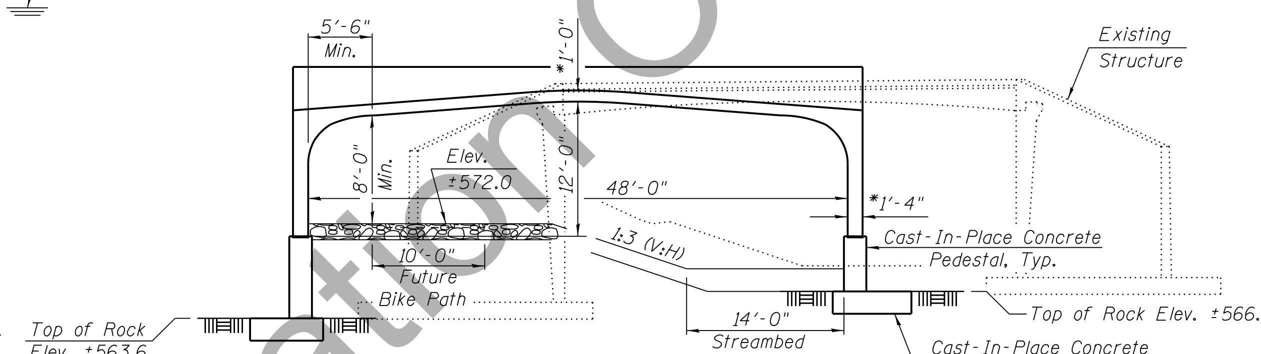
10 Year Velocity through Proposed Bridge = 6.0 fps



LONGITUDINAL SECTION
(Looking North)



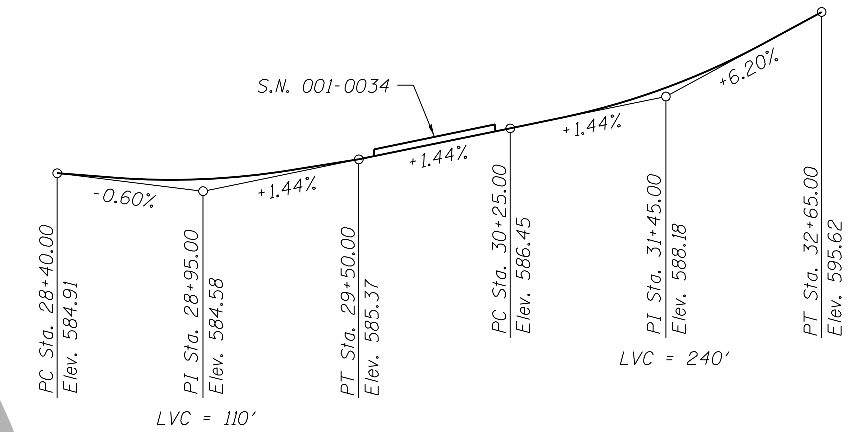
PLAN



SECTION THRU STRUCTURE
(At Rt. L's to ℄ structure)

*Slab and wall thickness and shape may vary as per manufacturer's design.

Notes:
Footing size and stem wall thickness to be refined during final design.
See Sheet 2 of 2 for Precast Modular Wall Details.



PROFILE GRADE
(along ℄ roadway IL Rte. 96)

DESIGN SCOUR ELEVATION TABLE

Event/Limit State	Design Scour Elevations (ft.) S. Footing	Design Scour Elevations (ft.) N. Footing	Item 113
Q100	563.60	566.30	5
Q500	563.60	566.30	
Design	561.60	564.30	
Check	561.60	564.30	

HIGHWAY CLASSIFICATION

F.A.U. Rte. 7825 - IL. Rte. 96
Functional Class: Minor Arterial
ADT: 6,450 (2013); 7,511 (2032)
ADTT: 325 (2013); 375 (2032)
DHV: 12% (2032)
Design Speed: 35 m.p.h.
Posted Speed: 30 m.p.h.
Two-Way Traffic
Directional Distribution: 50/50

LOADING HL-93

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

DESIGN SPECIFICATIONS

2014 AASHTO LRFD Bridge Design Specifications 7th Edition

DESIGN STRESSES

FIELD UNITS

f'_c = 3,500 psi
f_y = 60,000 psi (Reinforcement)

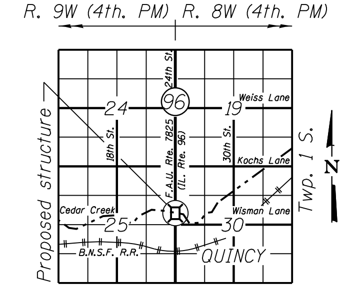
PRECAST UNITS

f'_c = 5,000 psi
f_y = 65,000 psi (Welded Wire Fabric)

SEISMIC DATA

Seismic Performance Zone (SPZ) = 1
Design Spectral Acceleration at 1.0 sec. (S_{D1}) = 0.083g
Design Spectral Acceleration at 0.2 sec. (S_{DS}) = 0.134g
Soil Site Class = C

R. 9W (4th. PM) R. 8W (4th. PM)



LOCATION SKETCH

UTILITY LEGEND

FO = Fiber Optic
A = Aerial Power
W = Water
SS = Storm Sewer

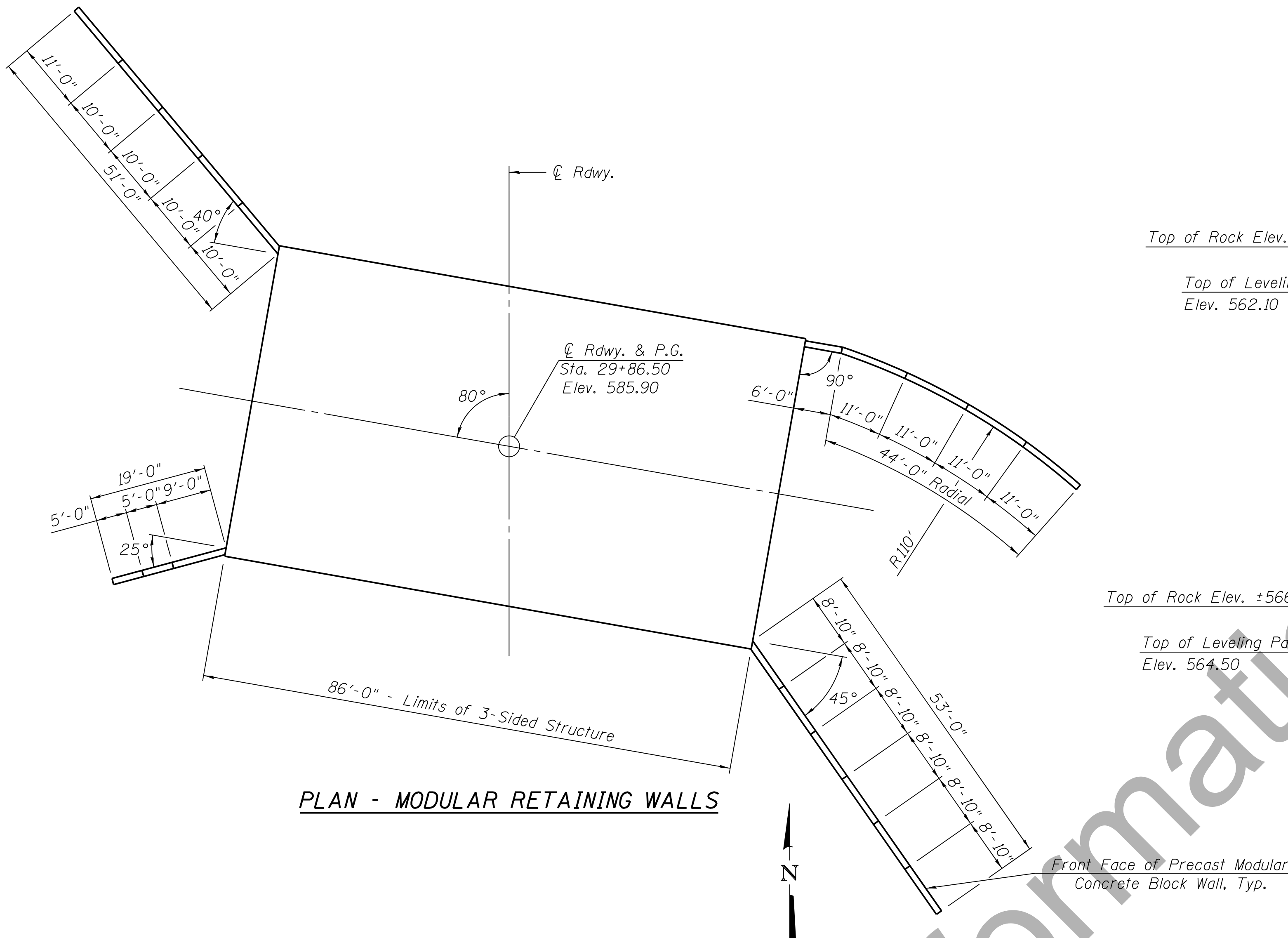
GENERAL PLAN
IL 96 (24th ST.) OVER CEDAR CREEK
F.A.U. ROUTE 7825 SECTION (11)B-3
ADAMS COUNTY
STATION 29+86.50
S.N. 001-0034

For Information Only

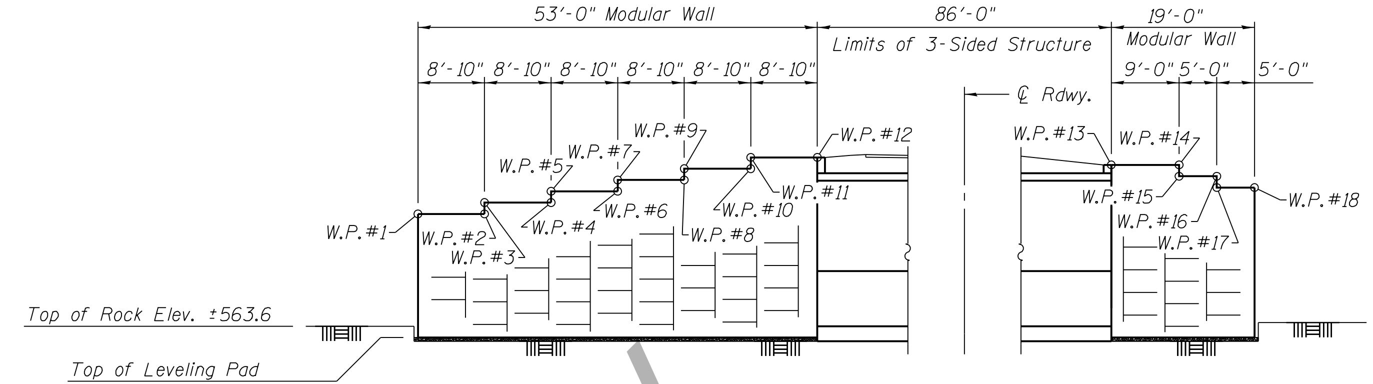
D:\0files\180276\WO 4 - IL 96 Cedar Creek\Bridge Plans\Final Plan Sheets.dgn

KLINGNER & ASSOCIATES, P.C. Engineers • Architects • Surveyors	USER NAME = rjp	DESIGNED - RJP	REVISED -	STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION	GENERAL PLAN S.N. 001-0034	F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
		CHECKED - ADL	REVISED -			7825	(11)B-3	ADAMS	2	1
	PLOT SCALE = 25.6105 ' / in.	DRAWN - RJP	REVISED -			CONTRACT NO. 72A97				
	PLOT DATE = 10/27/2016	CHECKED - ADL	REVISED -		SHEET NO. 1 OF 2 SHEETS	ILLINOIS FED. AID PROJECT				

Klingner & Associates P.C.

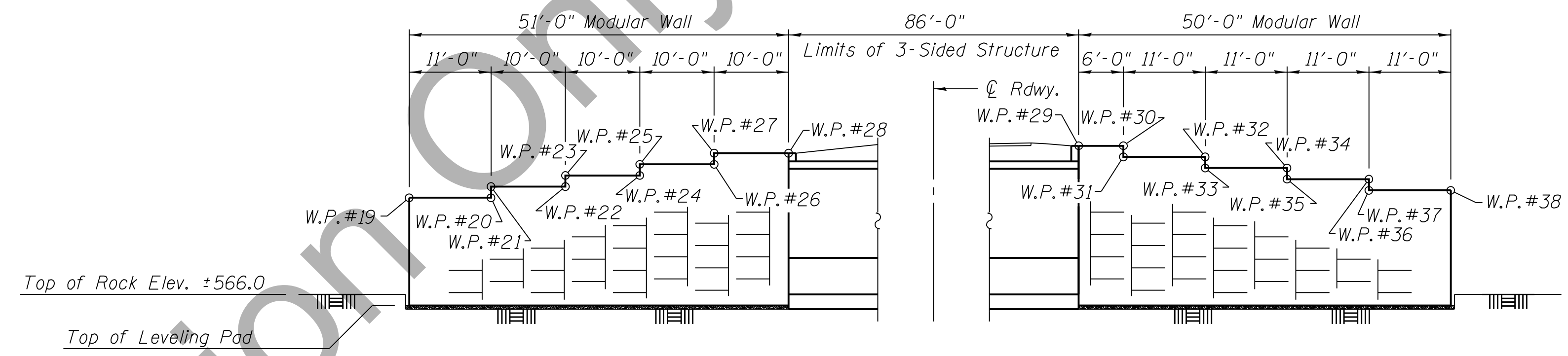


PLAN - MODULAR RETAINING WALLS



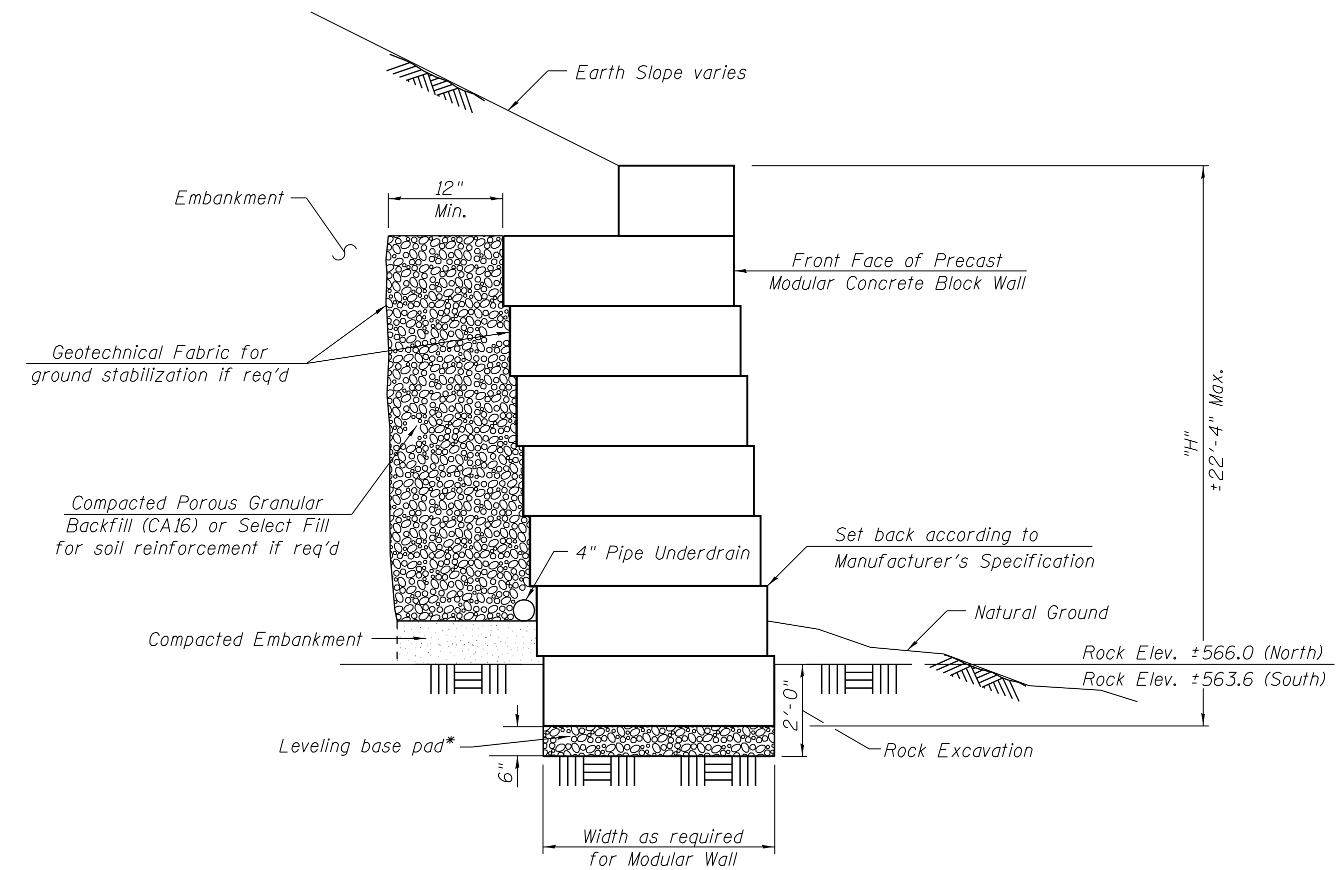
SOUTH PRECAST MODULAR WALL ELEVATION

(Looking South at Front Face of Wall)



NORTH PRECAST MODULAR WALL ELEVATION

(Looking North at Front Face of Wall)



SECTION THRU PRECAST MODULAR WALL

*Compacted Granular Fill (CA6 or CA10)
or 6" non-reinforced concrete pad

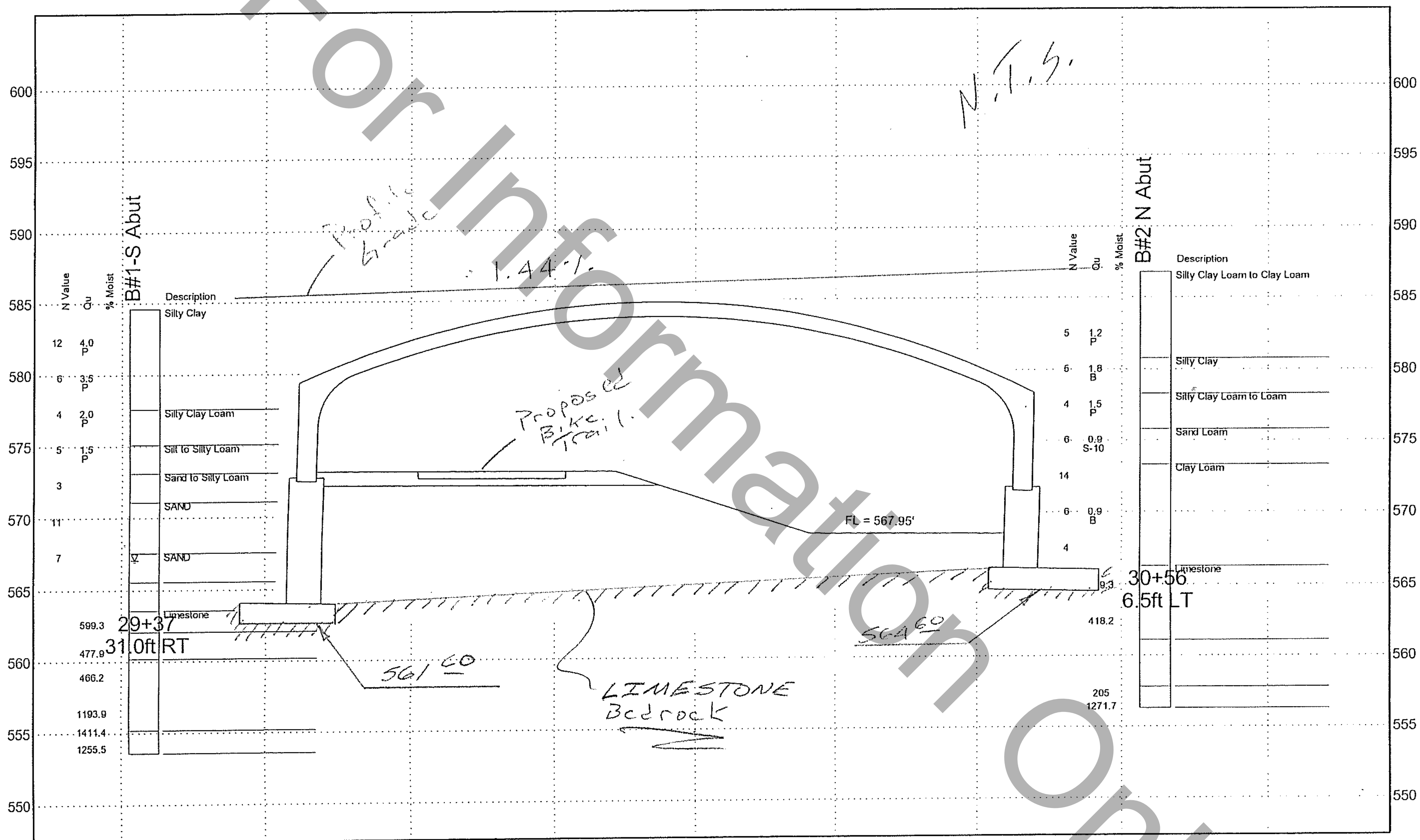
WORKING POINT COORDINATES

(At Front Face of Wall)

W.P.#	Station	Offset	Elevation	W.P.#	Station	Offset	Elevation
1	00+00.00	00.00' Lt.	000.00	20	00+00.00	00.00' Rt.	000.00
2	00+00.00	00.00' Lt.	000.00	21	00+00.00	00.00' Rt.	000.00
3	00+00.00	00.00' Lt.	000.00	22	00+00.00	00.00' Rt.	000.00
4	00+00.00	00.00' Lt.	000.00	23	00+00.00	00.00' Rt.	000.00
5	00+00.00	00.00' Lt.	000.00	24	00+00.00	00.00' Rt.	000.00
6	00+00.00	00.00' Lt.	000.00	25	00+00.00	00.00' Rt.	000.00
7	00+00.00	00.00' Lt.	000.00	26	00+00.00	00.00' Rt.	000.00
8	00+00.00	00.00' Lt.	000.00	27	00+00.00	00.00' Rt.	000.00
9	00+00.00	00.00' Lt.	000.00	28	00+00.00	00.00' Rt.	000.00
10	00+00.00	00.00' Lt.	000.00	29	00+00.00	00.00' Lt.	000.00
11	00+00.00	00.00' Lt.	000.00	30	00+00.00	00.00' Lt.	000.00
12	00+00.00	00.00' Lt.	000.00	31	00+00.00	00.00' Lt.	000.00
13	00+00.00	00.00' Rt.	000.00	32	00+00.00	00.00' Lt.	000.00
14	00+00.00	00.00' Rt.	000.00	33	00+00.00	00.00' Lt.	000.00
15	00+00.00	00.00' Rt.	000.00	34	00+00.00	00.00' Lt.	000.00
16	00+00.00	00.00' Rt.	000.00	35	00+00.00	00.00' Lt.	000.00
17	00+00.00	00.00' Rt.	000.00	36	00+00.00	00.00' Lt.	000.00
18	00+00.00	00.00' Rt.	000.00	37	00+00.00	00.00' Lt.	000.00
19	00+00.00	00.00' Rt.	000.00	38	00+00.00	00.00' Lt.	000.00

For Information Only

Structure Number 001-0032Ex 001-0034Prop IL 96 over Cedar Creek
Located in the of Section , Township , Range of the P.M.



NOT TO HORIZONTAL SCALE

VARIATIONS IN SUBSURFACE CONDITIONS MAY EXIST BETWEEN BORINGS

Groundwater
First Encounter
Completion
after (refer to log) hours

Abbreviations
WOH - Sampler Advanced by Weight of Hammer, WOP - Weight of Pipe
B.S. - Before Seating

Illinois Department of Transportation
Division of Highways
IDOT

SUBSURFACE DATA PROFILE

Route: IL 96 (N 24th St)

Section: 11B-3

County: Adams

For Information Only

SUBSURFACE DATA PROFILE 001-0034 IL 96 OVER CEDAR CREEK.GPJ D6TEMPLT.GDT 4/11/16

Illinois Department of Transportation
Division of Highways
District 6

SOIL BORING LOG

Date 10/20/15

ROUTE IL 96 (N 24th St) DESCRIPTION IL 96 over Cedar Creek LOGGED BY S. Jones

SECTION 11B-3 LOCATION , SEC. , TWP. , RNG. , PM

COUNTY Adams DRILLING METHOD HSA HAMMER TYPE 140# Auto

STRUCT. NO. 001-0032Ex 001-0034Prop
Station 29+88

BORING NO. 1-S Abut
Station 29+37
Offset 31.0ft RT
Ground Surface Elev. 584.6 ft

Surface Water Elev. 568.71 ft
Stream Bed Elev. 566.91 ft

Groundwater Elev.:
First Encounter 567.1 ft
Upon Completion cored with water ft
After ___ Hrs. ___ ft

Description	Elev.	DEPTH (ft)	BLOWS /6"	UCS Qu (tsf)	MOIST (%)
Tan and Reddish Brown dry SILTY CLAY poor recovery			3		
			8	4.0	
			4	P	
		-5	2		
			3	3.5	
			3	P	
	577.60				
Brown to Reddish Brown and Gray SILTY CLAY LOAM w/ oxidation nodules, moist			1		
			2	2.0	
			2	P	
	575.10				
Dk Brown SILT to SILTY LOAM, dry		-10	2		
			3	1.5	
			2	P	
	573.10				
Med Grained Brown SAND to Dk Brown SILTY LOAM w/ Oxidation			0		
			1		
			2		
	571.10				
Brown Moist Med Grained SAND w/ Large Chert Nodules rock lodged in spoon, poor recovery		-15	3		
			9		
			2		
	567.60				
Med to Coarse SAND w/ Chert Nodules turning to weathered LS FREE WATER (▽)			3		
			4		
			3		
	565.60				
		-20	9		

Description	Elev.	DEPTH (ft)	BLOWS /6"	UCS Qu (tsf)	MOIST (%)
Tan and Gray Moist Clay Residuum to Dirty Broken LIMESTONE and *(continued)*			100/3"		
	563.60				
Borehole continued with rock coring.					
		-25			
		-30			
		-35			
		-40			

For Information Only

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer, E-Estimated)
Abbreviations W.O.H - Sampler Advanced By Weight of Hammer, W.O.P - Advanced by Weight of Pipe, B.S. - Before Seating
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206) BBS, from 137 (Rev. 8-99)

File Name S:\SOILS\GINT FILES\001 ADAMS\BRIDGE BORINGS\001-0034 IL 96 OVER CEDAR CREEK.GPJ Data Template D6TEMPLT.GDT Date Printed 2/22/16
Latitude Longitude Datum NAD83 Job Number 72G89

Illinois Department of Transportation

Division of Highways
District 6

ROCK CORE LOG

Date 10/20/15

ROUTE IL 96 (N 24th St) DESCRIPTION IL 96 over Cedar Creek LOGGED BY S. Jones

SECTION 11B-3 LOCATION , SEC. , TWP. , RNG. , PM

COUNTY Adams CORING METHOD Water

STRUCT. NO. 001-0032Ex 001-0034Prop
Station 29+88

CORING BARREL TYPE & SIZE NQ2WL

Core Diameter 2 in
Top of Rock Elev. 563.60 ft
Begin Core Elev. 562.90 ft

BORING NO. 1-S Abut
Station 29+37
Offset 31.0ft RT
Ground Surface Elev. 584.6 ft

Description	Elev.	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
Tan and Lt Gray Microcrystalline LIMESTONE Open Joints 2"-6" 1" shale seam @22.3'	563.60		1	100	88		599.3
Lt Gray Microcrystalline LIMESTONE Open Joints 2"-12"	562.10						477.9
Lt Gray Microcrystalline LIMESTONE w/ Gray and Tan Chert Nodules Closed Joints 6"-12"	560.20	-25					466.2 1193.9
Lt and Dk Gray Macrocrystalline LIMESTONE Closed Joints 2"-12" with dk gray clay to clayey shale @30.75' to 31' multiple 1/8" shale seams	555.20	-30					1411.4 1255.5
	553.60	-35 -40					

Color pictures of the cores Yes, On File
Cores will be stored for examination until 5 Years after Construction
The "Strength" column represents the uniaxial compressive strength of the core sample (ASTM D-2938)
RQD is the ratio of the total length of sound core specimens >4" to total length of core run

BBS, form 138 (Rev. 8-99)

ROCK CORE 001-0034 IL 96 OVER CEDAR CREEK.GPJ D6TEMPLT.GDT 2/22/16

For Information Only

Illinois Department of Transportation
Division of Highways
District 6

SOIL BORING LOG

Date 9/24/15

ROUTE IL 96 (N 24th St) **DESCRIPTION** IL 96 over Cedar Creek **LOGGED BY** M. Tappan

SECTION 11B-3 **LOCATION** , SEC. , TWP. , RNG. , PM

COUNTY Adams **DRILLING METHOD** HSA **HAMMER TYPE** 140# Auto

STRUCT. NO.	001-0032Ex 001-0034Prop
Station	29+88
BORING NO.	2 N Abut
Station	30+56
Offset	6.5ft LT
Ground Surface Elev.	586.8 ft
Surface Water Elev.	568.71 ft
Stream Bed Elev.	566.91 ft
Groundwater Elev.:	
▽ First Encounter	ft
▼ Upon Completion	ft
▼ After ___ Hrs.	ft

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Brown Moist SILTY CLAY LOAM to CLAY LOAM (Disturbed) (14" of Asphalt)			0		
		-5	2	1.2	
			3	P	
	580.80				
Brown Moist SILTY CLAY w/ Iron Oxidation nodules			1		
			2	1.8	
			3	B	
	578.30				
Brown Moist SILTY CLAY LOAM to Brown and Dk Gray Moist LOAM w/ angular Cherty Limestone Gravel			1		
		-10	2	1.5	
			2	P	
	575.80				
Gray and Yellowish Brown Moist SAND LOAM w/ angular Chery Limestone Gravel			2		
			2	0.9	
			4	S-10	
	573.30				
Lt Gray Moist CLAY LOAM Residuum w/ White Angular Chery Limestone Gravel			2		
		-15	4		
			10		
			0		
Lt Yellowish Brown			2	0.9	
			4	B	
			2		
Yellowish Brown dirty broken		-20	4		
crystalline Limestone gravel to Brown Weathered Cherty crystalline Limestone	566.30		100/4"		
Borehole continued with rock coring.					
		-25			
		-30			
		-35			
		-40			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer, E-Estimated)
Abbreviations W.O.H - Sampler Advanced By Weight of Hammer, W.O.P - Advanced by Weight of Pipe, B.S. - Before Seating
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206) BBS, from 137 (Rev. 8-99)

File Name S:\SOILS\GINT FILES\001 ADAMS\BRIDGE BORINGS\001-0034 IL 96 OVER CEDAR CREEK.GPJ Data Template D6TEMPLT.GDT Date Printed 2/22/16
Latitude 39D 57.5266N Longitude 90D 22.6482 Datum NAD83 Job Number 72G89

For Information Only

Illinois Department of Transportation
Division of Highways
District 6

ROCK CORE LOG

Date 9/24/15

ROUTE IL 96 (N 24th St) DESCRIPTION IL 96 over Cedar Creek LOGGED BY M. Tappan

SECTION 11B-3 LOCATION , SEC. , TWP. , RNG. , PM

COUNTY Adams CORING METHOD Water

STRUCT. NO. 001-0032Ex 001-0034Prop CORING BARREL TYPE & SIZE NQ2WL
Station 29+88

Core Diameter 2 in
Top of Rock Elev. 566.30 ft
Begin Core Elev. 565.20 ft

BORING NO. 2 N Abut
Station 30+56
Offset 6.5ft LT
Ground Surface Elev. 586.8 ft

Description	Elev.	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
Lt Gray fossiliferous Macrosrystalline LIMESTONE w/ some Lt Brown Chert Nodules open joints 2"-12"	566.30		1	95	62		669.3
							418.2
		-25					
	561.10						
Lt Gay Microcrystalline Cherty LIMESTONE w/ multiple Chert Seams var 1"-10" open joints 2"-12" Chert Seams have vertical fractures							
	557.80						
Gray to Lt Brown Microcrystalline Weathered LIMESTONE w/ Multiple Chert Seams 1/2"-4" closed joints 2"-12" w/ olive brown clayey shale		-30					205
	556.30						1271.7
Sample #3 Had A Diagonal Mud Line 29.2 - 29.5 ft							
		-35					
		-40					

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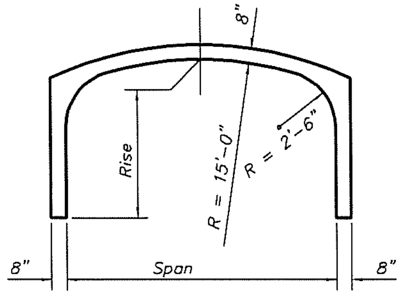
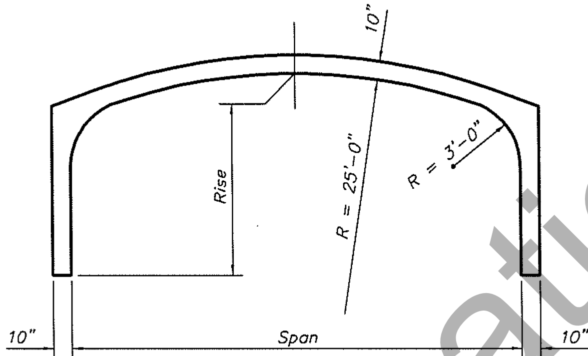
Color pictures of the cores Yes, On File
Cores will be stored for examination until 5 Years after Construction
The "Strength" column represents the uniaxial compressive strength of the core sample (ASTM D-2938)
RQD is the ratio of the total length of sound core specimens >4" to total length of core run



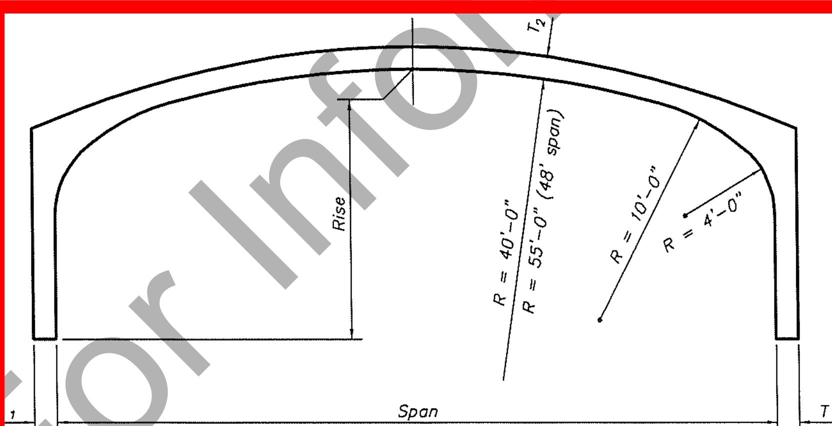
SHORT SPAN SERIES

WATERWAY AREA (SQUARE FEET)		
RISE	SPAN (FT.)	
(FT.)	12	14
4	42	50
5	54	64
6	66	78
7	78	92
8	90	106
9	102	120
10	114	134
11	*	148



INTERMEDIATE SPAN SERIES

WATERWAY AREA (SQUARE FEET)			
RISE	SPAN (FT.)		
(FT.)	16	20	24
5	71	85	*
6	87	105	119
7	103	125	143
8	119	145	167
9	135	165	191
10	151	185	215



T_1 = 12" (28' & 32' spans)
14" (36' & 42' spans)
16" (48' span)

T_2 = 10" (28' span)
12" (32', 36', 42' & 48' spans)

LONG SPAN SERIES

WATERWAY AREA (SQUARE FEET)					
RISE	SPAN (FT.)				
(FT.)	28	32	36	42 **	48
8	195	216	*	*	*
9	223	248	268	*	*
10	251	280	304	334	*
11	279	312	340	376	435
12	*	344	376	418	483
13	*	*	412	460	*
14	*	*	*	502	*

** Note: Geometry may vary slightly depending upon location of production, call CON/SPAN for details.

*Contact local provider for more information regarding this Span and Rise combination.

CON/SPAN® BRIDGE SYSTEMS

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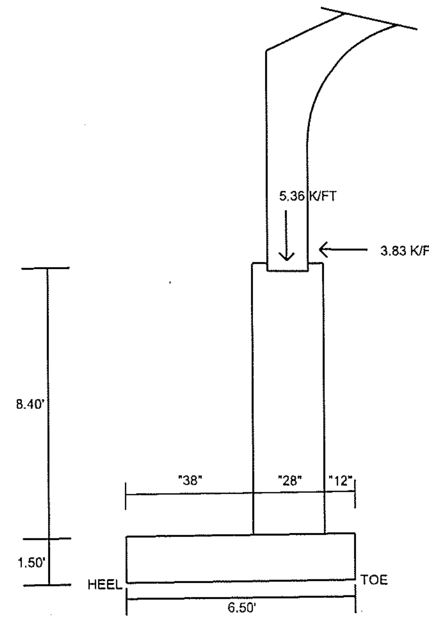
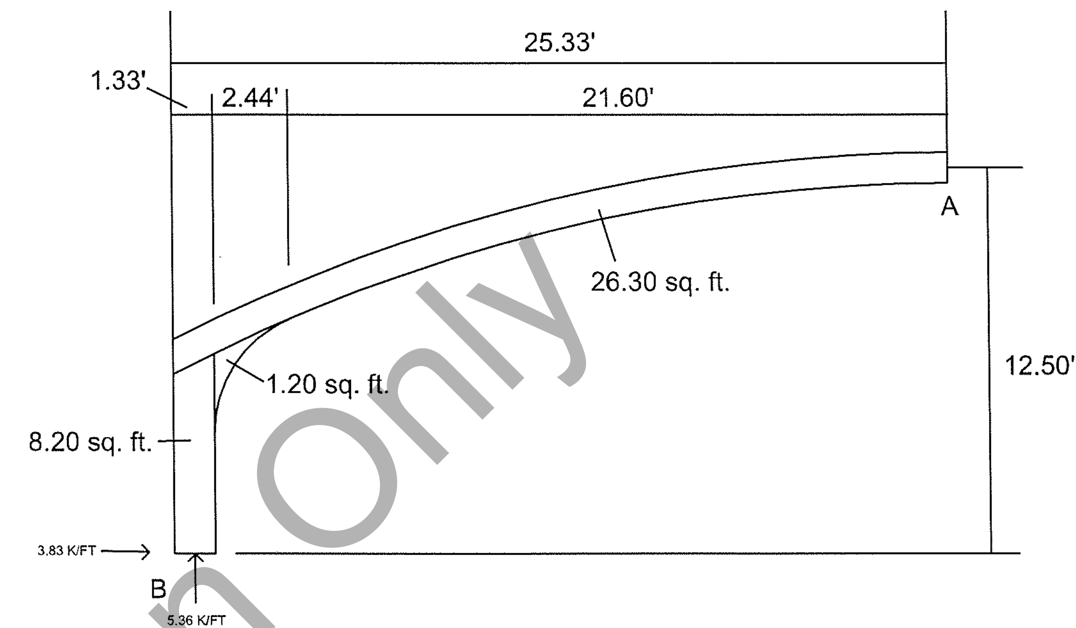
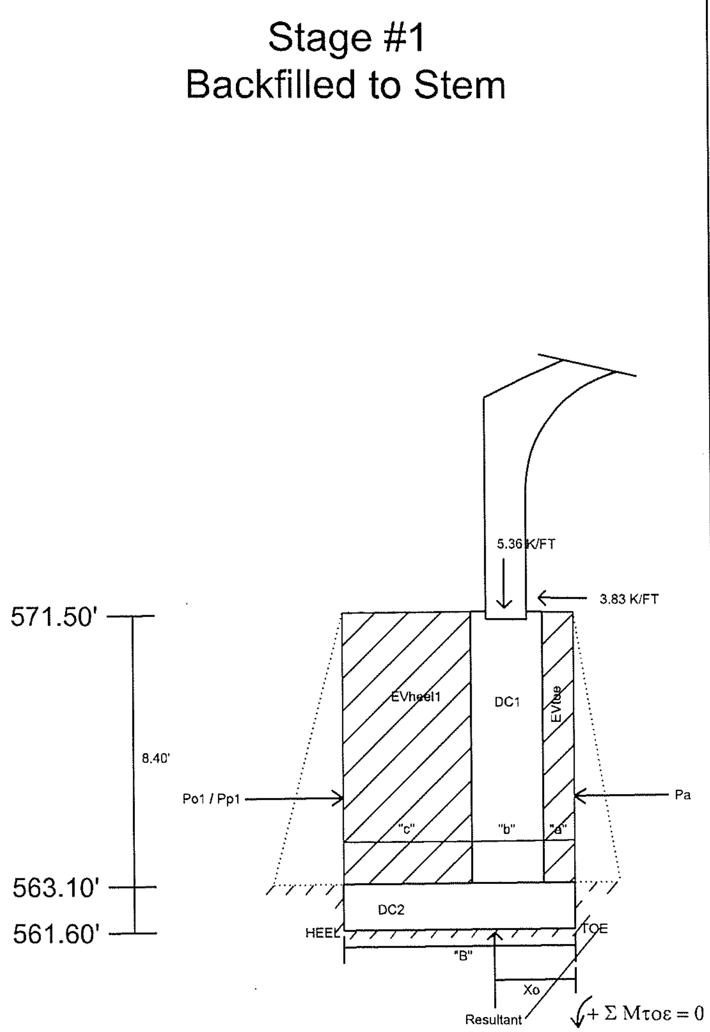
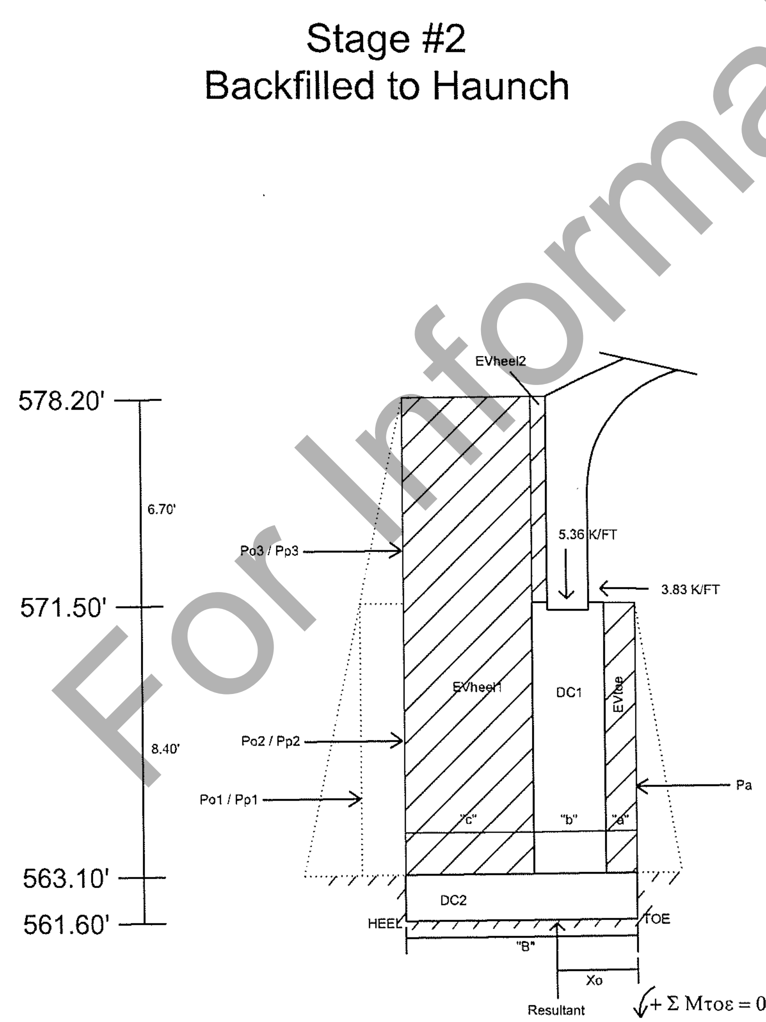
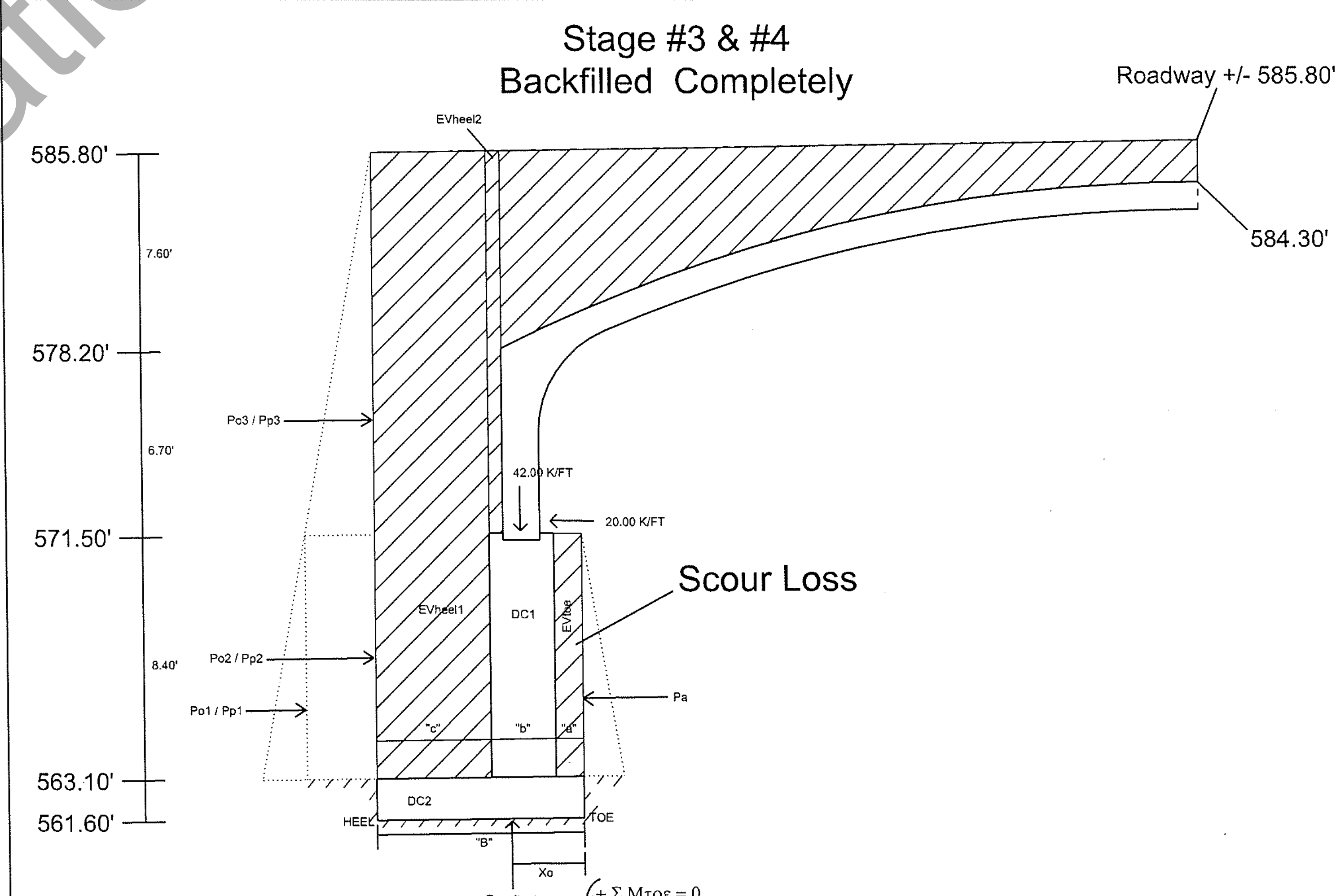
SOUTH LEG











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FILE NAME = pw:\\IL084EBIDINTEG.illinois.gov:PWIDOT\Documents\IDOT Offices\District 6\Projects\D672... \Geotechnical\Geotechnical Files\... Default	USER NAME = laninghambk	DESIGNED -	REVISED -	STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION
		DRAWN -	REVISED -	
	PLOT SCALE = 6.2500 ' / in.	CHECKED -	REVISED -	
	PLOT DATE = 4/20/2016	DATE -	REVISED -	

SCALE: ____ SHEET ____ OF ____ SHEETS STA. ____ TO STA. ____

F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
		CONTRACT NO.		
		ILLINOIS FED. AID PROJECT		

South Leg Arch Backfilled to Stem Wall (Stage 1) ϕ = 30 degrees

Trial	Front TOE wall setback width "a" (ft)	Stem Wall width "b" (ft)	Back HEEL wall setback width "c" (ft)	Total Base Width "B" (ft)	Wall Height (ft)	Base Height)ft)	Item	Load (K/ft)	Load Factor	Factored Load (K/ft)	Moment about the **TOE**	Factored Moment	Resultant Distance $X_0 = (\Sigma M_{vert} + \Sigma M_{hor})/\Sigma Vert_{load}$	$e_{b\,(ft)}$	**9B/10 (ft)**	σ_{vmax} (KSF)	σ_{vmin} (KSF)
1							**Vertical Loads**						5.68	2.43	5.85	12.86	0.00
	1.00	2.33	3.17	**6.50**	8.40	1.50	DC_{Base}	1.46	0.90	1.32	3.25	4.28					
							DC_{Stem}	2.94	0.90	2.64	2.17	5.72					
							Ev_{heel1}	3.20	0.90	2.88	4.92	14.13					
							Ev_{toe}	1.01	0.90	0.91	0.50	0.45					
							$Arch_{load}$	5.36	1.50	8.04	2.17	17.41					
							Total			**15.78**		**41.99**					
	1.00	2.33	3.17	**6.50**	8.40	1.50	$Arch_{load}$	3.83	1.50	5.75	8.40	48.26					
							$Active_{Pa}$	1.30	1.35	1.76	4.30	7.55					
							At Rest Po_1/Passive Pp_1	-2.10	0.90	-1.89	4.30	-8.13					
							Total					**47.68**					

K_a = 0.303, K_o = 0.50, K_p = 5.0		
Pressures	Total	Units
$P_a = 1/2K_a\gamma H^2$	1.3	K/ft
$P_o = 1/2K_o\gamma H^2$	2.1	K/ft
$P_p = 1/2K_p\gamma H^2$	21.2	K/ft

South Leg Arch Backfilled to Stem Wall (Stage 1) ϕ = 35 degrees

Trial	Front TOE wall setback width "a" (ft)	Stem Wall width "b" (ft)	Back HEEL wall setback width "c" (ft)	Total Base Width "B" (ft)	Wall Height (ft)	Base Height)ft)	Item	Load (K/ft)	Load Factor	Factored Load (K/ft)	Moment about the **TOE**	Factored Moment	Resultant Distance $X_0 = (\Sigma M_{vert} + \Sigma M_{hor})/\Sigma Vert_{load}$	$e_{b\,(ft)}$	**9B/10 (ft)**	σ_{vmax} (KSF)	σ_{vmin} (KSF)
1							**Vertical Loads**						5.65	2.40	5.85	12.31	0.00
	1.00	2.33	3.17	**6.50**	8.40	1.50	DC_{Base}	1.46	0.90	1.32	3.25	4.28					
							DC_{Stem}	2.94	0.90	2.64	2.17	5.72					
							Ev_{heel1}	3.20	0.90	2.88	4.92	14.13					
							Ev_{toe}	1.01	0.90	0.91	0.50	0.45					
							$Arch_{load}$	5.36	1.50	8.04	2.17	17.41					
							Total			**15.78**		**41.99**					
	1.00	2.33	3.17	**6.50**	8.40	1.50	$Arch_{load}$	3.83	1.50	5.75	8.40	48.26					
							$Active_{Pa}$	1.00	1.35	1.35	4.30	5.81					
							At Rest Po_1	-1.80	0.90	-1.62	4.30	-6.97					
							Total					**47.10**					

K_a = 0..248, K_o = 0.430, K_p = 6.6		
Pressures	Total	Unit
$P_a = 1/2K_a\gamma H^2$	1.0	K/ft
$P_o = 1/2K_o\gamma H^2$	1.8	K/ft
$P_p = 1/2K_p\gamma H^2$	28.3	K/ft

For Information Only

South Leg Arch Backfilled to Haunch (Stage 2) ϕ = 30 degrees

Trial	Front TOE wall setback width "a" (ft)	Stem Wall width "b" (ft)	Bach HEEL wall setback width "c" (ft)	Total Base Width "B" (ft)	Wall Height (ft)	Leg Height (ft)	Base Height)ft)	Item	Load (K/ft)	Load Factor	Factored Load (K/ft)	Moment about the TOE	Factored Moment	Resultant Distance $X_0 = (\Sigma M_{vert} + \Sigma M_{hor})/\Sigma Vert_{load}$	e_b (ft)	9B/10 (ft)	σ_{vmax} (KSF)	σ_{vmin} (KSF)
1								**Vertical Loads**						3.83	0.58	5.85	4.60	0.00
	1.00	2.33	3.17	**6.50**	8.40	6.70	1.50	DC_{Base}	1.46	0.90	1.32	3.25	4.28					
								DC_{Stem}	2.94	0.90	2.64	2.17	5.72					
								Ev_{heel1}	5.74	0.90	5.17	4.92	25.41					
								Ev_{heel2}	0.40	0.90	0.36	1.50	0.54					
								Ev_{toe}	1.01	0.90	0.91	0.50	0.45					
								$Arch_{load}$	5.36	1.50	8.04	2.17	17.41					
								Total			**18.44**		**53.81**					
								Horizontal Loads										
	1.00	2.33	3.17	**6.50**	8.40	6.70	1.50	$Arch_{load}$	3.83	1.50	5.75	8.40	48.26					
								$Active_{Pa}$	1.35	1.50	2.03	4.30	8.71					
								At Rest Po_3/Passive Pp_3	-1.35	0.90	-1.22	12.13	-14.74					
								At Rest Po_2/Passive Pp_2	-3.38	0.90	-3.04	5.70	-17.34					
								At Rest Po_1/Passive Pp_1	-2.10	0.90	-1.89	4.30	-8.13					
								Total					**16.76**					

$K_a = 0.303$, $K_o = 0.50$, $K_p = 5.0$

Pressures	Individual	Total	Units
$P_a = 1/2K_a\gamma H^2$	1.30	1.30	K/ft
$P_{o3} = 1/2K_o\gamma H^2$	1.35	6.83	K/ft
$P_{o2} = K_o\gamma H^2$	3.38		
$P_{o1} = 1/2K_o\gamma H^2$	2.10		
$P_{p3} = 1/2K_p\gamma H^2$	13.50	68.50	K/ft
$P_{p2} = K_p\gamma H^2$	33.80		
$P_{p1} = 1/2K_p\gamma H^2$	21.20		

South Leg Arch Backfilled to Haunch (Stage 2) ϕ = 35 degrees

Trial	Front TOE wall setback width "a" (ft)	Stem Wall width "b" (ft)	Bach HEEL wall setback width "c" (ft)	Total Base Width "B" (ft)	Wall Height (ft)	Leg Height (ft)	Base Height)ft)	Item	Load (K/ft)	Load Factor	Factored Load (K/ft)	Moment about the TOE	Factored Moment	Resultant Distance $X_0 = (\Sigma M_{vert} + \Sigma M_{hor})/\Sigma Vert_{load}$	e_b (ft)	9B/10 (ft)	σ_{vmax} (KSF)	σ_{vmin} (KSF)
1								**Vertical Loads**						4.14	0.89	5.85	5.20	0.00
	1.00	2.33	3.17	**6.50**	8.40	6.70	1.50	DC_{Base}	1.46	0.90	1.32	3.25	4.28					
								DC_{Stem}	2.94	0.90	2.64	2.17	5.72					
								Ev_{heel1}	5.74	0.90	5.17	4.92	25.41					
								Ev_{heel2}	0.40	0.90	0.36	1.50	0.54					
								Ev_{toe}	1.01	0.90	0.91	0.50	0.45					
								$Arch_{load}$	5.36	1.50	8.04	2.17	17.41					
								Total			**18.44**		**53.81**					
								Horizontal Loads										
	1.00	2.33	3.17	**6.50**	8.40	6.70	1.50	$Arch_{load}$	3.83	1.50	5.75	8.40	48.26					
								$Active_{Pa}$	1.35	1.50	2.03	4.30	8.71					
								At Rest Po_3	-1.16	0.90	-1.04	12.13	-12.66					
								At Rest Po_2	-2.90	0.90	-2.61	5.70	-14.88					
								At Rest Po_1	-1.80	0.90	-1.62	4.30	-6.97					
								Total					**22.46**					

$K_a = 0.248$, $K_o = 0.43$, $K_p = 6.6$

Pressures	Individual	Total	Units
$P_a = 1/2K_a\gamma H^2$	1.04	1.04	K/ft
$P_{o3} = 1/2K_o\gamma H^2$	1.16	5.86	K/ft
$P_{o2} = K_o\gamma H^2$	2.90		
$P_{o1} = 1/2K_o\gamma H^2$	1.80		
$P_{p3} = 1/2K_p\gamma H^2$	18.10	91.70	K/ft
$P_{p2} = K_p\gamma H^2$	45.20		
$P_{p1} = 1/2K_p\gamma H^2$	28.40		

For Information Only

South Leg Arch Backfilled Completely (Stage 3) ϕ = 30 degrees

Trial	Front TOE wall setback width "a" (ft)	Stem Wall width "b" (ft)	Bach HEEL wall setback width "c" (ft)	Total Base Width "B" (ft)	Wall Height (ft)	Leg Height (ft)	Backfilled Height from Haunch (ft)	Base Height)ft)	Item	Load (K/ft)	Load Factor	Factored Load (K/ft)	Moment about the **TOE**	Factored Moment	Resultant Distance $X_0 = (\Sigma M_{vert} + \Sigma M_{hor})/\Sigma Vert_{load}$	$e_{b\,(ft)}$		σ_{vmax} (KSF)	σ_{vmin} (KSF)
1									**Vertical Loads**						3.46	0.21	5.85	12.23	0.00
	1.00	2.33	3.17	**6.50**	8.40	6.70	7.60	1.50	DC_{Base}	1.46	0.90	1.32	3.25	4.28					
									DC_{Stem}	2.94	0.90	2.64	2.17	5.72					
									Ev_{heel1}	8.64	0.90	7.77	4.92	38.20					
									Ev_{heel2}	1.31	0.90	1.18	1.50	1.77					
									Ev_{toe}	1.01	0.90	0.91	0.50	0.45					
									$Arch_{load}$	42.00	1.00	42.00	2.17	90.93					
									Total			**55.82**		**141.35**					
									Horizontal Loads										
	1.00	2.33	3.17	**6.50**	8.40	6.70	7.60	1.50	$Arch_{load}$	20.00	1.00	20.00	8.40	168.00					
									$Active_{Pa}$	1.30	1.50	1.95	4.30	8.39					
									At Rest Po_3/Passive Pp_3	-6.12	0.90	-5.51	14.67	-80.80					
									At Rest Po_2/Passive Pp_2	-7.19	0.90	-6.47	5.70	-36.88					
									At Rest Po_1/Passive Pp_1	-2.11	0.90	-1.90	3.73	-7.09					
									Total					**51.61**					

K_a = 0.303, K_o = 0.50, K_p = 5.0			
Pressures	Individual	Total	Units
$P_a = 1/2K_a\gamma H^2$	1.30	1.30	K/ft
$P_{o3} = 1/2K_o\gamma H^2$	6.12	15.42	K/ft
$P_{o2} = K_o\gamma H^2$	7.19		
$P_{o1} = 1/2K_o\gamma H^2$	2.11		
$P_{p3} = 1/2K_p\gamma H^2$	61.40	154.70	K/ft
$P_{p2} = K_p\gamma H^2$	72.10		
$P_{p1} = 1/2K_p\gamma H^2$	21.20		

South Leg Arch Backfilled Completely (Stage 3) ϕ = 35 degrees

Trial	Front TOE wall setback width "a" (ft)	Stem Wall width "b" (ft)	Bach HEEL wall setback width "c" (ft)	Total Base Width "B" (ft)	Wall Height (ft)	Leg Height (ft)	Backfilled Height from Haunch (ft)	Base Height)ft)	Item	Load (K/ft)	Load Factor	Factored Load (K/ft)	Moment about the **TOE**	Factored Moment	Resultant Distance $X_0 = (\Sigma M_{vert} + \Sigma M_{hor})/\Sigma Vert_{load}$	$e_{b\,(ft)}$	**9B/10 (ft)**	σ_{vmax} (KSF)	σ_{vmin} (KSF)
1									**Vertical Loads**						3.76	0.51	5.85	13.59	0.00
	1.00	2.33	3.17	**6.50**	8.40	6.70	7.60	1.50	DC_{Base}	1.46	0.90	1.32	3.25	4.28					
									DC_{Stem}	2.94	0.90	2.64	2.17	5.72					
									Ev_{heel1}	8.64	0.90	7.77	4.92	38.20					
									Ev_{heel2}	1.31	0.90	1.18	1.50	1.77					
									Ev_{toe}	1.01	0.90	0.91	0.50	0.45					
									$Arch_{load}$	42.00	1.00	42.00	2.17	90.93					
									Total			**55.82**		**141.35**					
									Horizontal Loads										
	1.00	2.33	3.17	**6.50**	8.40	6.70	7.60	1.50	$Arch_{load}$	20.00	1.00	20.00	8.40	168.00					
									$Active_{Pa}$	1.30	1.50	1.95	4.30	8.39					
									At Rest Po_3/Passive Pp_3	-5.30	0.90	-4.77	14.67	-69.98					
									At Rest Po_2/Passive Pp_2	-6.19	0.90	-5.57	5.70	-31.75					
									At Rest Po_1/Passive Pp_1	-1.80	0.90	-1.62	3.73	-6.05					
									Total					**68.61**					

K_a = 0.248, K_o = 0.43, K_p = 6.6			
Pressures	Individual	Total	Units
$P_a = 1/2K_a\gamma H^2$	1.06	1.06	K/ft
$P_{o3} = 1/2K_o\gamma H^2$	5.30	13.29	K/ft
$P_{o2} = K_o\gamma H^2$	6.19		
$P_{o1} = 1/2K_o\gamma H^2$	1.80		
$P_{p3} = 1/2K_p\gamma H^2$	82.20	207.10	K/ft
$P_{p2} = K_p\gamma H^2$	96.50		
$P_{p1} = 1/2K_p\gamma H^2$	28.40		

For Information Only

South Leg Arch Backfilled Completely After Scour (Stage 4) ϕ = 30 degrees

Trial	Front TOE wall setback width "a" (ft)	Stem Wall width "b" (ft)	Bach HEEL wall setback width "c" (ft)	Total Base Width "B" (ft)	Wall Height (ft)	Leg Height (ft)	Backfilled Height from Haunch (ft)	Base Height)ft)	Item	Load (K/ft)	Load Factor	Factored Load (K/ft)	Moment about the TOE	Factored Moment	Resultant Distance $X_0 = (\Sigma M_{vert} + \Sigma M_{hor})/\Sigma Vert_{load}$	$e_{b\,(ft)}$	9B/10 (ft)	σ_{vmax} (KSF)	σ_{vmin} (KSF)
1									**Vertical Loads**						3.35	0.10	5.85	11.63	0.00
	1.00	2.33	3.17	**6.50**	8.40	6.70	7.60	1.50	DC_{Base}	1.46	0.90	1.32	3.25	4.28					
									DC_{Stem}	2.94	0.90	2.64	2.17	5.72					
									Ev_{heel1}	8.64	0.90	7.77	4.92	38.20					
									Ev_{heel2}	1.31	0.90	1.18	1.50	1.77					
									Ev_{toe}	0.00	0.90	0.00	0.50	0.00					
									$Arch_{load}$	42.00	1.00	42.00	2.17	90.93					
									Total			**54.91**		**140.90**					
									Horizontal Loads										
	1.00	2.33	3.17	**6.50**	8.40	6.70	7.60	1.50	$Arch_{load}$	20.00	1.00	20.00	8.40	168.00					
									$Active_{Pa}$	0.00	1.50	0.00	4.30	0.00					
									At Rest Po_3	-6.12	0.90	-5.51	14.67	-80.80					
									At Rest Po_2	-7.19	0.90	-6.47	5.70	-36.88					
									At Rest Po_1	-2.13	0.90	-1.92	3.73	-7.16					
									Total					**43.16**					

K_a = 0.303, K_o = 0.50, K_p = 5.0

Pressures	Individual	Total	Units
$P_a = 1/2K_a\gamma H^2$	1.30	1.30	K/ft
$P_{o3} = 1/2K_o\gamma H^2$	6.12	15.42	K/ft
$P_{o2} = K_o\gamma H^2$	7.19		
$P_{o1} = 1/2K_o\gamma H^2$	2.11		
$P_{p3} = 1/2K_p\gamma H^2$	61.40	154.70	K/ft
$P_{p2} = K_p\gamma H^2$	72.10		
$P_{p1} = 1/2K_p\gamma H^2$	21.20		

South Leg Arch Backfilled Completely After Scour (Stage 4) ϕ = 35 degrees

Trial	Front TOE wall setback width "a" (ft)	Stem Wall width "b" (ft)	Bach HEEL wall setback width "c" (ft)	Total Base Width "B" (ft)	Wall Height (ft)	Leg Height (ft)	Backfilled Height from Haunch (ft)	Base Height)ft)	Item	Load (K/ft)	Load Factor	Factored Load (K/ft)	Moment about the TOE	Factored Moment	Resultant Distance $X_0 = (\Sigma M_{vert} + \Sigma M_{hor})/\Sigma Vert_{load}$	$e_{b\,(ft)}$	9B/10 (ft)	σ_{vmax} (KSF)	σ_{vmin} (KSF)
1									**Vertical Loads**						3.66	0.41	5.85	12.90	0.00
	1.00	2.33	3.17	**6.50**	8.40	6.70	7.60	1.50	DC_{Base}	1.46	0.90	1.32	3.25	4.28					
									DC_{Stem}	2.94	0.90	2.64	2.17	5.72					
									Ev_{heel1}	8.64	0.90	7.77	4.92	38.20					
									Ev_{heel2}	1.31	0.90	1.18	1.50	1.77					
									Ev_{toe}	0.00	0.90	0.00	0.50	0.00					
									$Arch_{load}$	42.00	1.00	42.00	2.17	90.93					
									Total			**54.91**		**140.90**					
									Horizontal Loads										
	1.00	2.33	3.17	**6.50**	8.40	6.70	7.60	1.50	$Arch_{load}$	20.00	1.00	20.00	8.40	168.00					
									$Active_{Pa}$	0.00	1.50	0.00	4.30	0.00					
									At Rest Po_3	-5.30	0.90	-4.77	14.67	-69.98					
									At Rest Po_2	-6.19	0.90	-5.57	5.70	-31.75					
									At Rest Po_1	-1.80	0.90	-1.62	3.73	-6.05					
									Total					**60.22**					

K_a = 0.248, K_o = 0.43, K_p = 6.6

Pressures	Individual	Total	Units
$P_a = 1/2K_a\gamma H^2$	1.06	1.06	K/ft
$P_{o3} = 1/2K_o\gamma H^2$	5.30	13.29	K/ft
$P_{o2} = K_o\gamma H^2$	6.19		
$P_{o1} = 1/2K_o\gamma H^2$	1.80		
$P_{p3} = 1/2K_p\gamma H^2$	82.20	207.10	K/ft
$P_{p2} = K_p\gamma H^2$	96.50		
$P_{p1} = 1/2K_p\gamma H^2$	28.40		

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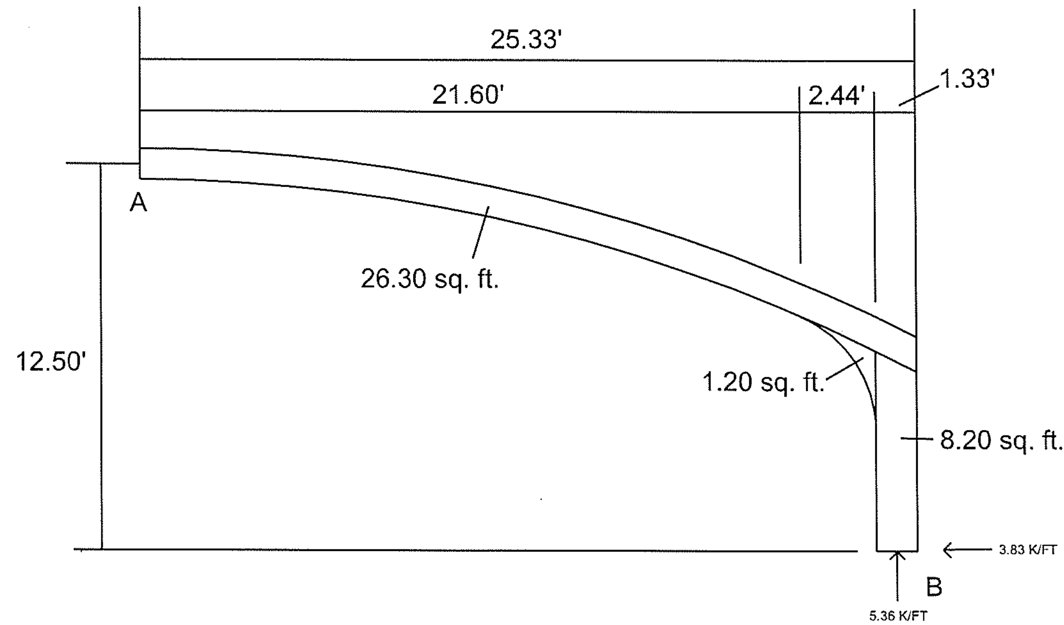
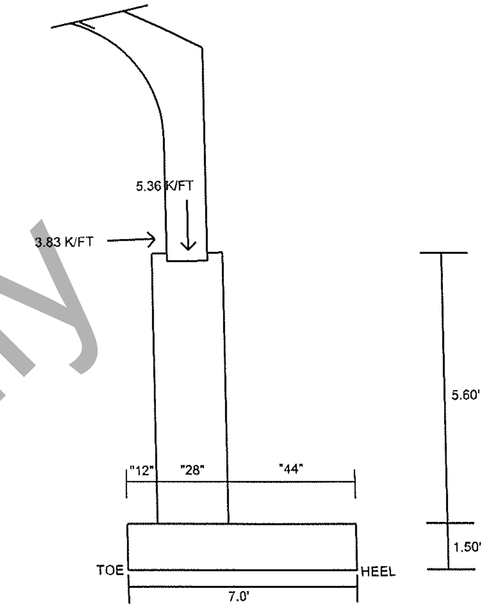
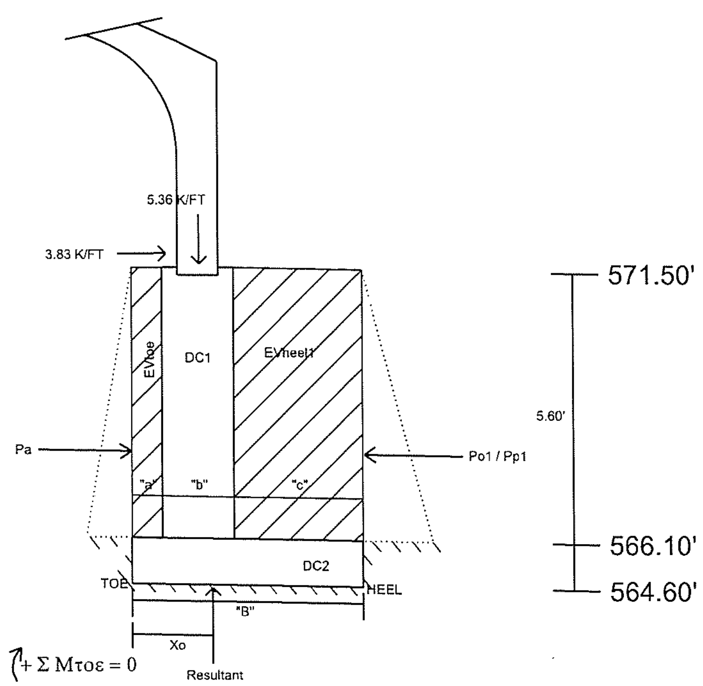
NORTH LEG

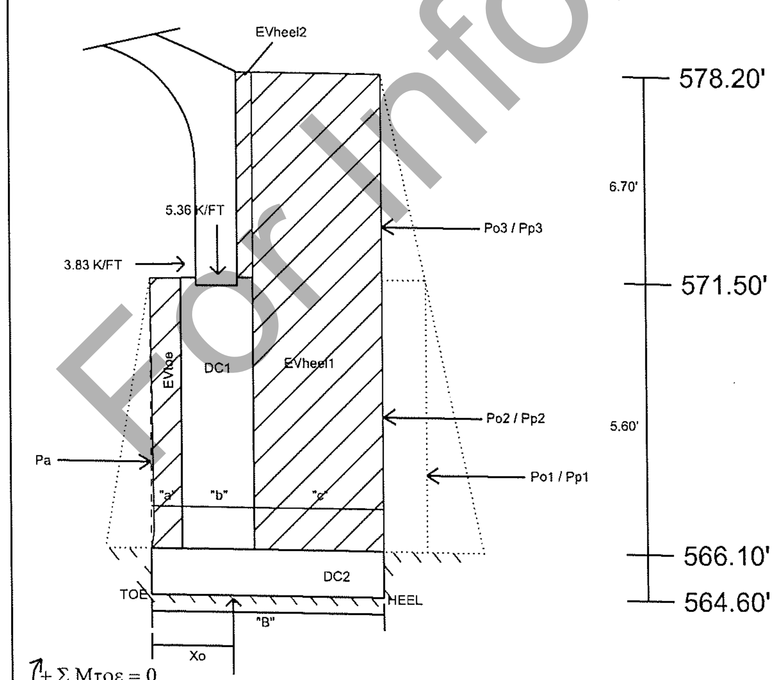




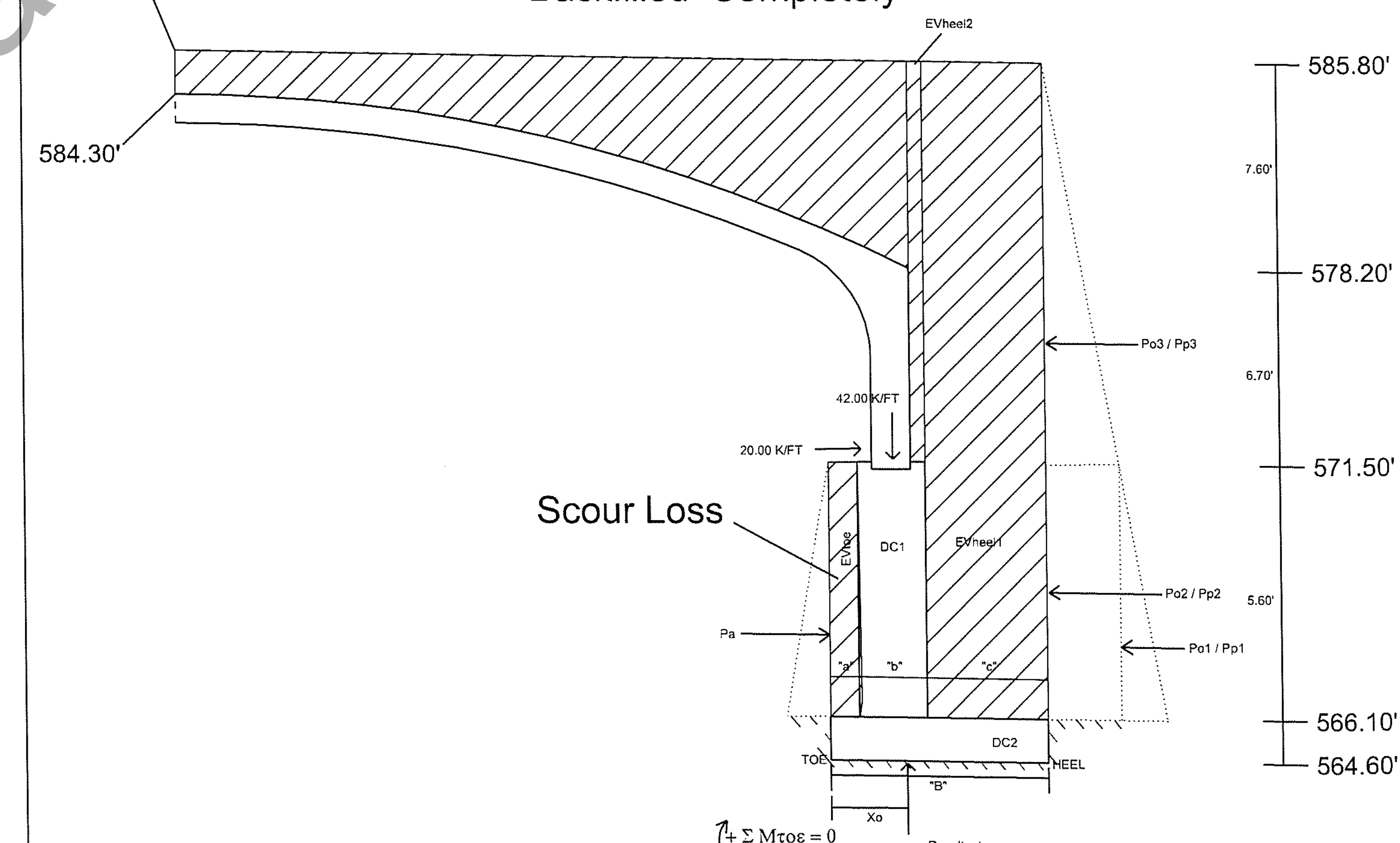
Stage #1
Backfilled to Stem



Stage #2
Backfilled to Haunch



Stage #3 & #4
Backfilled Completely



FILE NAME =	USER NAME = laninghambk	DESIGNED -	REVISED -	STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION
pw:\\IL084EBIDINTEG.illinois.gov:PWIDOT\Documents\IDOT Offices\District 6\Projects\D672DRAWING\Data\Geotechnical\Geotechnical File			REVISED -	
	PLOT SCALE = 6.2500 ' / in.	CHECKED -	REVISED -	
Default	PLOT DATE = 4/20/2016	DATE -	REVISED -	

SCALE: SHEET OF SHEETS STA. TO STA.

F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
		CONTRACT NO.		
	ILLINOIS FED. AID PROJECT			

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North Leg Arch Backfilled to Stem Wall (Stage 1) ϕ = 30 degrees

Trial	Front TOE wall setback width "a" (ft)	Stem Wall width "b" (ft)	Back HEEL wall setback width "c" (ft)	Total Base Width "B" (ft)	Wall Height (ft)	Base Height)ft)	Item	Load (K/ft)	Load Factor	Factored Load (K/ft)	Moment about the **TOE**	Factored Moment	Resultant Distance $X_0 = (\Sigma M_{vert} + \Sigma M_{hor})/\Sigma Vert_{load}$	$e_{b\ (ft)}$	**9B/10 (ft)**	σ_{vmax} (KSF)	σ_{vmin} (KSF)
1							**Vertical Loads**						4.98	1.48	6.30	4.65	0.00
	1.00	2.33	3.67	**7.00**	5.60	1.50	DC_{Base}	1.58	0.90	1.42	3.50	4.96					
							DC_{Stem}	1.96	0.90	1.76	2.17	3.81					
							Ev_{heel1}	2.47	0.90	2.22	5.17	11.46					
							Ev_{toe}	0.67	0.90	0.60	0.50	0.30					
							$Arch_{load}$	5.36	1.50	8.04	2.17	17.41					
							Total			**14.04**		**37.95**					
	1.00	2.33	3.67	**7.00**	5.60	1.50	$Arch_{load}$	3.83	1.50	5.75	5.60	32.17					
							$Active_{Pa}$	0.60	1.35	0.81	3.37	2.73					
							At Rest Po_1/Passive Pp_1	-0.94	0.90	-0.85	3.37	-2.85					
							Total					**32.05**					

K_a = 0.303, K_o = 0.50, K_p = 5.0		
Pressures	Total	Units
$P_a = 1/2K_a\gamma H^2$	0.57	K/ft
$P_o = 1/2K_o\gamma H^2$	0.94	K/ft
$Pp = 1/2K_p\gamma H^2$	9.40	K/ft

North Leg Arch Backfilled to Stem Wall (Stage 1) ϕ = 35 degrees

Trial	Front TOE wall setback width "a" (ft)	Stem Wall width "b" (ft)	Back HEEL wall setback width "c" (ft)	Total Base Width "B" (ft)	Wall Height (ft)	Base Height)ft)	Item	Load (K/ft)	Load Factor	Factored Load (K/ft)	Moment about the **TOE**	Factored Moment	Resultant Distance $X_0 = (\Sigma M_{vert} + \Sigma M_{hor})/\Sigma Vert_{load}$	$e_{b\ (ft)}$	**9B/10 (ft)**	σ_{vmax} (KSF)	σ_{vmin} (KSF)
1							**Vertical Loads**						5.01	1.51	6.30	4.71	0.00
	1.00	2.33	3.67	**7.00**	5.60	1.50	DC_{Base}	1.58	0.90	1.42	3.50	4.96					
							DC_{Stem}	1.96	0.90	1.76	2.17	3.81					
							Ev_{heel1}	2.47	0.90	2.22	5.17	11.46					
							Ev_{toe}	0.67	0.90	0.60	0.50	0.30					
							$Arch_{load}$	5.36	1.50	8.04	2.17	17.41					
							Total			**14.04**		**37.95**					
	1.00	2.33	3.67	**7.00**	5.60	1.50	$Arch_{load}$	3.83	1.50	5.75	5.60	32.17					
							$Active_{Pa}$	0.60	1.35	0.81	3.37	2.73					
							At Rest Po_1/Passive Pp_1	-0.81	0.90	-0.73	3.37	-2.45					
							Total					**32.44**					

K_a = 0.248, K_o = 0.43, K_p = 6.6		
Pressures	Total	Units
$P_a = 1/2K_a\gamma H^2$	0.47	K/ft
$P_o = 1/2K_o\gamma H^2$	0.81	K/ft
$Pp = 1/2K_p\gamma H^2$	12.60	K/ft

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North Leg Arch Backfilled to Haunch (Stage 2) ϕ = 30 degrees

Trial	Front TOE wall setback width "a" (ft)	Stem Wall width "b" (ft)	Bach HEEL wall setback width "c" (ft)	Total Base Width "B" (ft)	Wall Height (ft)	Leg Height (ft)	Base Height)ft)	Item	Load (K/ft)	Load Factor	Factored Load (K/ft)	Moment about the **TOE**	Factored Moment	Resultant Distance X_0 = $(\Sigma M_{vert} + \Sigma M_{hor})/\Sigma Vert_{load}$	$e_{b\,(ft)}$	**9B/10 (ft)**	σ_{vmax} (KSF)	σ_{vmin} (KSF)
1								**Vertical Loads**						4.11	0.61	6.30	3.94	0.00
	1.00	2.33	3.67	**7.00**	5.60	6.70	1.50	DC_{Base}	1.58	0.90	1.42	3.50	4.96					
								DC_{Stem}	1.96	0.90	1.76	2.17	3.81					
								Ev_{heel1}	5.42	0.90	4.88	5.17	25.18					
								Ev_{heel2}	0.40	0.90	0.36	1.50	0.54					
								Ev_{toe}	0.67	0.90	0.60	0.50	0.30					
								$Arch_{load}$	5.36	1.50	8.04	2.17	17.41					
								Total			**17.06**		**52.21**					
								Horizontal Loads										
	1.00	2.33	3.67	**7.00**	5.60	6.70	1.50	$Arch_{load}$	3.83	1.50	5.75	5.60	32.17					
								$Active_{Pa}$	1.35	1.50	2.03	4.30	8.71					
								At Rest Po_3/Passive Pp_3	-1.35	0.90	-1.22	9.33	-11.34					
								At Rest Po_2/Passive Pp_2	-2.25	0.90	-2.03	4.30	-8.71					
								At Rest Po_1/Passive Pp_1	-0.94	0.90	-0.85	3.37	-2.85					
								Total					**17.99**					

$K_a = 0.303$, $K_o = 0.50$, $K_p = 5.0$

Pressures	Individual	Total	Units
$P_a = 1/2K_a\gamma H^2$	0.47	0.47	K/ft
$P_{o3} = 1/2K_o\gamma H^2$	1.35	4.54	K/ft
$P_{o2} = K_o\gamma H^2$	2.25		
$P_{o1} = 1/2K_o\gamma H^2$	0.94		
$P_{p3} = 1/2K_p\gamma H^2$	13.50	45.40	K/ft
$P_{p2} = K_p\gamma H^2$	22.50		
$P_{p1} = 1/2K_p\gamma H^2$	9.40		

North Leg Arch Backfilled to Haunch (Stage 2) ϕ = 35 degrees

Trial	Front TOE wall setback width "a" (ft)	Stem Wall width "b" (ft)	Bach HEEL wall setback width "c" (ft)	Total Base Width "B" (ft)	Wall Height (ft)	Leg Height (ft)	Base Height)ft)	Item	Load (K/ft)	Load Factor	Factored Load (K/ft)	Moment about the **TOE**	Factored Moment	Resultant Distance X_0 = $(\Sigma M_{vert} + \Sigma M_{hor})/\Sigma Vert_{load}$	$e_{b\,(ft)}$	**9B/10 (ft)**	σ_{vmax} (KSF)	σ_{vmin} (KSF)
1								**Vertical Loads**						4.11	0.61	6.30	3.94	0.00
	1.00	2.33	3.67	**7.00**	5.60	6.70	1.50	DC_{Base}	1.58	0.90	1.42	3.50	4.96					
								DC_{Stem}	1.96	0.90	1.76	2.17	3.81					
								Ev_{heel1}	5.42	0.90	4.88	5.17	25.18					
								Ev_{heel2}	0.40	0.90	0.36	1.50	0.54					
								Ev_{toe}	0.67	0.90	0.60	0.50	0.30					
								$Arch_{load}$	5.36	1.50	8.04	2.17	17.41					
								Total			**17.06**		**52.21**					
								Horizontal Loads										
	1.00	2.33	3.67	**7.00**	5.60	6.70	1.50	$Arch_{load}$	3.83	1.50	5.75	5.60	32.17					
								$Active_{Pa}$	1.35	1.50	2.03	4.30	8.71					
								At Rest Po_3/Passive Pp_3	-1.35	0.90	-1.22	9.33	-11.34					
								At Rest Po_2/Passive Pp_2	-2.25	0.90	-2.03	4.30	-8.71					
								At Rest Po_1/Passive Pp_1	-0.94	0.90	-0.85	3.37	-2.85					
								Total					**17.99**					

$K_a = 0.248$, $K_o = 0..43$, $K_p = 6.60$

Pressures	Individual	Total	Units
$P_a = 1/2K_a\gamma H^2$	0.47	0.47	K/ft
$P_{o3} = 1/2K_o\gamma H^2$	1.35	4.54	K/ft
$P_{o2} = K_o\gamma H^2$	2.25		
$P_{o1} = 1/2K_o\gamma H^2$	0.94		
$P_{p3} = 1/2K_p\gamma H^2$	18.10	60.80	K/ft
$P_{p2} = K_p\gamma H^2$	30.10		
$P_{p1} = 1/2K_p\gamma H^2$	12.60		

For Information Only

North Leg Arch Backfilled Completely (Stage 3) ϕ = 30 degrees

Trial	Front TOE wall setback width "a" (ft)	Stem Wall width "b" (ft)	Bach HEEL wall setback width "c" (ft)	Total Base Width "B" (ft)	Wall Height (ft)	Leg Height (ft)	Backfilled Height from Haunch (ft)	Base Height)ft)	Item	Load (K/ft)	Load Factor	Factored Load (K/ft)	Moment about the **TOE**	Factored Moment	Resultant Distance $X_0 = (\Sigma M_{vert} + \Sigma M_{hor})/\Sigma Vert_{load}$	$e_{b\ (ft)}$	**9B/10 (ft)**	σ_{vmax} (KSF)	σ_{vmin} (KSF)
1									**Vertical Loads**						3.21	-0.29	6.30	9.64	0.00
	1.00	2.33	3.67	**7.00**	5.60	6.70	7.60	1.50	DC_{Base}	1.58	0.90	1.42	3.50	4.96					
									DC_{Stem}	1.96	0.90	1.76	2.17	3.81					
									Ev_{heel1}	8.76	0.90	7.89	5.17	40.74					
									Ev_{heel2}	1.31	0.90	1.18	1.50	1.77					
									Ev_{toe}	0.67	0.90	0.60	0.50	0.30					
									$Arch_{load}$	42.00	1.00	42.00	2.17	90.93					
									Total			**54.85**		**142.52**					
									Horizontal Loads										
	1.00	2.33	3.67	**7.00**	5.60	6.70	7.60	1.50	$Arch_{load}$	20.00	1.00	20.00	5.60	112.00					
									$Active_{Pa}$	1.30	1.50	1.95	4.30	8.39					
									At Rest Po_3/Passive Pp_3	-6.13	0.90	-5.52	11.90	-65.65					
									At Rest Po_2/Passive Pp_2	-4.80	0.90	-4.32	4.30	-18.58					
									At Rest Po_1/Passive Pp_1	-0.94	0.90	-0.85	3.37	-2.85					
									Total					**33.31**					

$K_a = 0.303$, $K_o = 0.50$, $K_p = 5.0$

Pressures	Individual	Total	Units
$P_a = 1/2K_a\gamma H^2$	0.47	0.47	K/ft
$P_{o3} = 1/2K_o\gamma H^2$	6.13	11.87	K/ft
$P_{o2} = K_o\gamma H^2$	4.80		
$P_{o1} = 1/2K_o\gamma H^2$	0.94		
$P_{p3} = 1/2K_p\gamma H^2$	61.40	118.80	K/ft
$P_{p2} = K_p\gamma H^2$	48.00		
$P_{p1} = 1/2K_p\gamma H^2$	9.40		

North Leg Arch Backfilled Completely (Stage 3) ϕ = 35 degrees

Trial	Front TOE wall setback width "a" (ft)	Stem Wall width "b" (ft)	Bach HEEL wall setback width "c" (ft)	Total Base Width "B" (ft)	Wall Height (ft)	Leg Height (ft)	Backfilled Height from Haunch (ft)	Base Height)ft)	Item	Load (K/ft)	Load Factor	Factored Load (K/ft)	Moment about the **TOE**	Factored Moment	Resultant Distance $X_0 = (\Sigma M_{vert} + \Sigma M_{hor})/\Sigma Vert_{load}$	$e_{b\ (ft)}$	**9B/10 (ft)**	σ_{vmax} (KSF)	σ_{vmin} (KSF)
1									**Vertical Loads**						3.21	-0.29	6.30	9.64	0.00
	1.00	2.33	3.67	**7.00**	5.60	6.70	7.60	1.50	DC_{Base}	1.58	0.90	1.42	3.50	4.96					
									DC_{Stem}	1.96	0.90	1.76	2.17	3.81					
									Ev_{heel1}	8.76	0.90	7.89	5.17	40.74					
									Ev_{heel2}	1.31	0.90	1.18	1.50	1.77					
									Ev_{toe}	0.67	0.90	0.60	0.50	0.30					
									$Arch_{load}$	42.00	1.00	42.00	2.17	90.93					
									Total			**54.85**		**142.52**					
									Horizontal Loads										
	1.00	2.33	3.67	**7.00**	5.60	6.70	7.60	1.50	$Arch_{load}$	20.00	1.00	20.00	5.60	112.00					
									$Active_{Pa}$	1.30	1.50	1.95	4.30	8.39					
									At Rest Po_3/Passive Pp_3	-6.13	0.90	-5.52	11.90	-65.65					
									At Rest Po_2/Passive Pp_2	-4.80	0.90	-4.32	4.30	-18.58					
									At Rest Po_1/Passive Pp_1	-0.94	0.90	-0.85	3.37	-2.85					
									Total					**33.31**					

$K_a = 0.248$, $K_o = 0.43$, $K_p = 6.6$

Pressures	Individual	Total	Units
$P_a = 1/2K_a\gamma H^2$	0.47	0.47	K/ft
$P_{o3} = 1/2K_o\gamma H^2$	6.13	11.87	K/ft
$P_{o2} = K_o\gamma H^2$	4.80		
$P_{o1} = 1/2K_o\gamma H^2$	0.94		
$P_{p3} = 1/2K_p\gamma H^2$	82.20	159.00	K/ft
$P_{p2} = K_p\gamma H^2$	64.20		
$P_{p1} = 1/2K_p\gamma H^2$	12.60		

For Information Only

North Leg Arch Backfilled Completely with Scour (Stage 4) ϕ = 30 degrees

Trial	Front TOE wall setback width "a" (ft)	Stem Wall width "b" (ft)	Bach HEEL wall setback width "c" (ft)	Total Base Width "B" (ft)	Wall Height (ft)	Leg Height (ft)	Backfilled Height from Haunch (ft)	Base Height)ft)	Item	Load (K/ft)	Load Factor	Factored Load (K/ft)	Moment about the **TOE**	Factored Moment	Resultant Distance X_0 = $(\Sigma M_{vert} + \Sigma M_{hor})/\Sigma Vert_{load}$	$e_{b\ (ft)}$	**9B/10 (ft)**	σ_{vmax} (KSF)	σ_{vmin} (KSF)
1									**Vertical Loads**						3.05	-0.45	6.30	9.26	0.00
	1.00	2.33	3.67	**7.00**	5.60	6.70	7.60	1.50	DC_{Base}	1.58	0.90	1.42	3.50	4.96					
									DC_{Stem}	1.96	0.90	1.76	2.17	3.81					
									Ev_{heel1}	8.76	0.90	7.89	5.17	40.74					
									Ev_{heel2}	1.31	0.90	1.18	1.50	1.77					
									Ev_{toe}	0.67	0.90	0.60	0.50	0.30					
									$Arch_{load}$	42.00	1.00	42.00	2.17	90.93					
									Total			**54.85**		**142.52**					
									Horizontal Loads										
	1.00	2.33	3.67	**7.00**	5.60	6.70	7.60	1.50	$Arch_{load}$	20.00	1.00	20.00	5.60	112.00					
									$Active_{Pa}$	0.00	1.50	0.00	4.30	0.00					
									At Rest Po_3/Passive Pp_3	-6.13	0.90	-5.52	11.90	-65.65					
									At Rest Po_2/Passive Pp_2	-4.80	0.90	-4.32	4.30	-18.58					
									At Rest Po_1/Passive Pp_1	-0.94	0.90	-0.85	3.37	-2.85					
									Total					**24.92**					

K_a = 0.303, K_o = 0.50, K_p = 5.0

Pressures	Individual	Total	Units
$P_a = 1/2K_a\gamma H^2$	0.47	1.30	K/ft
$P_{o3} = 1/2K_o\gamma H^2$	6.13	11.87	K/ft
$P_{o2} = K_o\gamma H^2$	4.80		
$P_{o1} = 1/2K_o\gamma H^2$	0.94		
$P_{p3} = 1/2K_p\gamma H^2$	61.40	118.80	K/ft
$P_{p2} = K_p\gamma H^2$	48.00		
$P_{p1} = 1/2K_p\gamma H^2$	9.40		

North Leg Arch Backfilled Completely with Scour (Stage 4) ϕ = 35 degrees

Trial	Front TOE wall setback width "a" (ft)	Stem Wall width "b" (ft)	Bach HEEL wall setback width "c" (ft)	Total Base Width "B" (ft)	Wall Height (ft)	Leg Height (ft)	Backfilled Height from Haunch (ft)	Base Height)ft)	Item	Load (K/ft)	Load Factor	Factored Load (K/ft)	Moment about the **TOE**	Factored Moment	Resultant Distance X_0 = $(\Sigma M_{vert} + \Sigma M_{hor})/\Sigma Vert_{load}$	$e_{b\ (ft)}$	**9B/10 (ft)**	σ_{vmax} (KSF)	σ_{vmin} (KSF)
1									**Vertical Loads**						3.05	-0.45	6.30	9.26	0.00
	1.00	2.33	3.67	**7.00**	5.60	6.70	7.60	1.50	DC_{Base}	1.58	0.90	1.42	3.50	4.96					
									DC_{Stem}	1.96	0.90	1.76	2.17	3.81					
									Ev_{heel1}	8.76	0.90	7.89	5.17	40.74					
									Ev_{heel2}	1.31	0.90	1.18	1.50	1.77					
									Ev_{toe}	0.67	0.90	0.60	0.50	0.30					
									$Arch_{load}$	42.00	1.00	42.00	2.17	90.93					
									Total			**54.85**		**142.52**					
									Horizontal Loads										
	1.00	2.33	3.67	**7.00**	5.60	6.70	7.60	1.50	$Arch_{load}$	20.00	1.00	20.00	5.60	112.00					
									$Active_{Pa}$	0.00	1.50	0.00	4.30	0.00					
									At Rest Po_3/Passive Pp_3	-6.13	0.90	-5.52	11.90	-65.65					
									At Rest Po_2/Passive Pp_2	-4.80	0.90	-4.32	4.30	-18.58					
									At Rest Po_1/Passive Pp_1	-0.94	0.90	-0.85	3.37	-2.85					
									Total					**24.92**					

K_a = 0.248, K_o = 0.43, K_p = 6.6

Pressures	Individual	Total	Units
$P_a = 1/2K_a\gamma H^2$	0.47	0.47	K/ft
$P_{o3} = 1/2K_o\gamma H^2$	6.13	11.87	K/ft
$P_{o2} = K_o\gamma H^2$	4.80		
$P_{o1} = 1/2K_o\gamma H^2$	0.94		
$P_{p3} = 1/2K_p\gamma H^2$	82.20	159.00	K/ft
$P_{p2} = K_p\gamma H^2$	64.20		
$P_{p1} = 1/2K_p\gamma H^2$	12.60		

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COFFERDAMS
Effective: October 15, 2011

Replace Article 502.06 with the following.

502.06 Cofferdams. A Cofferdam shall be defined as a temporary structure, consisting of engineered components, designed to isolate the work area from water to enable construction under dry conditions based on either the Estimated Water Surface Elevation (EWSE) or Cofferdam Design Water Elevation (CDWE) shown on the contract plans as specified below. When cofferdams are not specified in the contract documents and conditions are encountered where the excavation for the structure cannot be kept free of water for prosecuting the work by pumping and/or diverting water, the Contractor, with the written permission of the Engineer, will be permitted to construct a cofferdam.

The Contractor shall submit a cofferdam plan for each cofferdam to the Engineer for approval prior to the start of construction. Cofferdams shall not be installed or removed without the Engineer's approval. Work shall not be performed in flowing water except for the installation and removal of the cofferdam. The cofferdam plan shall address the following:

(a) Cofferdam (Type 1). The Contractor shall submit a cofferdam plan which addresses the proposed methods of construction and removal; the construction sequence including staging; dewatering methods; erosion and sediment control measures; disposal of excavated material; effluent water control measures; backfilling; and the best management practices to prevent reintroduction of excavated material into the aquatic environment. The design and method of construction shall provide, within the measurement limits specified in Article 502.12, necessary clearance for forms, inspection of exterior of the forms, pumping, and protection of fresh concrete from water. For Type 1 cofferdams, it is anticipated the design will be based on the EWSE shown on the contract plans. The Contractor shall assume all liability, financial or otherwise for a Type 1 cofferdam designed for an elevation lower than the EWSE.

(b) Cofferdam (Type 2). In addition to the requirements of Article 502.06(a), the Contractor's submittal shall include detailed drawings and design calculations, prepared and sealed by an Illinois Licensed Structural Engineer. For Type 2 cofferdams it is anticipated the design will be based on the CDWE shown on the contract plans. The Contractor shall assume all liability, financial or otherwise for a Type 2 cofferdam designed for an elevation lower than the CDWE.

(c) Seal Coat. The seal coat concrete, when shown on the plans, is based on design assumptions in order to establish an estimated quantity. When seal coat is indeed utilized, it shall be considered an integral part of the overall cofferdam system and, therefore, its design shall be included in the overall cofferdam design submittal. If a seal coat was not specified but determined to be necessary, it shall be added to the contract by written permission of the Engineer. The seal coat concrete shall be constructed according to Article

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503.14. After the excavation within the cofferdam has been completed and the piles have been driven (if applicable), and prior to placing the seal coat, the elevation of the bottom of the proposed seal coat shall be verified by soundings. The equipment and methods used to conduct the soundings shall meet the approval of the Engineer. Any material within the cofferdam above the approved bottom of the seal coat elevation shall be removed.

No component of the cofferdam shall extend into the substructure concrete or remain in place without written permission of the Engineer. Removal shall be according to the previously approved procedure. Unless otherwise approved in writing by the Engineer, all components of the cofferdam shall be removed.

Revise the first paragraph of 502.12(b) to read as follows.

(b) Measured Quantities. Structure excavation, when specified, will be measured for payment in its original position and the volume computed in cubic yards (cubic meters). Horizontal dimensions will not extend beyond vertical planes 2 ft (600 mm) outside of the edges of footings of bridges, walls, and corrugated steel plate arches. The vertical dimension for structure excavation will be the average depth from the surface of the material to be excavated to the bottom of the footing as shown on the plans or ordered in writing by the Engineer. The volume of any unstable and/or unsuitable material removed within the structure excavation will be measured for payment in cubic yards (cubic meters).

Revise the last paragraph of 502.12(b) to read as follows.

Cofferdam excavation will be measured for payment in cubic yards (cubic meters) in its original position within the cofferdam. Unless otherwise shown on the plans, the horizontal dimensions used in computing the volume will not extend beyond vertical planes 2 ft (600 mm) outside of the edges of the substructure footings or 4 ft (1.2 m) outside of the faces of the substructure stem wall, whichever is greater. The vertical dimensions will be the average depth from the surface of the material to be excavated to the elevation shown on the plans for bottom of the footing, stem wall, or seal coat, or as otherwise determined by the Engineer as the bottom of the excavation.

Revise the first sentence of the sixth paragraph of 502.13 to read as follows.

Cofferdams, when specified, will be paid for at the contract unit price per each for COFFERDAM (TYPE 1) or COFFERDAM (TYPE 2), at the locations specified.

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