Appendix A

BRIDGE NEW - PPCB
LETTING DATE 07-19-05
NHSX-034-7 (62)--3H-90

WAPELLO COUNTY

CONVENTIONAL SIGNS

- DIVIDED HIGHWAY
- PAVED ROAD
- BITUMINOUS ROAD
- GRAVEL ROAD
- EARTH ROAD
- INTERSTATE HIGHWAY
- UNITED STATES HIGHWAY
- STATE HIGHWAY
- COUNTY HIGHWAY
- RAILROAD
- PIPELINE
- AIRPORT
- HYDROLOGY
- BRIDGE
- STATE BOUNDARY
- COUNTY BOUNDARY
- CORPORATE LIMIT LINE
- TOWNSHIP LINE
- SECTION LINE

Iowa Department of Transportation
Highway Division

PLANS OF PROPOSED IMPROVEMENTS ON THE

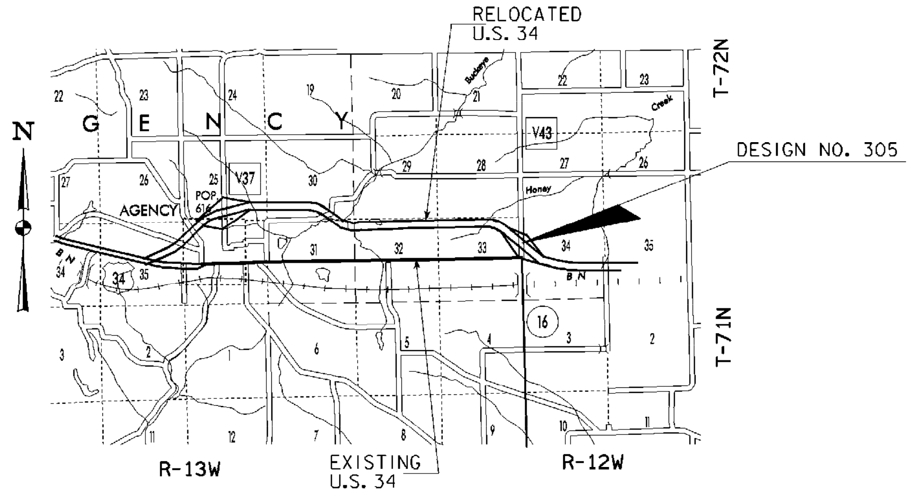
PRIMARY ROAD SYSTEM
WAPELLO COUNTY
BRIDGE NEW - PPCB
RELOCATED U.S.34 OVER IOWA 16/V43 (AGENCY BYPASS)

THE IOWA DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR HIGHWAY AND BRIDGE CONSTRUCTION, SERIES 2001, PLUS APPLICABLE GENERAL SUPPLEMENTAL SPECIFICATIONS, DEVELOPMENTAL SPECIFICATIONS, SUPPLEMENTAL SPECIFICATIONS AND SPECIAL PROVISIONS SHALL APPLY TO CONSTRUCTION WORK ON THIS PROJECT.

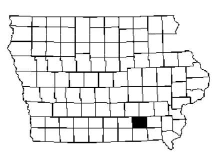
VALUE ENGINEERING SAVES. REFER TO THE GENERAL NOTES IN THESE PLANS.

TOTAL SHEETS	36
PROJECT NUMBER	NHSX-034-7 (62)--3H-90
R.O.W. PROJECT NUMBER	
PROJECT IDENTIFICATION NUMBER	94-90-034-060-02

INDEX OF SHEETS



LOCATION MAP



PROJECT DIRECTORY NAME: 90034060A94

ENGLISH STANDARD BRIDGE PLANS

STANDARD	ISSUED	REVISED

STANDARD ROAD PLANS

STANDARD ROAD PLANS ARE LISTED ON SHEET C.02.

REVISIONS

DESIGN DATA RURAL RELOCATED U.S.34

2004	AADT	8090	V.P.D.
2024	AADT	11290	V.P.D.
2024	DHV	1178	V.P.H.
TRUCKS		11	%
ESALs per day		N.A.	

DESIGN DATA RURAL IOWA 16

2004	AADT	2130	V.P.D.
2024	AADT	2960	V.P.D.
2024	DHV	324	V.P.H.
TRUCKS		8	%
ESALs per day		N.A.	

INDEX OF SEALS

SHEET NO.	NAME	TYPE
1	GORDON L. PORT	STRUCTURAL DESIGN
SPS.01	ROBERT L. STANLEY	GEOTECHNICAL DESIGN
C.01	R. DAVID SKOGERBOE	ROADWAY DESIGN

STRUCTURAL DESIGN

LICENSED PROFESSIONAL ENGINEER Gordon L. Port 8377 IOWA

I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.

Signature: Gordon L. Port Date: 04-27-05

Printed or Typed Name: Gordon L. Port

My license renewal date is December 31, 2006

Pages or sheets covered by this seal: SHEETS 1 THRU 32 OF 36

TOTAL ESTIMATED BRIDGE QUANTITIES - BOTH BRIDGES

ITEM NO.	ITEM CODE	ITEM DESCRIPTION	UNIT	WESTBOUND BRIDGE	EASTBOUND BRIDGE	TOTAL	AS BUILT QUANTITY
1	2301-9091100	LONGITUDINAL GROOVING IN CONC	SY	885	885	1770	
2	2402-2720000	EXCAVATION, CL 20	CY	451	507	958	
3	2403-0100010	STRUCT CONC (BRIDGE)	CY	532.7	533.8	1066.5	
4	2404-7775000	REINFORC STEEL	LB	28,242	28,242	56,484	
5	2404-7775005	REINFORC STEEL, EPOXY COATED	LB	90,225	90,225	180,450	
6	2407-0580450	BEAM, PPC, LXD50	EACH	12	12	24	
7	2407-0550000	BEAM, PPC, SLXD115	EACH	6	6	12	
8	2414-6424110	CONC BARRIER RAIL	LF	490	490	980	
9	2501-5425057	PILE, DRIVE STEEL BEAR, HP 10X57	LF	4650	4650	9405	
10	2501-5550057	PILE, FURN STEEL BEAR, HP 10X57	LF	4650	4650	9405	
11	2501-6335010	PREBORED HOLE	LF	270	270	540	
12	2533-4980005	MOBILIZATION	LS			1	
13	2601-2638620	MACADAM STONE SLOPE PROTECTION	SY	632	632	1264	

ITEM NO.	ESTIMATE REFERENCE INFORMATION
3	INCLUDES FURNISHING AND PLACING SUBDRAIN (INCLUDING EXCAVATION), GRANULAR BACKFILL, POROUS BACKFILL AND SUBDRAIN OUTLETS AT ABUTMENTS AND AT TOE OF BRIDGE BERMS. INCLUDES ALL PREFORMED EXPANSION JOINT FILLER REQUIRED. INCLUDES FURNISHING AND PLACING ENGINEERING FABRIC, MACADAM STONE, 4"x6" TREATED TIMBERS, $\frac{1}{2}$" DIAMETER STEEL PINS (OR REBARS), AND ALL REQUIRED EXCAVATING, SHAPING AND COMPACTING FOR BRIDGE WING ARMORING. INCLUDES 16 DECK DRAINS AT 106 LBS. EACH.
6 & 7	INCLUDES PIER AND ABUTMENT BEARING MATERIAL AND COIL RODS. GRADATION OF COARSE AGGREGATES FOR PRESTRESSED CONCRETE BRIDGE UNITS SHALL MEET THE REQUIREMENTS OF SECTION 4115 CLASS III DURABILITY. GRADATION OF THE COARSE AGGREGATE SHALL MEET THE REQUIREMENTS OF SECTION 2407.02A. PPC BEAM SLXD115 HAS ADDITIONAL STRANDS, INCREASED CONCRETE RELEASE STRENGTH AND INCREASED 28 DAY CONCRETE STRENGTH.
8	INCLUDES 500 LIN. FT. OF 2"Φ RIGID STEEL CONDUIT IN NORTH BARRIER RAIL OF WESTBOUND BRIDGE AND SOUTH BARRIER RAIL OF EASTBOUND BRIDGE. INCLUDES MATERIAL AND LABOR ASSOCIATED WITH PROVIDING AND INSTALLING RIGID STEEL CONDUIT, JUNCTION BOXES AND FITTINGS. IF PLACEMENT OF CONCRETE IS DONE BY THE SLIPFORMING METHOD, CLASS BR CONCRETE IS REQUIRED. WHEN CLASS D CONCRETE IS USED FOR BARRIER RAILS, THE CAST-IN-PLACE (FIXED FORM) METHOD OF PLACEMENT WILL BE REQUIRED. PRICE BID FOR THIS ITEM SHALL INCLUDE THE COST OF CAST-IN-PLACE FORMS IF REQUIRED FOR PLACEMENT OF THE CONCRETE.
13	INCLUDES FURNISHING AND PLACING ENGINEERING FABRIC, MACADAM STONE, 4"x6" TREATED TIMBERS, $\frac{1}{2}$" DIAMETER STEEL PINS (OR REBARS), POROUS BACKFILL OR GRANULAR SUBBASE BACKFILL AT FRONT FACE OF ABUTMENT FOOTING, AND ALL REQUIRED EXCAVATING, SHAPING AND COMPACTING.

DESIGN STRESSES :

DESIGN STRESSES FOR THE FOLLOWING MATERIALS ARE IN ACCORDANCE WITH THE AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, SERIES OF 1996.
REINFORCING STEEL IN ACCORDANCE WITH SECTION 8, GRADE 60.
CONCRETE IN ACCORDANCE WITH SECTION 8, f'c = 3500 PSI.
PRESTRESSED CONCRETE BEAMS, SEE DESIGN SHEETS 23 & 25.

SPECIFICATIONS :

DESIGN : AASHTO SERIES OF 1996.
CONSTRUCTION : IOWA DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR HIGHWAY AND BRIDGE CONSTRUCTION, SERIES 2001, PLUS APPLICABLE GENERAL SUPPLEMENTAL SPECIFICATIONS, DEVELOPMENTAL SPECIFICATIONS, SUPPLEMENTAL SPECIFICATIONS AND SPECIAL PROVISIONS.

TRAFFIC CONTROL PLAN ON RELOCATED U.S. 34

NOTE : THIS STRUCTURE IS BEING CONSTRUCTED ON A RELOCATION AND THE ROAD WILL NOT BE OPEN TO TRAFFIC UNTIL AFTER COMPLETION OF CONSTRUCTION. REFER TO TRAFFIC CONTROL PLAN SHOWN ELSEWHERE IN THESE PLANS.

TRAFFIC CONTROL PLAN ON IOWA V43

NOTE : THE ROADWAY WILL BE CLOSED TO THRU TRAFFIC BY THE GRADING CONTRACTOR BEFORE BRIDGE CONSTRUCTION IS STARTED.

NOTE: ROADWAY QUANTITIES SHOWN ELSEWHERE IN THESE PLANS.

NOTE : POLLUTION PREVENTION PLAN SHOWN ELSEWHERE IN THESE PLANS.

GENERAL NOTES :

IT IS THE INTENT OF THESE PLANS TO CONSTRUCT DUAL 218'-0 x 40' PRETENSIONED PRESTRESSED CONCRETE BEAM BRIDGES AT STATION 1416+93.83 (ENGLISH) RELOCATED ON U.S. 34 AND STATION 24382+81.76 (ENGLISH) ON IOWA 16.

THIS BRIDGE IS DESIGNED FOR HS20-44 LOADING PLUS 20 LBS. PER SQUARE FOOT OF ROADWAY FOR FUTURE WEARING SURFACE.

THE ROAD WILL BE CLOSED TO TRAFFIC DURING CONSTRUCTION. SEE TRAFFIC CONTROL PLAN NOTE ON THIS SHEET.

UTILITY COMPANIES WHOSE FACILITIES ARE SHOWN ON THE PLANS OR KNOWN TO BE WITHIN THE CONSTRUCTION LIMITS SHALL BE NOTIFIED BY THE BRIDGE CONTRACTOR OF THE STARTING DATE.

IT SHALL BE THE BRIDGE CONTRACTOR'S RESPONSIBILITY TO PROVIDE SITES FOR EXCESS EXCAVATED MATERIAL. NO PAYMENT FOR OVERHAUL WILL BE ALLOWED FOR MATERIAL HAULED TO THESE SITES.

EXCAVATION QUANTITIES FOR THE PIER AND ABUTMENTS ARE BASED ON THE ASSUMPTION THAT ROADWAY EXCAVATION WILL HAVE BEEN COMPLETED PRIOR TO STARTING CONSTRUCTION OF THE PIER AND ABUTMENTS.

THE BRIDGE CONTRACTOR SHALL PREBORE HOLES FOR ABUTMENT PILES. HOLES SHALL BE BORED TO THE ELEVATIONS SHOWN ON THE "LONGITUDINAL SECTION ALONG ℄ APPROACH ROADWAY" ON DESIGN SHEET 2. PILES SHALL BE DRIVEN THROUGH THE HOLES TO AT LEAST THE SPECIFIED DESIGN BEARING.

THE BRIDGE CONTRACTOR IS TO INSTALL SUBDRAINS BEHIND THE ABUTMENTS, SEE DESIGN SHEET 29 FOR DETAILS.

THE BRIDGE CONTRACTOR SHALL NOTE THE STANDARD ABUTMENT DETAILS HAVE BEEN MODIFIED TO OFFSET THE ABUTMENT FOOTING FROM THE WINGWALL TO AID IN TYING THE REINFORCING STEEL BETWEEN THE FOOTING TO WINGWALL AND THE FOOTING TO BACKWALL.

THE BRIDGE CONTRACTOR IS ENCOURAGED TO TAKE FULL ADVANTAGE OF SPECIFICATION 1105.15 -- VALUE ENGINEERING INCENTIVE PROPOSAL. A PAMPHLET AND CONCEPTUAL PROPOSAL FORM WILL BE AVAILABLE AT THE PRECONSTRUCTION CONFERENCE.

THE INFORMATION IN THE "BERM SLOPE LOCATION TABLE" PROVIDES THE LOCATION AND ELEVATION OF FOUR POINTS WHICH CAN BE USED TO LEVEL OFF AND SHAPE THE BERMS TO THEIR FINAL DIMENSIONS. THE 'A' POINTS ARE LOCATED WHERE THE FINISHED GRADE OF THE BERM SLOPE (OR TOP OF SLOPE PROTECTION) MEETS THE EDGE OF DITCH. 'A1' AND 'A3' ARE LOCATED AT THE EDGE OF THE SLOPE PROTECTION. 'A2' IS ALONG THE CENTERLINE OF APPROACH ROADWAY. 'B' IS LOCATED AT THE POINT WHERE THE EXTENSION OF THE BERM SLOPE ALONG CENTERLINE OF APPROACH ROADWAY INTERSECTS WITH THE TOP OF PAVEMENT AT THE CENTERLINE OF APPROACH ROADWAY.

CONCRETE BARRIER RAILS PLACED USING THE SLIPFORM METHOD WILL REQUIRE THE USE OF A CLASS BR CONCRETE IN ACCORDANCE WITH ARTICLE 2513.03B OF THE STANDARD SPECIFICATIONS. CLASS D CONCRETE IS NOT PERMITTED FOR CONCRETE BARRIER RAILS PLACED USING THE SLIPFORM METHOD.

IF NECESSARY TO PREVENT DAMAGE TO THE END OF THE BRIDGE DECK OR BACKWALL FROM CONSTRUCTION EQUIPMENT, AN APPROPRIATE METHOD OF PROTECTION APPROVED BY THE ENGINEER SHALL BE PROVIDED BY THE BRIDGE CONTRACTOR AT NO EXTRA COST TO THE STATE.

GUARDRAIL IS TO BE PLACED BY OTHERS.

THE APPROACH FILLS AS SHOWN ARE NOT A PART OF THIS CONTRACT, BUT ARE TO BE IN PLACE BEFORE ABUTMENT PILES ARE DRIVEN. THE BRIDGE CONTRACTOR IS TO LEVEL OFF AND SHAPE THE BERMS TO THE ELEVATIONS AND DIMENSIONS SHOWN. DRESSING OF SLOPES OUTSIDE THE BRIDGE AREA NOT DISTURBED BY THE BRIDGE CONTRACTOR SHALL BE PAID FOR AS EXTRA WORK.

NON-STANDARD BEAMS ARE REQUIRED FOR THIS BRIDGE.

TRANSVERSE GROOVING OR TINING IN THE PLASTIC CONCRETE OF THE BRIDGE DECK OR BRIDGE FLOOR OVERLAY WILL NOT BE ALLOWED. LONGITUDINAL GROOVES SHALL BE CUT INTO THE HARDENED CONCRETE SURFACES USING A MECHANICAL CUTTING DEVICE. THIS SURFACE TREATMENT SHALL BE DONE AFTER ANY SURFACE GRINDING IS DONE AND BEFORE TRAFFIC IS ALLOWED ON THE SURFACE. EACH GROOVE SHALL BE $\frac{1}{8}$ INCH $\pm\frac{1}{64}$ INCH IN WIDTH, $\frac{1}{8}$ INCH $+\frac{1}{32}$ INCH OR $-\frac{1}{16}$ INCH IN DEPTH, AND THE GROOVES SHALL BE UNIFORMLY SPACED AT $\frac{3}{4}$ INCH INTERVALS MEASURED FROM CENTER OF GROOVE TO CENTER OF GROOVE. LONGITUDINAL GROOVING WILL NOT BE REQUIRED IN THE AREA APPROXIMATELY 2 FEET ADJACENT TO THE CURBS.

THE LONGITUDINAL GROOVING IS TO BE BID ON A SQUARE YARD BASIS. THE NUMBER OF SQUARE YARDS OF LONGITUDINAL GROOVING WILL BE PAID FOR AT THE CONTRACT PRICE PER SQUARE YARD BASED ON PLAN QUANTITIES. PRICE BID FOR " LONGITUDINAL GROOVING IN CONCRETE " SHALL BE FULL COMPENSATION FOR FURNISHING ALL EQUIPMENT AND LABOR REQUIRED TO GROOVE THE DECK IN ACCORDANCE WITH THESE PLANS AND CURRENT SPECIFICATIONS.

THIS BRIDGE HAS BEEN CONVERTED FROM METRIC TO ENGLISH FOR DESIGN AND CONSTRUCTION. THE GRADING PLANS AND SURVEY REMAINED IN METRIC.

DESIGN FOR 23° SKEW (R.A.)

DUAL 218'-0 x 40' PRETENSIONED PRESTRESSED CONCRETE BEAM BRIDGES

50'-9 END SPANS 116'-6 INTERIOR SPAN

NOTES & QUANTITIES

STATION : 1416+93.83 (℄ RELOCATED U.S. 34)
STATION : 24382+81.76 (℄ IOWA 16) JULY, 2005

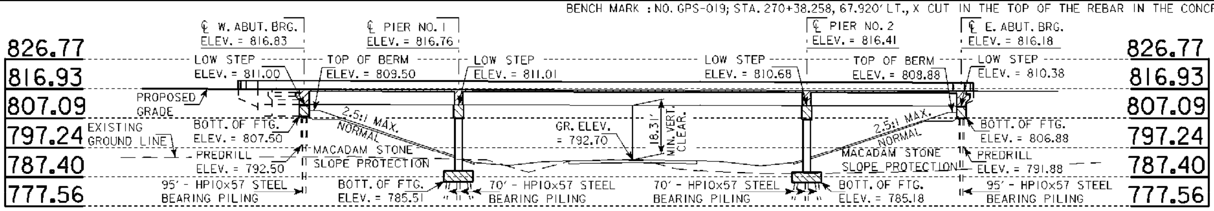
WAPELLO COUNTY

IOWA DEPARTMENT OF TRANSPORTATION - HIGHWAY DIVISION
DESIGN SHEET NO. 1 OF 31 FILE NO. 29907 DESIGN NO. 305

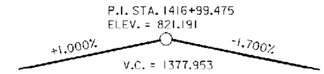
DESIGNED BY N.KOTLERS CHECKED BY E.SOUHRADA
DETAILED BY R.RYSAVY CADD FILE

WAPELLO COUNTY | PROJECT NUMBER NHSX-034-7 (62)--3H-90 | SHEET NUMBER 2

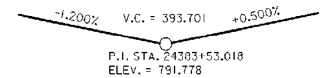
BENCH MARK : NO. GPS-019; STA. 270+38.258, 67.920' LT., X CUT IN THE TOP OF THE REBAR IN THE CONCRETE REFERENCE MARKER IN THE NORTHEAST CORNER OF THE JUNCTION OF U.S. 34 AND IA. 16, ELEV. = 798.117.



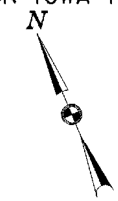
LONGITUDINAL SECTION ALONG ℄ APPROACH ROADWAY WESTBOUND BRIDGE

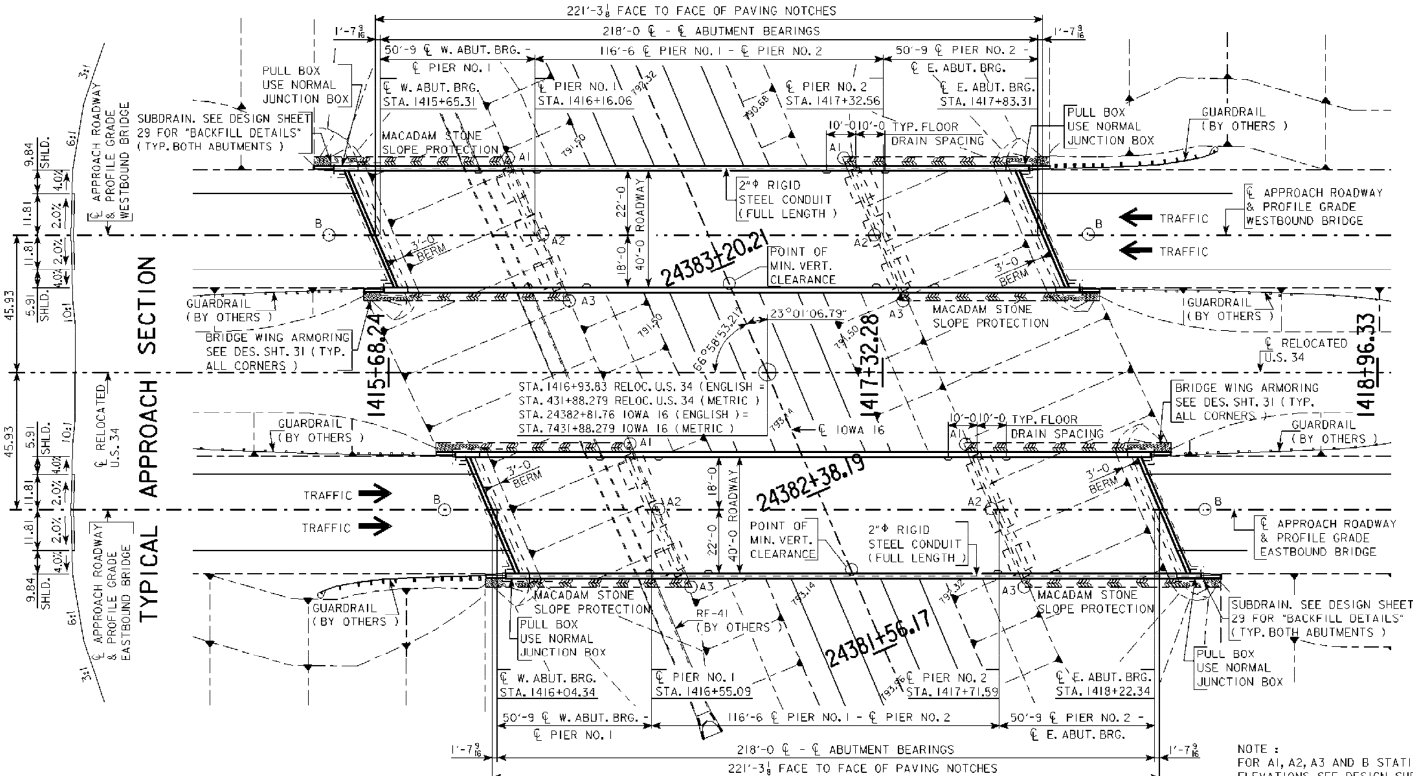


PROPOSED PROFILE GRADE ON RELOCATED U.S. 34



PROPOSED PROFILE GRADE ON IOWA 16





NOTE : FOR A1, A2, A3 AND B STATIONS, OFFSETS AND ELEVATIONS SEE DESIGN SHEET 3.

SITUATION PLAN

TRAFFIC ESTIMATE : IOWA 16
2130 V.P.D. (2004)
2960 V.P.D. (2024)
8% TRUCKS

TRAFFIC ESTIMATE : RELOCATED U.S. 34
8090 V.P.D. (2004)
11290 V.P.D. (2024)
11% TRUCKS

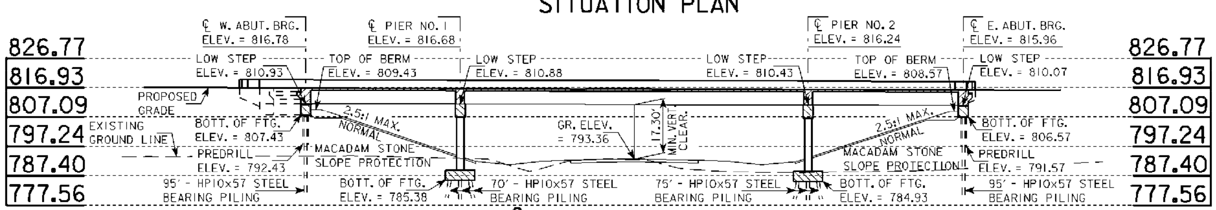
LOCATION :
U.S. RELOCATED 34 OVER IOWA 16
SECTIONS 33 & 34
T-72 N R-12 W
PLEASANT TWP.
WAPELLO COUNTY

FHWA NO. 609380 (WB)
FHWA NO. 609385 (EB)

NOTE : THIS PLAN NOT TO SCALE

NOTE :
ALL DIMENSIONS IN FEET UNLESS OTHERWISE NOTED OR SHOWN.
ALL STATIONS AND ELEVATIONS ARE IN FEET.
THIS PLAN NOT TO SCALE.

NOTE :
THIS BRIDGE HAS BEEN CONVERTED FROM METRIC TO ENGLISH FOR DESIGN AND CONSTRUCTION. THE GRADING PLANS AND SURVEY HAVE REMAINED IN METRIC.



LONGITUDINAL SECTION ALONG ℄ APPROACH ROADWAY EASTBOUND BRIDGE

DESIGN FOR 23° SKEW (R.A.)

DUAL 218'-0 × 40' PRETENSIONED PRESTRESSED CONCRETE BEAM BRIDGES

50'-9 END SPANS 116'-6 INTERIOR SPAN

SITUATION PLAN

STATION : 1416+93.83 (℄ RELOCATED U.S. 34)
STATION : 24382+81.76 (℄ IOWA 16) JULY, 2005

WAPELLO COUNTY

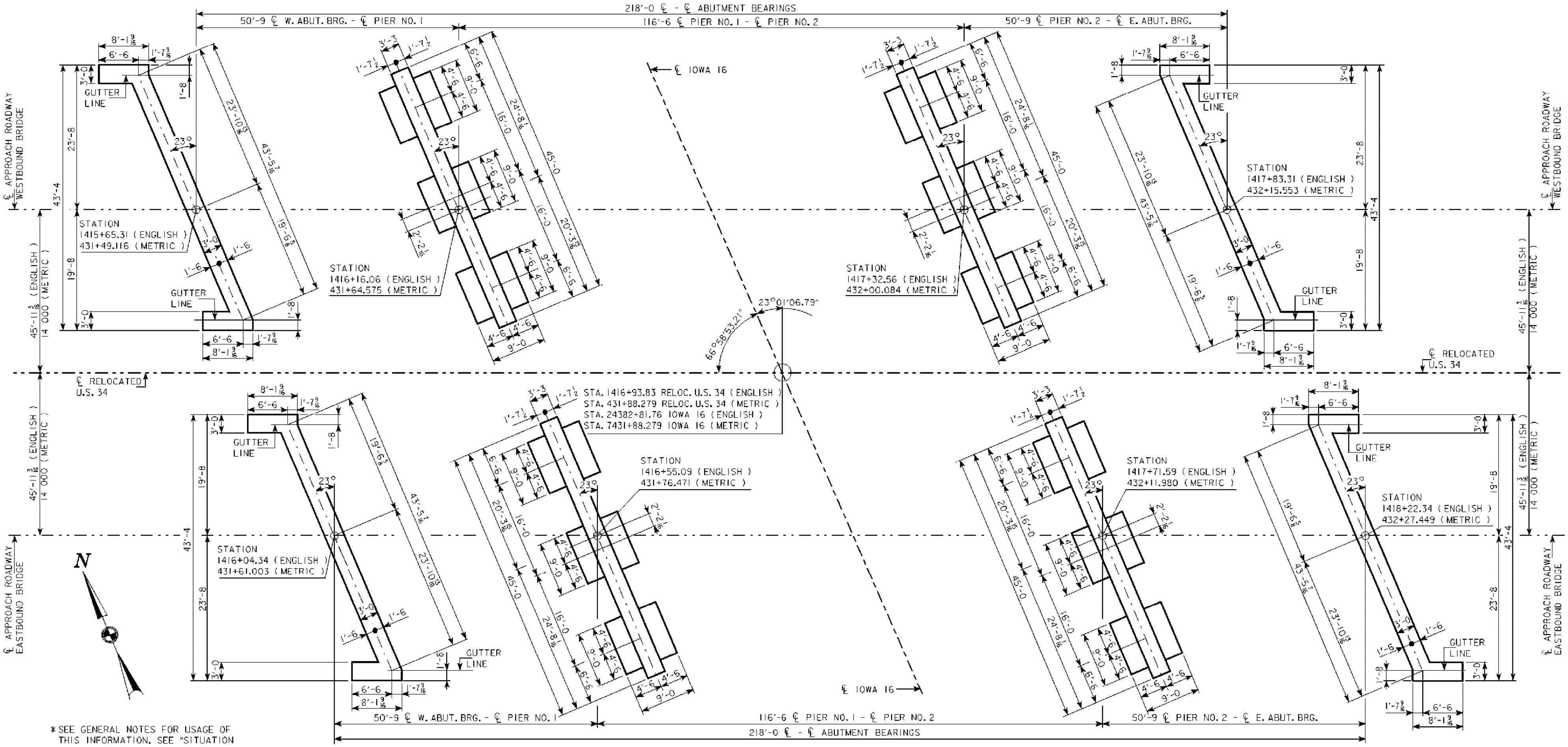
IOWA DEPARTMENT OF TRANSPORTATION - HIGHWAY DIVISION

DESIGN SHEET NO. 2 OF 31 FILE NO. 29907 DESIGN NO. 305

DESIGNED BY N.KOTLERS CHECKED BY E.SOUHRADA
DETAILED BY R.RYSAVY CADD FILE

27-APR-2005 09:47 rrysavy w:\projects\90034060A94\BRFinal\h900305.s02 \\NTPLTSVR1\Bridge1T1f

METRIC BENCH MARK : NO. GPS-019; STA. 82+41.261, 20.702 m LT., X CUT IN THE TOP OF THE REBAR IN THE CONCRETE REFERENCE MARKER IN THE NORTHEAST CORNER OF THE JUNCTION OF U.S. 34 AND IA. 16, ELEV. = 243.266.
ENGLISH BENCH MARK : NO. GPS-019; STA. 270+38.258, 67.920' LT., X CUT IN THE TOP OF THE REBAR IN THE CONCRETE REFERENCE MARKER IN THE NORTHEAST CORNER OF THE JUNCTION OF U.S. 34 AND IA. 16, ELEV. = 798.117.



STAKING DIAGRAM

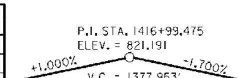
* SEE GENERAL NOTES FOR USAGE OF THIS INFORMATION. SEE "SITUATION PLAN" SHEET FOR LOCATIONS OF POINTS A1, A2, A3 & B.

* ENGLISH BERM SLOPE LOCATION TABLE

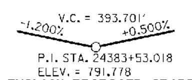
WESTBOUND BRIDGE	WEST ABUTMENT			EASTBOUND BRIDGE	WEST ABUTMENT		
	STATION	OFFSET	ELEVATION		STATION	OFFSET	ELEVATION
A1	1416+09.72	26.25 LT.	791.82	A1	1416+48.07	22.31 LT.	792.29
A2	1416+18.52	0	791.91	A2	1416+57.55	0	792.47
A3	1416+27.97	22.31 RT.	792.00	A3	1416+68.67	26.25 RT.	792.71
B	1415+52.60	0	816.89	B	1415+93.43	0	816.80
	EAST ABUTMENT				EAST ABUTMENT		
	STATION	OFFSET	ELEVATION		STATION	OFFSET	ELEVATION
A1	1417+18.89	26.25 LT.	791.96	A1	1417+59.60	22.31 LT.	792.62
A2	1417+30.02	0	792.10	A2	1417+69.05	0	792.84
A3	1417+39.50	22.31 RT.	792.24	A3	1417+80.20	26.25 RT.	793.14
B	1417+93.41	0	816.13	B	1418+29.81	0	815.92

* METRIC BERM SLOPE LOCATION TABLE

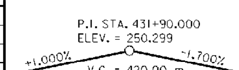
WESTBOUND BRIDGE	WEST ABUTMENT			EASTBOUND BRIDGE	WEST ABUTMENT		
	STATION	OFFSET	ELEVATION		STATION	OFFSET	ELEVATION
A1	431+61.927	8 LT.	241.348	A1	431+74.333	6.8 LT.	241.491
A2	431+65.326	0	241.373	A2	431+77.222	0	241.545
A3	431+68.206	6.8 RT.	241.403	A3	431+80.612	8 RT.	241.617
B	431+45.231	0	248.987	B	431+57.677	0	248.961
	EAST ABUTMENT				EAST ABUTMENT		
	STATION	OFFSET	ELEVATION		STATION	OFFSET	ELEVATION
A1	431+95.919	8 LT.	241.390	A1	432+08.325	6.8 LT.	241.591
A2	431+99.310	0	241.431	A2	432+11.205	0	241.659
A3	432+02.199	6.8 RT.	241.474	A3	432+14.604	8 RT.	241.749
B	432+18.631	0	248.755	B	432+29.727	0	248.691



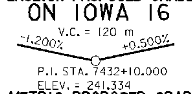
ENGLISH PROPOSED GRADE ON RELOCATED U.S. 34



ENGLISH PROPOSED GRADE ON IOWA 16



METRIC PROPOSED GRADE ON RELOCATED U.S. 34



METRIC PROPOSED GRADE ON IOWA 16

NOTE :
THESE BRIDGES HAVE BEEN CONVERTED FROM METRIC TO ENGLISH FOR DESIGN AND CONSTRUCTION. THE GRADING PLANS AND SURVEY HAVE REMAINED IN METRIC.

DESIGN FOR 23° SKEW (R.A.)

DUAL 218'-0 x 40' PRETENSIONED PRESTRESSED CONCRETE BEAM BRIDGES

50'-9 END SPANS 116'-6 INTERIOR SPAN

STAKING DIAGRAM

STATION : 1416+93.83 (℄ RELOCATED U.S. 34)
STATION : 24382+81.76 (℄ IOWA 16) JULY, 2005

WAPELLO COUNTY

IOWA DEPARTMENT OF TRANSPORTATION - HIGHWAY DIVISION

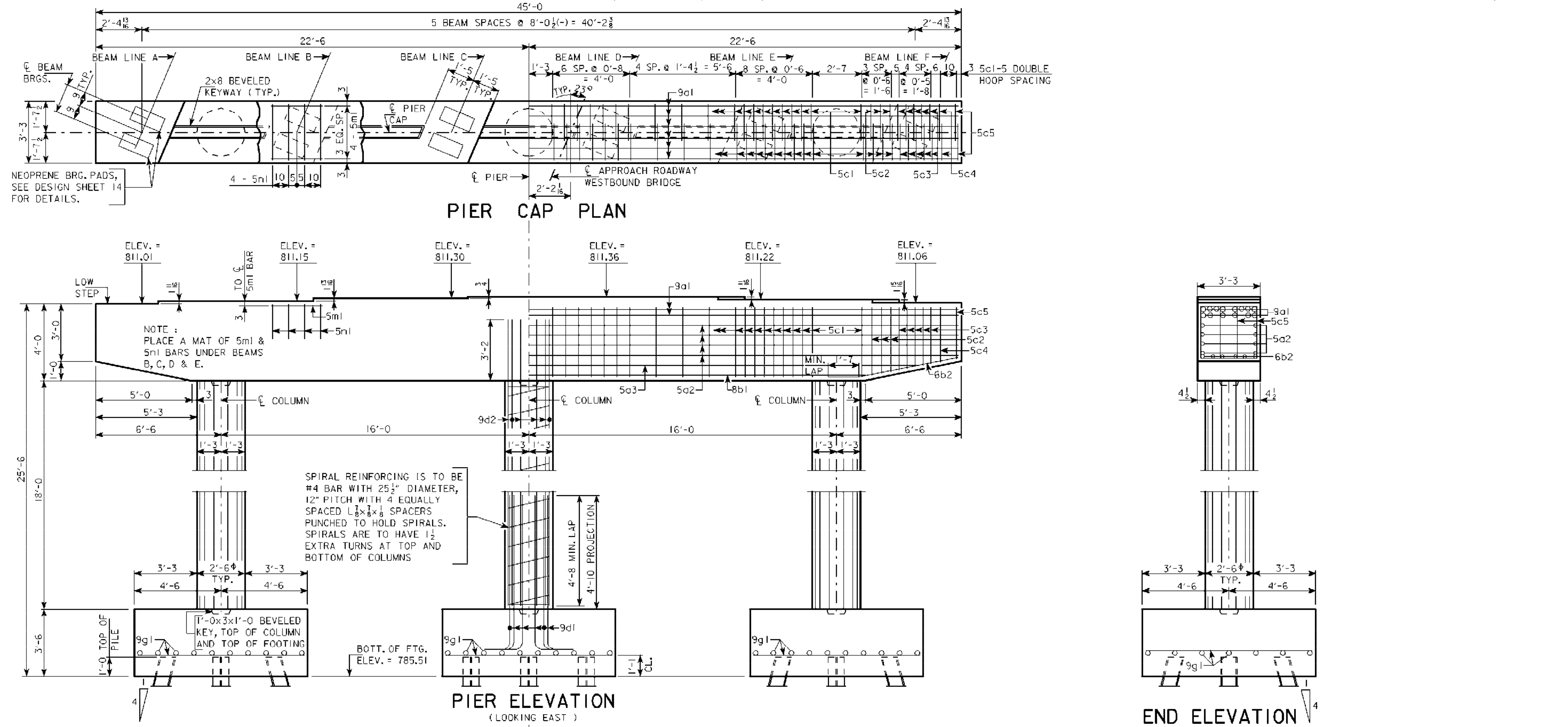
DESIGN SHEET NO. 3 OF 31 FILE NO. 29907 DESIGN NO. 305

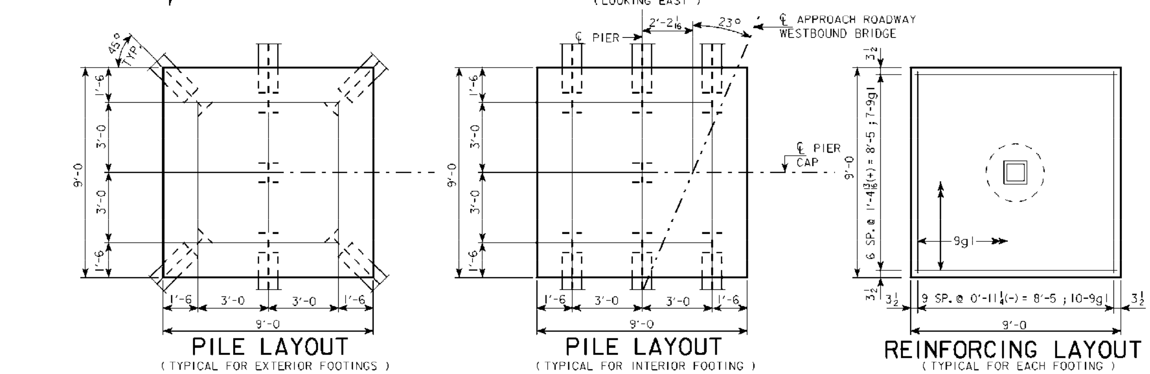
DESIGNED BY N.KOTLERS CHECKED BY E.SOUHRADA
DETAILED BY R.RYSAVY CADD FILE

WAPELLO COUNTY | PROJECT NUMBER NHSX-034-7 (62)--3H-90 | SHEET NUMBER 4

27-APR-2005 09:47 rrysavy w:\projects\90034060A94\BRFinal\h900305.s03 \\NTPLTSVR1\Bridge1Tif

BENCH MARK : NO. GPS-019; STA. 270+38.258, 67.920' LT., X CUT IN THE TOP OF THE REBAR IN THE CONCRETE REFERENCE MARKER IN THE NORTHEAST CORNER OF THE JUNCTION OF U.S. 34 AND IA. 16, ELEV. = 798.117.





NOTE :
PILE DIMENSIONS SHOWN ARE AT BOTTOM OF FOOTING. BATTER PILES 1:4 IN THE DIRECTION SHOWN.

7 - HP10x57 STEEL BEARING PILING REQUIRED AT EACH FOOTING.

21 - HP10x57 STEEL BEARING PILING REQUIRED AT PIER.

NOTE :
SEE DESIGN SHEET 6 FOR OTHER PIER DETAILS.

DESIGN FOR 23° SKEW (R.A.)

DUAL 218'-0 x 40' PRETENSIONED PRESTRESSED CONCRETE BEAM BRIDGES

50'-9 END SPANS 116'-6 INTERIOR SPAN

PIER NO. 1 - WESTBOUND BRIDGE

STATION : 1416+93.83 (℄ RELOCATED U.S. 34)
STATION : 24382+81.76 (℄ IOWA 16) JULY, 2005

WAPELLO COUNTY

IOWA DEPARTMENT OF TRANSPORTATION - HIGHWAY DIVISION

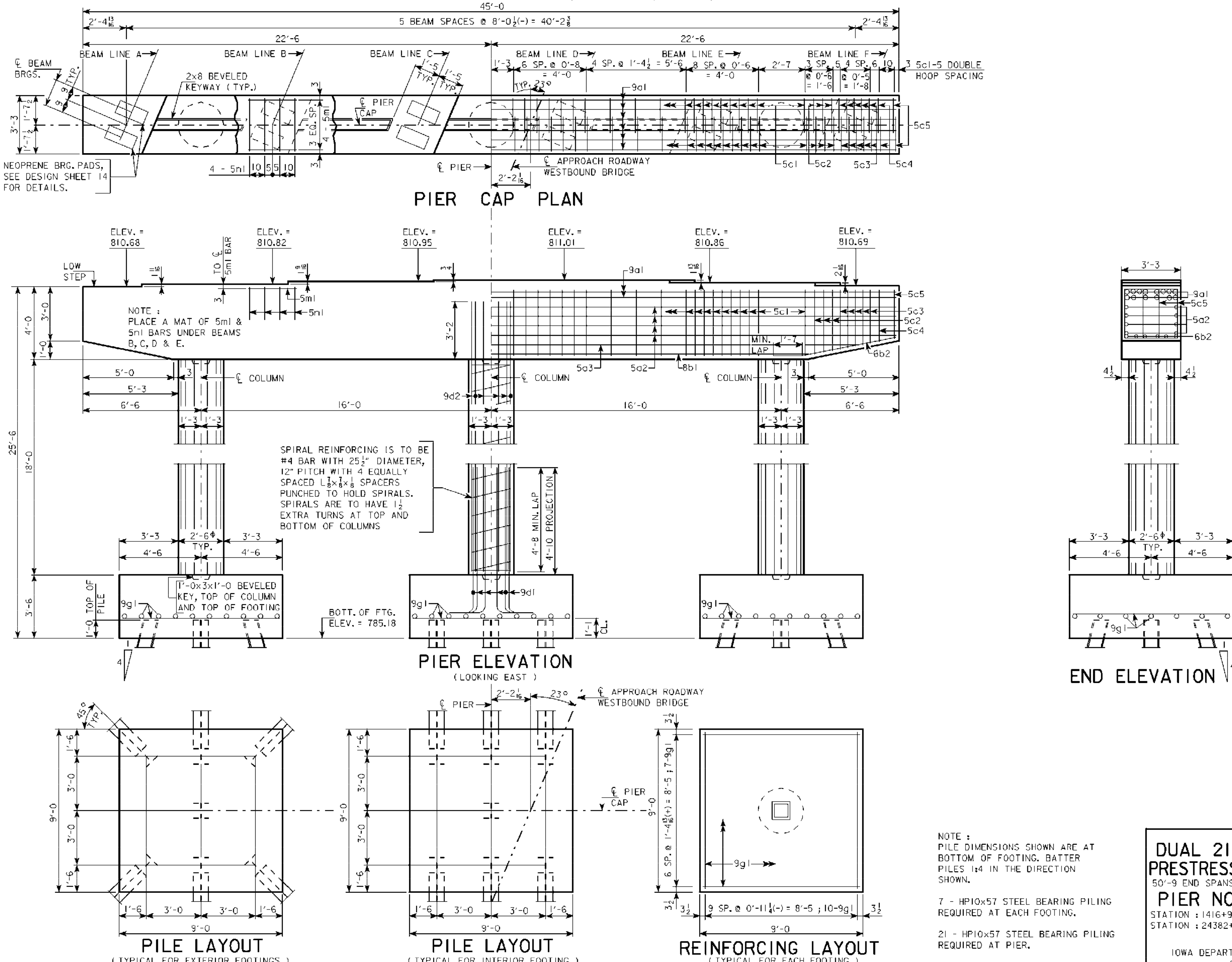
DESIGN SHEET NO. 4 OF 31 FILE NO. 29907 DESIGN NO. 305

DESIGNED BY N.KOTLERS CHECKED BY E.SOUHRADA
DETAILED BY R.RYSAVY CADD FILE

WAPELLO COUNTY | PROJECT NUMBER NHSX-034-7(62)--3H-90 | SHEET NUMBER 5

27-APR-2005 09:47 rrysavy w:\projects\90034060A94\BRFinal\h900305.s04 \\NTPLTSVR1\Bridge1Tif

BENCH MARK : NO. GPS-019; STA. 270+38.258, 67.920' LT., X CUT IN THE TOP OF THE REBAR IN THE CONCRETE REFERENCE MARKER IN THE NORTHEAST CORNER OF THE JUNCTION OF U.S. 34 AND IA. 16, ELEV. = 798.117.



NOTE :
SEE DESIGN SHEET 6
FOR OTHER PIER DETAILS.

NOTE :
PILE DIMENSIONS SHOWN ARE AT BOTTOM OF FOOTING. BATTER PILES 1:4 IN THE DIRECTION SHOWN.

7 - HP10x57 STEEL BEARING PILING REQUIRED AT EACH FOOTING.

21 - HP10x57 STEEL BEARING PILING REQUIRED AT PIER.

DESIGN FOR 23° SKEW (R.A.)

DUAL 218'-0 x 40' PRETENSIONED PRESTRESSED CONCRETE BEAM BRIDGES

50'-9 END SPANS 116'-6 INTERIOR SPAN

PIER NO. 2 - WESTBOUND BRIDGE

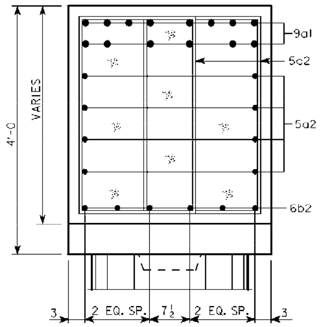
STATION : 1416+93.83 (℄ RELOCATED U.S. 34)
STATION : 24382+81.76 (℄ IOWA 16) JULY, 2005

WAPELLO COUNTY
IOWA DEPARTMENT OF TRANSPORTATION - HIGHWAY DIVISION
DESIGN SHEET NO. 5 OF 31 FILE NO. 29907 DESIGN NO. 305

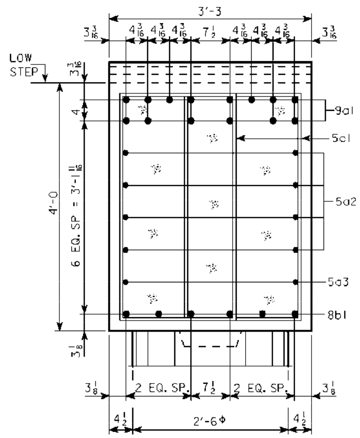
DESIGNED BY N.KOTLERS CHECKED BY E.SOUHRADA
DETAILED BY R.RYSAVY CADD FILE

WAPELLO COUNTY | PROJECT NUMBER NHSX-034-7 (62)--3H-90 | SHEET NUMBER 6

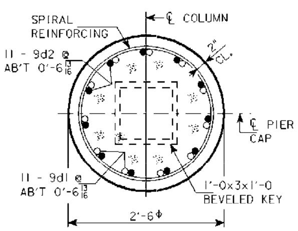
27-APR-2005 09:47 rrysavy w:\projects\90034060A94\BRFinal\h900305.s05 \\NTPLTSVR1\Bridge1Tif



SECTION THRU CANTILEVER



SECTION THRU PIER CAP



TYPICAL COLUMN SECTION

PIER NOTES :

ALL EXPOSED CORNERS OF 90° OR SHARPER ARE TO BE FILLETED WITH A $\frac{3}{4}$" DRESSED AND BEVELED STRIP.

MINIMUM CLEAR DISTANCE FROM FACE OF CONCRETE TO NEAR REINFORCING BAR IS TO BE 2 INCHES UNLESS OTHERWISE NOTED OR SHOWN. THE 9d1 FOOTING TO COLUMN DOWELS ARE TO BE IN PLACE BEFORE FOOTING CONCRETE IS PLACED.

THE SPIRAL REINFORCING MAY BE SPLICED BY LAPPING 2'-2. THE LENGTH OF THE SPIRAL SHOWN DOES NOT INCLUDE THE LAPPED LENGTH OF THE SPLICES. THE COST OF THE LAPS AT SPLICES IS TO BE INCLUDED IN THE PRICE BID FOR OTHER REINFORCEMENT.

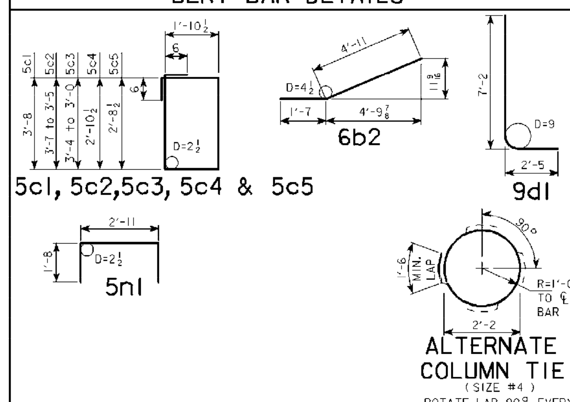
COLUMN TIES SPACED AT 12" CENTERS MAY BE SUBSTITUTED FOR THE SPIRAL REINFORCEMENT. PAYMENT WILL BE BASED ON THE WEIGHT OF SPIRAL REINFORCEMENT. NO ADJUSTMENTS IN REINFORCING STEEL PAY WEIGHT WILL BE ALLOWED. SEE BENT BAR DETAILS FOR SPLICE LAP LENGTH.

THE DESIGN BEARING FOR PIER PILES IS 44 TONS.

REINFORCING BAR LIST - ONE PIER

BAR	LOCATION	SHAPE	NO.	LENGTH	WEIGHT
9a1	CAP, TOP, LONGIT.		14	44'-8	2126
5a2	CAP, SIDES, LONGIT.		8	44'-8	373
5a3	CAP, SIDES, LONGIT.		2	40'-2	84
8b1	CAP, BOTTOM, LONGIT.		6	34'-8	555
6b2	CAP, BOTTOM, CANTILEVER		12	6'-6	117
5c1	CAP HOOPS		80	12'-1	1008
5c2	CAP HOOPS, CANTILEVER		12	VARIES	147
5c3	CAP HOOPS, CANTILEVER		20	VARIES	231
5c4	CAP HOOPS, CANTILEVER		4	10'-6	44
5c5	CAP HOOPS, CANTILEVER, END		4	10'-2	42
#4	COLUMN SPIRAL		3	141'-9	284
	SPIRAL SPACERS $L\frac{7}{8}\times\frac{7}{8}\times\frac{1}{8}$ (0.7 LB./FT.)		12	17'-8	148
9d1	FOOTING TO COLUMN DOWELS		33	9'-7	1075
9d2	COLUMN, VERTICAL		33	21'-0	2356
9g1	FOOTING, BOTTOM, LONGIT. & TRANSV.		51	8'-8	1180
5m1	STEPS, LONGIT.		16	2'-8	45
5n1	STEPS, TRANSV.		16	6'-3	104
				TOTAL - LBS.	9919

BENT BAR DETAILS



NOTE : ALL DIMENSIONS ARE OUT TO OUT. D = PIN DIAMETER.

CONCRETE PLACEMENT QUANTITIES

LOCATION	PIER NO. 1	PIER NO. 2	QUANTITY
FOOTINGS	31.5	31.5	63.0
COLUMNS	9.8	9.8	19.6
CAP & STEPS	22.3	22.2	44.5
TOTAL - CU.YDS.	63.6	63.5	127.1

ESTIMATED QUANTITIES - WESTBOUND BRIDGE TWO PIERS

ITEM		UNITS	QUANTITY
STRUCTURAL CONCRETE (BRIDGE)		CU.YDS.	127.1
REINFORCING STEEL		LBS.	19,838
CLASS 20 EXCAVATION	P.1 = 131 ; P.2 = 139	CU.YDS.	270
HP 10x57 STEEL BEARING PILING	FURNISH 21 @ 70' P.1 ; 21 @ 70' P.2	L.F.	2940
	DRIVE 21 @ 70' P.1 ; 21 @ 70' P.2	L.F.	2940

DESIGN FOR 23° SKEW (R.A.)

DUAL 218'-0 × 40' PRETENSIONED PRESTRESSED CONCRETE BEAM BRIDGES

50'-9 END SPANS 116'-6 INTERIOR SPAN

PIER DETAILS - WESTBOUND BRIDGE

STATION : 1416+93.83 (℄ RELOCATED U.S. 34)
STATION : 24382+81.76 (℄ IOWA 16) JULY, 2005

WAPELLO COUNTY

IOWA DEPARTMENT OF TRANSPORTATION - HIGHWAY DIVISION

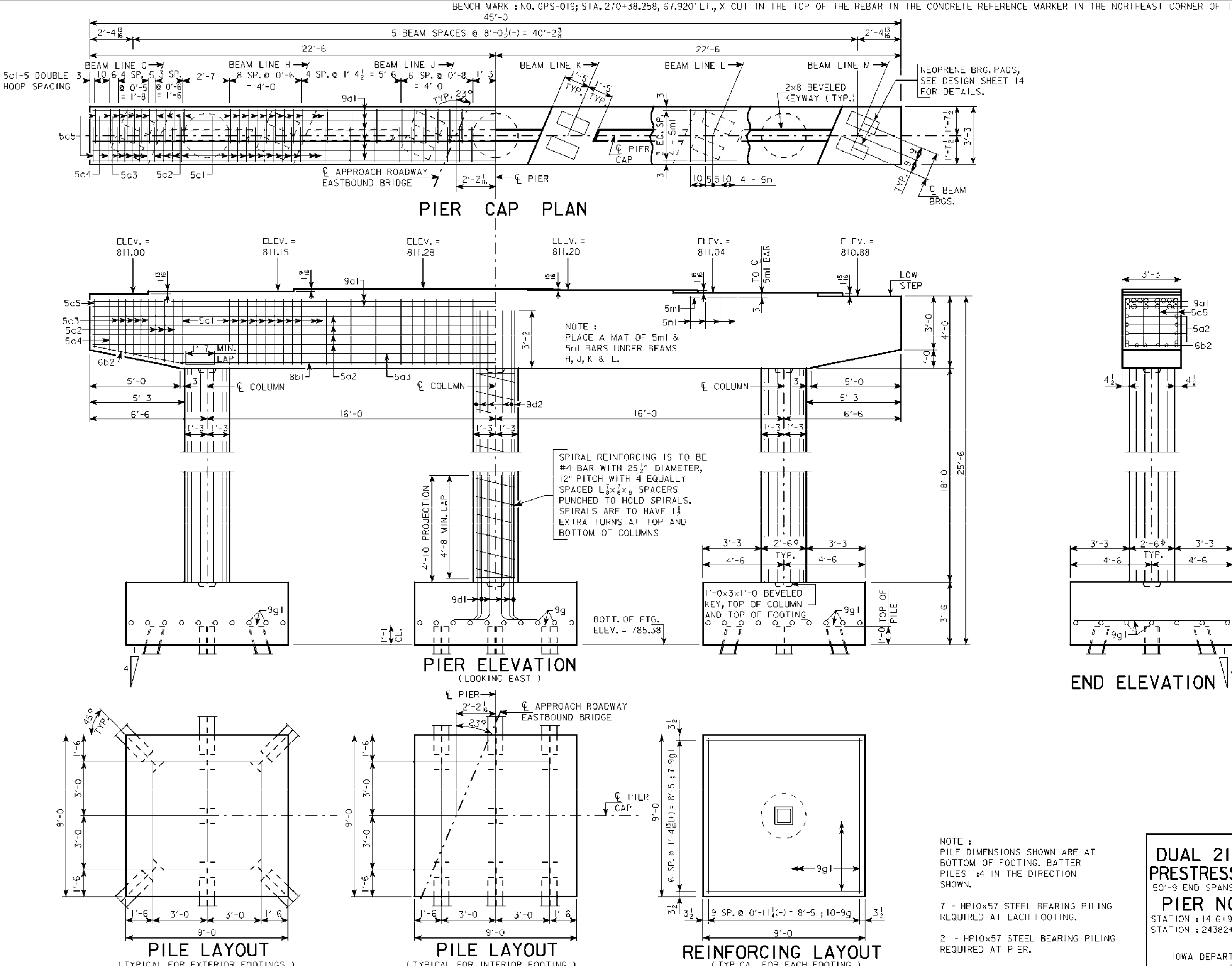
DESIGN SHEET NO. 6 OF 31 FILE NO. 29907 DESIGN NO. 305

DESIGNED BY N.KOTLERS CHECKED BY E.SOUHRADA
DETAILED BY R.RYSAVY CADD FILE

WAPELLO COUNTY PROJECT NUMBER NHSX-034-7 (62)--3H-90 SHEET NUMBER 7

27-APR-2005 09:47 rrysavy w:\projects\90034060A94\BRFinal\h900305.s06 \\NTPLTSVR1\Bridge1Tif

BENCH MARK : NO. GPS-019; STA. 270+38.258, 67.920' LT., X CUT IN THE TOP OF THE REBAR IN THE CONCRETE REFERENCE MARKER IN THE NORTHEAST CORNER OF THE JUNCTION OF U.S. 34 AND IA. 16, ELEV. = 798.117.



NOTE :
PILE DIMENSIONS SHOWN ARE AT BOTTOM OF FOOTING. BATTER PILES 1:4 IN THE DIRECTION SHOWN.

7 - HP10x57 STEEL BEARING PILING REQUIRED AT EACH FOOTING.

21 - HP10x57 STEEL BEARING PILING REQUIRED AT PIER.

NOTE :
SEE DESIGN SHEET 9 FOR OTHER PIER DETAILS.

DESIGN FOR 23° SKEW (R.A.)

DUAL 218'-0 x 40' PRETENSIONED PRESTRESSED CONCRETE BEAM BRIDGES

50'-9 END SPANS — 116'-6 INTERIOR SPAN

PIER NO. 1 - EASTBOUND BRIDGE

STATION : 1416+93.83 (℄ RELOCATED U.S. 34)
STATION : 24382+81.76 (℄ IOWA 16) JULY, 2005

WAPELLO COUNTY

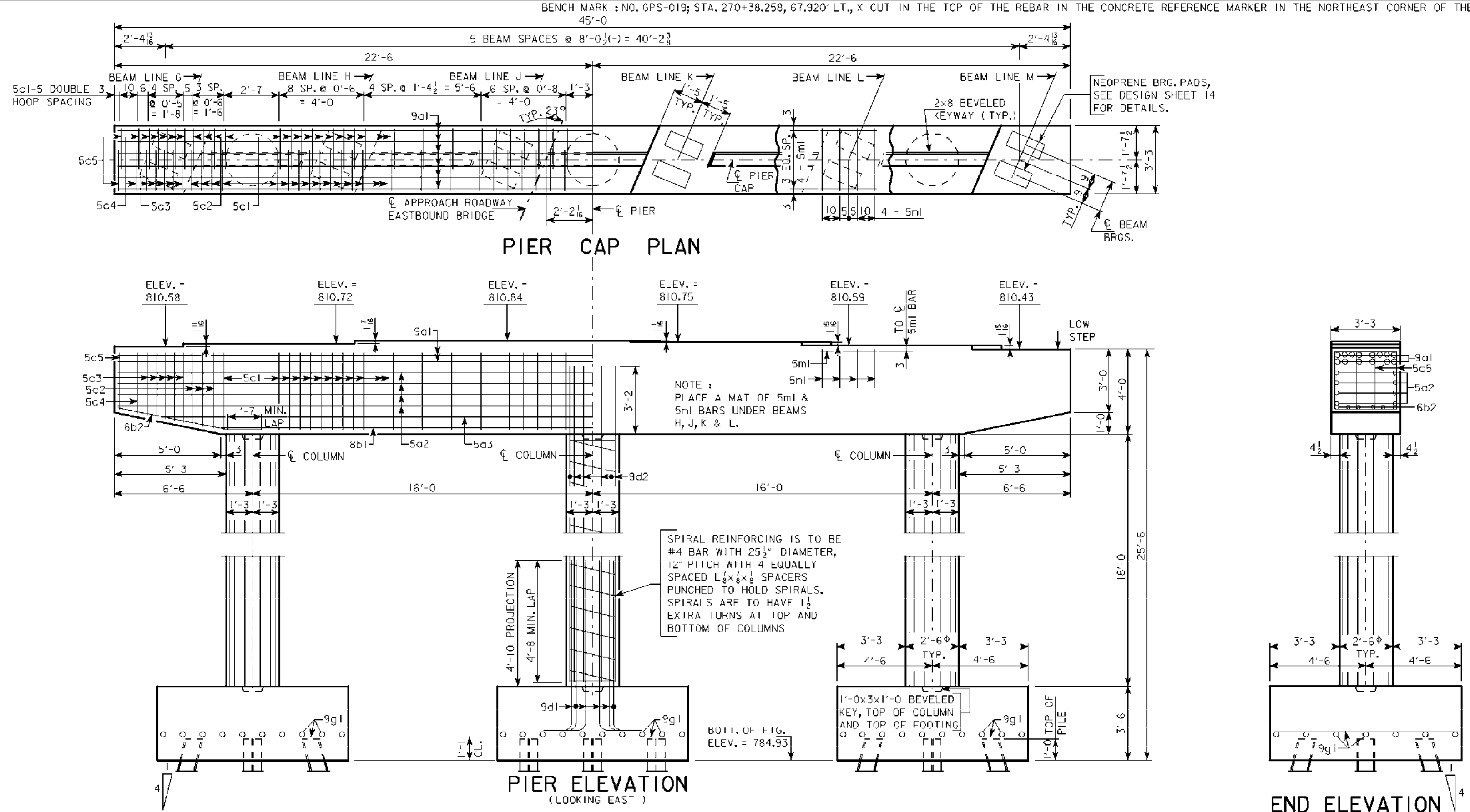
IOWA DEPARTMENT OF TRANSPORTATION - HIGHWAY DIVISION

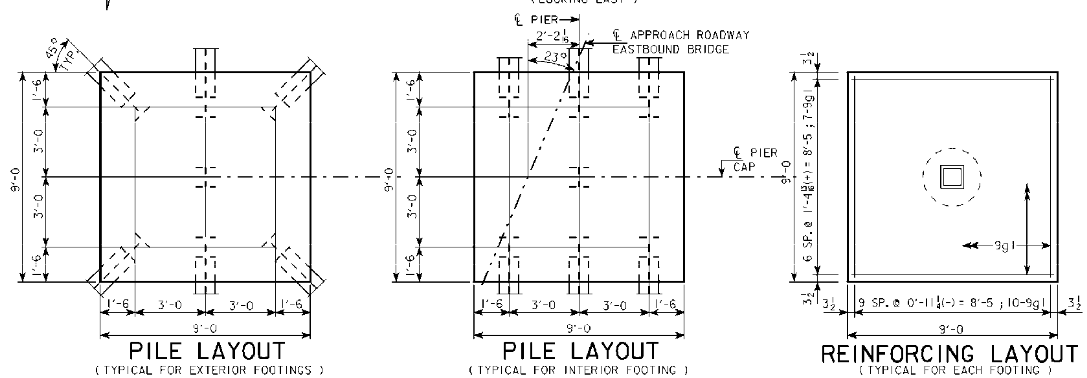
DESIGN SHEET NO. 7 OF 31 FILE NO. 29907 DESIGN NO. 305

DESIGNED BY N.KOTLERS — CHECKED BY E.SOUHRADA
DETAILED BY R.RYSAVY — CADD FILE

WAPELLO COUNTY — PROJECT NUMBER NHSX-034-7(62)--3H-90 — SHEET NUMBER 8

BENCH MARK : NO. GPS-019; STA. 270+38.258, 67.920' LT., X CUT IN THE TOP OF THE REBAR IN THE CONCRETE REFERENCE MARKER IN THE NORTHEAST CORNER OF THE JUNCTION OF U.S. 34 AND IA. 16, ELEV. = 798.117.





NOTE :
PILE DIMENSIONS SHOWN ARE AT BOTTOM OF FOOTING. BATTER PILES 1:4 IN THE DIRECTION SHOWN.

7 - HP10x57 STEEL BEARING PILING REQUIRED AT EACH FOOTING.

21 - HP10x57 STEEL BEARING PILING REQUIRED AT PIER.

NOTE :
SEE DESIGN SHEET 9 FOR OTHER PIER DETAILS.

DESIGN FOR 23° SKEW (R.A.)

DUAL 218'-0 x 40' PRETENSIONED PRESTRESSED CONCRETE BEAM BRIDGES

50'-9 END SPANS — 116'-6 INTERIOR SPAN

PIER NO. 2 - EASTBOUND BRIDGE

STATION : 1416+93.83 (℄ RELOCATED U.S. 34)
STATION : 24382+81.76 (℄ IOWA 16) — JULY, 2005

WAPELLO COUNTY

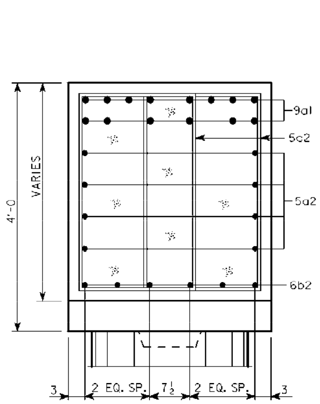
IOWA DEPARTMENT OF TRANSPORTATION - HIGHWAY DIVISION

DESIGN SHEET NO. 8 OF 31 — FILE NO. 29907 — DESIGN NO. 305

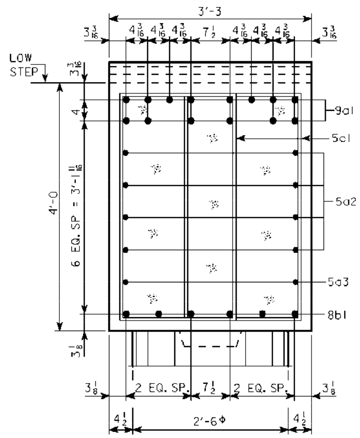
DESIGNED BY N.KOTLERS — CHECKED BY E.SOUHRADA
DETAILED BY R.RYSAVY — CADD FILE

WAPELLO COUNTY — PROJECT NUMBER NHSX-034-7(62)--3H-90 — SHEET NUMBER 9

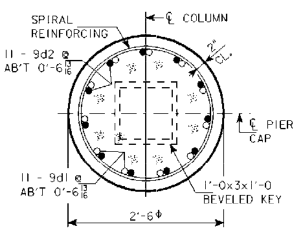
27-APR-2005 09:48 rrysavy w:\projects\90034060A94\BRFinal\h900305.s08 \\NTPLTSVR1\Bridge1T1f



SECTION THRU CANTILEVER



SECTION THRU PIER CAP

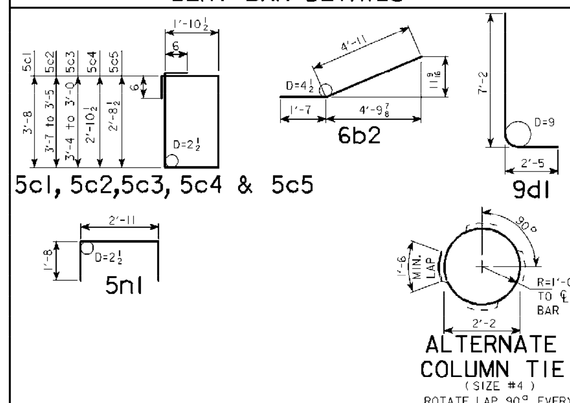


TYPICAL COLUMN SECTION

REINFORCING BAR LIST - ONE PIER

BAR	LOCATION	SHAPE	NO.	LENGTH	WEIGHT
9a1	CAP, TOP, LONGIT.		14	44'-8	2126
5a2	CAP, SIDES, LONGIT.		8	44'-8	373
5a3	CAP, SIDES, LONGIT.		2	40'-2	84
8b1	CAP, BOTTOM, LONGIT.		6	34'-8	555
6b2	CAP, BOTTOM, CANTILEVER		12	6'-6	117
5c1	CAP HOOPS		80	12'-1	1008
5c2	CAP HOOPS, CANTILEVER		12	VARIES	147
5c3	CAP HOOPS, CANTILEVER		20	VARIES	231
5c4	CAP HOOPS, CANTILEVER		4	10'-6	44
5c5	CAP HOOPS, CANTILEVER, END		4	10'-2	42
#4	COLUMN SPIRAL		3	141'-9	284
	SPIRAL SPACERS L $\frac{7}{8}\times\frac{7}{8}\times\frac{1}{8}$ (0.7 LB./FT.)		12	17'-8	148
9d1	FOOTING TO COLUMN DOWELS		33	9'-7	1075
9d2	COLUMN, VERTICAL		33	21'-0	2356
9g1	FOOTING, BOTTOM, LONGIT. & TRANSV.		51	8'-8	1180
5m1	STEPS, LONGIT.		16	2'-8	45
5n1	STEPS, TRANSV.		16	6'-3	104
				TOTAL - LBS.	9919

BENT BAR DETAILS



NOTE : ALL DIMENSIONS ARE OUT TO OUT. D = PIN DIAMETER.

PIER NOTES :

ALL EXPOSED CORNERS OF 90° OR SHARPER ARE TO BE FILLETED WITH A ¾" DRESSED AND BEVELED STRIP.

MINIMUM CLEAR DISTANCE FROM FACE OF CONCRETE TO NEAR REINFORCING BAR IS TO BE 2 INCHES UNLESS OTHERWISE NOTED OR SHOWN. THE 9d1 FOOTING TO COLUMN DOWELS ARE TO BE IN PLACE BEFORE FOOTING CONCRETE IS PLACED.

THE SPIRAL REINFORCING MAY BE SPLICED BY LAPPING 2'-2. THE LENGTH OF THE SPIRAL SHOWN DOES NOT INCLUDE THE LAPPED LENGTH OF THE SPLICES. THE COST OF THE LAPS AT SPLICES IS TO BE INCLUDED IN THE PRICE BID FOR OTHER REINFORCEMENT.

COLUMN TIES SPACED AT 12" CENTERS MAY BE SUBSTITUTED FOR THE SPIRAL REINFORCEMENT. PAYMENT WILL BE BASED ON THE WEIGHT OF SPIRAL REINFORCEMENT. NO ADJUSTMENTS IN REINFORCING STEEL PAY WEIGHT WILL BE ALLOWED. SEE BENT BAR DETAILS FOR SPLICE LAP LENGTH.

THE DESIGN BEARING FOR PIER PILES IS 44 TONS.

CONCRETE PLACEMENT QUANTITIES

LOCATION	PIER NO. 1	PIER NO. 2	QUANTITY
FOOTINGS	31.5	31.5	63.0
COLUMNS	9.8	9.8	19.6
CAP & STEPS	22.5	22.5	45.0
TOTAL - CU.YDS.	63.8	63.8	127.6

ESTIMATED QUANTITIES - EASTBOUND BRIDGE TWO PIERS

ITEM		UNITS	QUANTITY
STRUCTURAL CONCRETE (BRIDGE)		CU.YDS.	127.6
REINFORCING STEEL		LBS.	19,838
CLASS 20 EXCAVATION	P.1 = 142 ; P.2 = 155	CU.YDS.	297
HP 10x57 STEEL BEARING PILING	FURNISH 21 @ 70' P.1 ; 21 @ 75' P.2	L.F.	3045
	DRIVE 21 @ 70' P.1 ; 21 @ 75' P.2	L.F.	3045

DESIGN FOR 23° SKEW (R.A.)

DUAL 218'-0 × 40' PRETENSIONED PRESTRESSED CONCRETE BEAM BRIDGES

50'-9 END SPANS — 116'-6 INTERIOR SPAN

PIER DETAILS - EASTBOUND BRIDGE

STATION : 1416+93.83 (℄ RELOCATED U.S. 34)
STATION : 24382+81.76 (℄ IOWA 16) — JULY, 2005

WAPELLO COUNTY
IOWA DEPARTMENT OF TRANSPORTATION - HIGHWAY DIVISION

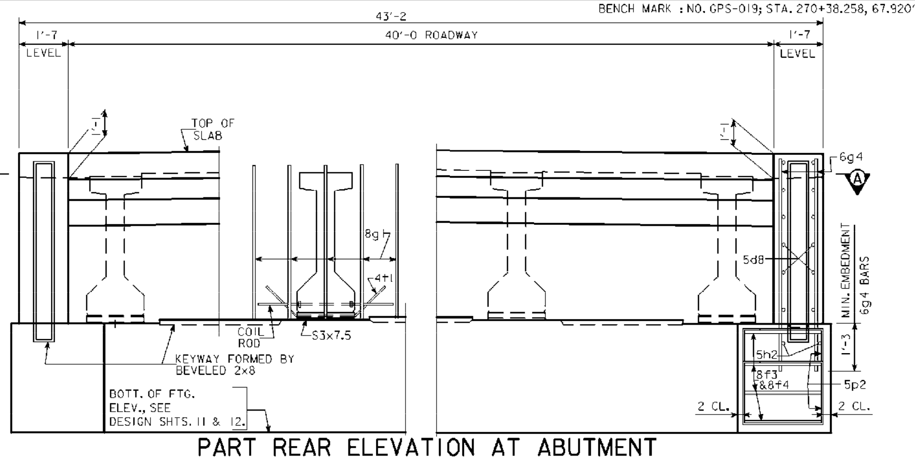
DESIGN SHEET NO. 9 OF 31 — FILE NO. 29907 — DESIGN NO. 305

DESIGNED BY N.KOTLERS — CHECKED BY E.SOUHRADA
DETAILED BY R.RYSAVY — CADD FILE

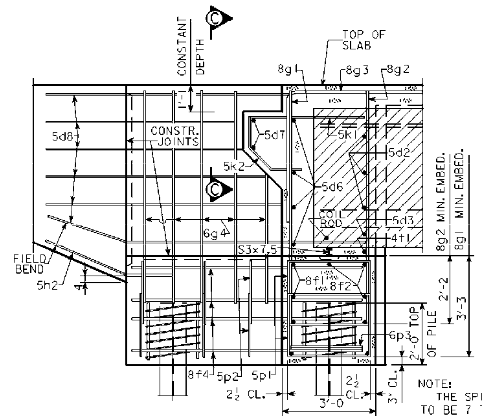
WAPELLO COUNTY — PROJECT NUMBER NHSX-034-7 (62)--3H-90 — SHEET NUMBER 10

27-APR-2005 09:48 rrysavy w:\projects\90034060A94\BRFinal\h900305.s09 \\NTPLTSVR1\Bridge1Tif

BENCH MARK : NO. GPS-019; STA. 270+38.258, 67.920' LT., X CUT IN THE TOP OF THE REBAR IN THE CONCRETE REFERENCE MARKER IN THE NORTHEAST CORNER OF THE JUNCTION OF U.S. 34 AND IA. 16, ELEV. = 798.117.

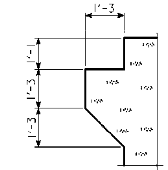


PART REAR ELEVATION AT ABUTMENT
(WINGS NOT SHOWN)



PART SECTION B - B

NOTE:
THE SPIRAL AT THE TOP OF EACH PILE TO BE 7 TURNS OF No. 2 BAR, 21" DIAMETER, 3" PITCH WITH 2 - L$\frac{7}{8}$ x $\frac{7}{8}$ x $\frac{1}{8}$ SPACERS PUNCHED TO HOLD SPIRAL.



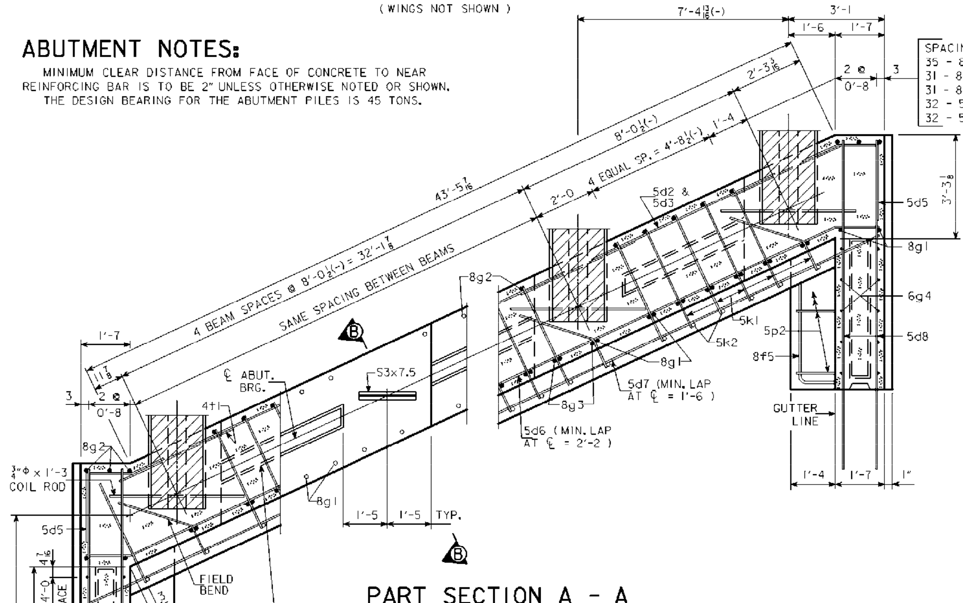
PAVING SUPPORT DETAIL

ABUTMENT NOTES:

MINIMUM CLEAR DISTANCE FROM FACE OF CONCRETE TO NEAR REINFORCING BAR IS TO BE 2" UNLESS OTHERWISE NOTED OR SHOWN.
THE DESIGN BEARING FOR THE ABUTMENT PILES IS 45 TONS.

SPACING FOR :
35 - 8g1 BACK FACE
31 - 8g2 FRONT FACE
31 - 8g3 BACK FACE
32 - 5k1 BACK FACE
32 - 5k2 BACK FACE

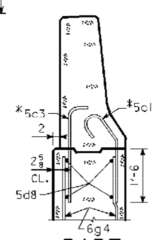
* NOTE: SEE DESIGN SHEET 27 FOR DETAILS OF BARRIER RAIL. REINFORCING BARS 5c3 AND 5c14 ARE INCLUDED IN SUPERSTRUCTURE QUANTITIES.



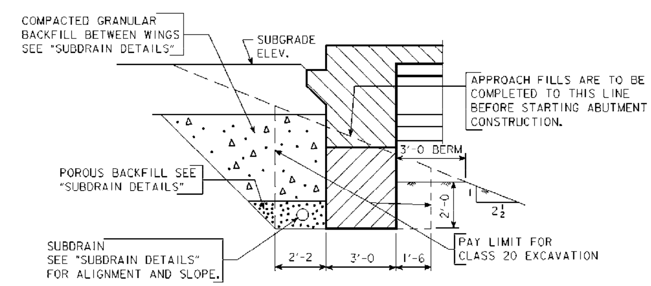
PART SECTION A - A
(WEST ABUTMENT SHOWN - EAST ABUTMENT SIMILAR)

NOTE:
SHIFT 8g2 BARS IN F.F. AS NECESSARY TO MISS BEAMS. PLACE 8g3 BARS PARALLEL TO LONGIT. STEEL.

NOTE: BARRIER RAIL NOT SHOWN IN DETAILS.



PART SECTION C-C



ABUTMENT EXCAVATION DETAILS

NOTE :
SEE DESIGN SHEETS 11 & 12 FOR ABUTMENT PILE PLAN AND ABUTMENT STEP DIAGRAM.

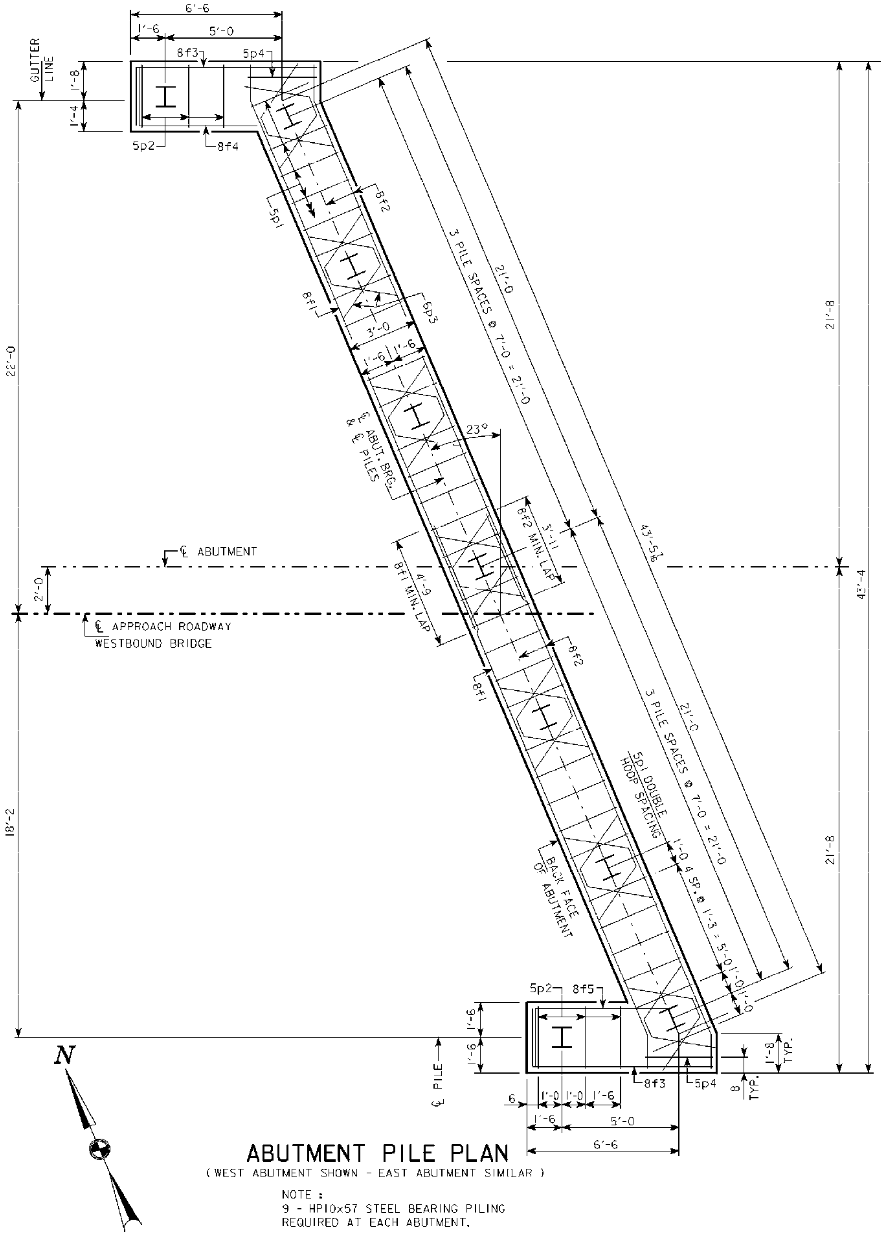
DESIGN FOR 23° SKEW (R.A.)
DUAL 218'-0 x 40' PRETENSIONED PRESTRESSED CONCRETE BEAM BRIDGES
50'-9 END SPANS | 116'-6 INTERIOR SPAN
ABUTMENT DETAILS
STATION : 1416+93.83 (℄ RELOCATED U.S. 34)
STATION : 24382+81.76 (℄ IOWA 16)
JULY, 2005
WAPELLO COUNTY
IOWA DEPARTMENT OF TRANSPORTATION - HIGHWAY DIVISION
DESIGN SHEET NO. 10 OF 31 FILE NO. 29907 DESIGN NO. 305

REVISED 09-01 - PART SECTION C-C ADDED AND ADDITIONAL 5d8 BARS.
HE2091.S01 (HSTD0209).S01--WRJ:THIS SHEET REDRAWN. DEVICE:7GA:H200.003ARCH.TAPE N°000015 DATE 9-8-88

DESIGNED BY N.KOTLERS / DETAILED BY R.RYSAVY	CHECKED BY E.SOUHRADA / CADD FILE	"C" OR "D" BEAMS - INTEGRAL ABUT. DETAILS - (R. A.) 15°01' - 30° SKEW	STANDARD SHEET 2091	WAPELLO COUNTY	PROJECT NUMBER NHSX-034-7 (62)--3H-90	SHEET NUMBER 11

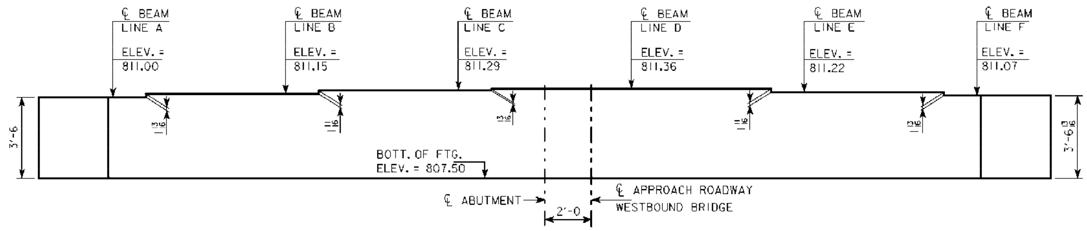
27-APR-2005 09:48 rrysavy w:\projects\90034060A94\BRFinal\h900305.s10 \\NTPLTSVR1\Bridge1Tif

BENCH MARK : NO. GPS-019; STA. 270+38.258, 67.920' LT., X CUT IN THE TOP OF THE REBAR IN THE CONCRETE REFERENCE MARKER IN THE NORTHEAST CORNER OF THE JUNCTION OF U.S. 34 AND IA. 16, ELEV. = 798.117.

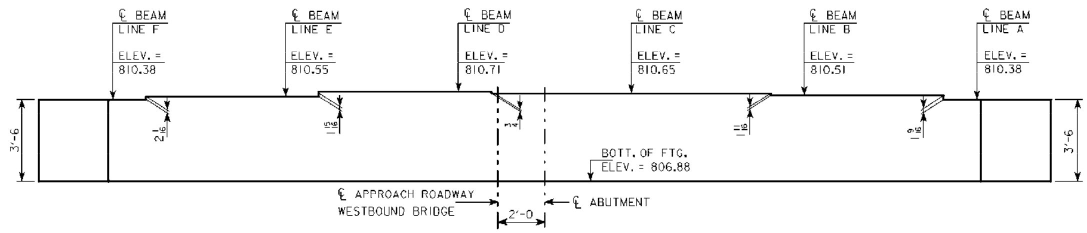


ABUTMENT PILE PLAN
(WEST ABUTMENT SHOWN - EAST ABUTMENT SIMILAR)

NOTE :
9 - HP10x57 STEEL BEARING PILING
REQUIRED AT EACH ABUTMENT.



REAR ELEVATION - WEST ABUTMENT
(LOOKING EAST)



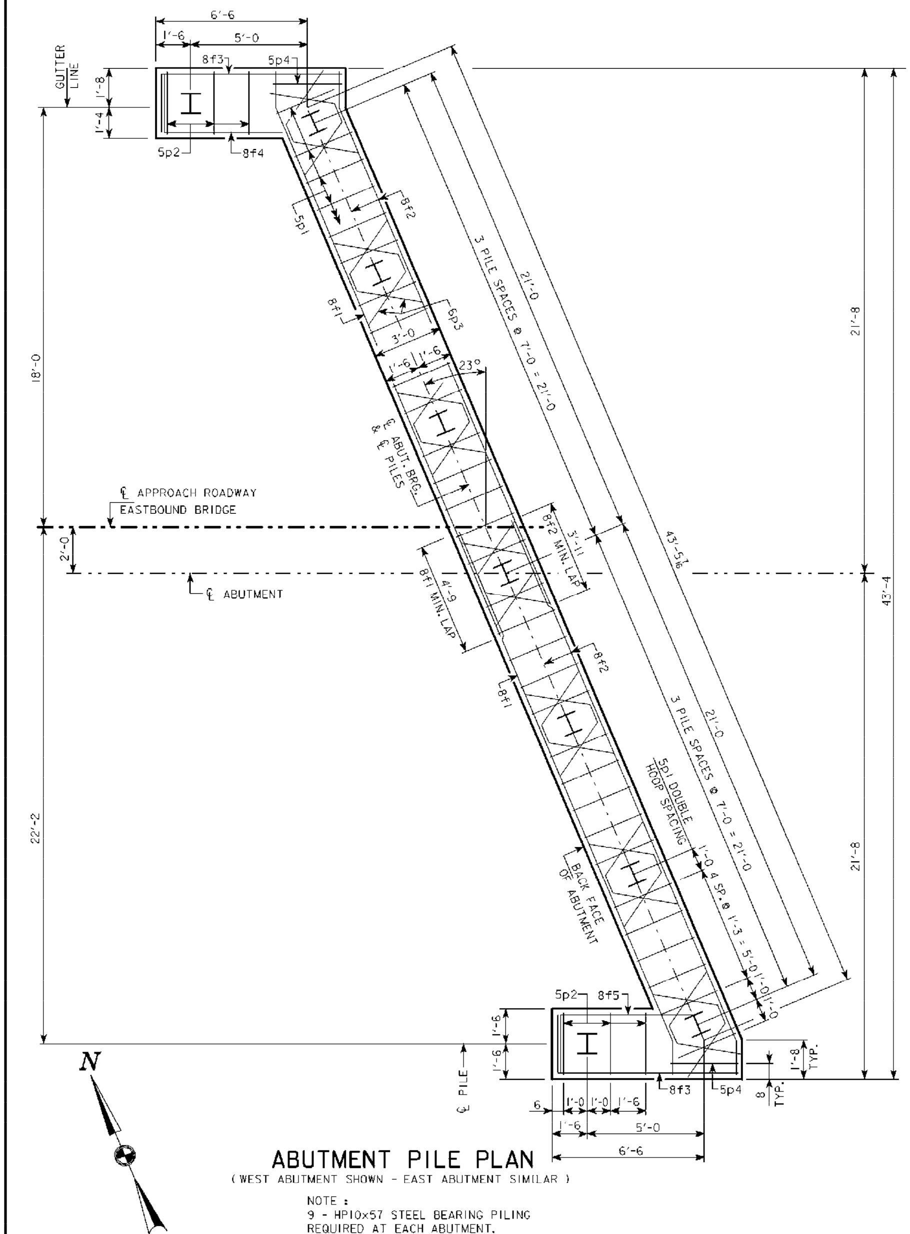
REAR ELEVATION - EAST ABUTMENT
(LOOKING WEST)

DESIGN FOR 23° SKEW (R.A.)
DUAL 218'-0 × 40' PRETENSIONED PRESTRESSED CONCRETE BEAM BRIDGES
50'-9 END SPANS 116'-6 INTERIOR SPAN
ABUTMENT DETAILS - WESTBOUND
STATION : 1416+93.83 (℄ RELOCATED U.S. 34)
STATION : 24382+81.76 (℄ IOWA 16) JULY, 2005
WAPELLO COUNTY
IOWA DEPARTMENT OF TRANSPORTATION - HIGHWAY DIVISION
DESIGN SHEET NO. 11 OF 31 FILE NO. 29907 DESIGN NO. 305

DESIGNED BY N.KOTLERS	CHECKED BY E.SOUHRADA	WAPELLO COUNTY	PROJECT NUMBER NHSX-034-7 (62)--3H-90	SHEET NUMBER 12
DETAILED BY R.RYSAVY	CADD FILE			

27-APR-2005 09:48 rrysavy w:\projects\90034060A94\BRFinal\h900305.s11 \\NTPLTSVR1\Bridge1T1f

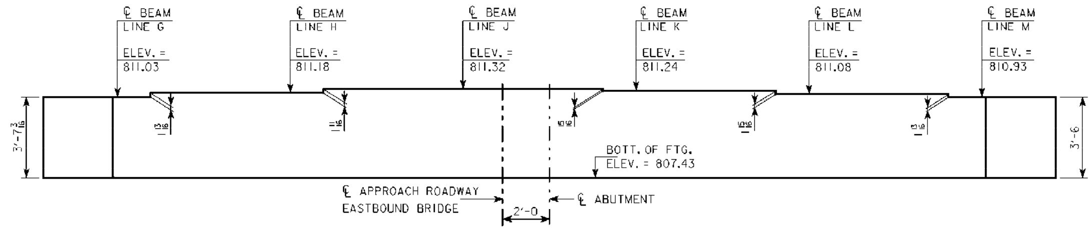
BENCH MARK : NO. GPS-019; STA. 270+38.258, 67.920' LT., X CUT IN THE TOP OF THE REBAR IN THE CONCRETE REFERENCE MARKER IN THE NORTHEAST CORNER OF THE JUNCTION OF U.S. 34 AND IA. 16, ELEV. = 798.117.



ABUTMENT PILE PLAN

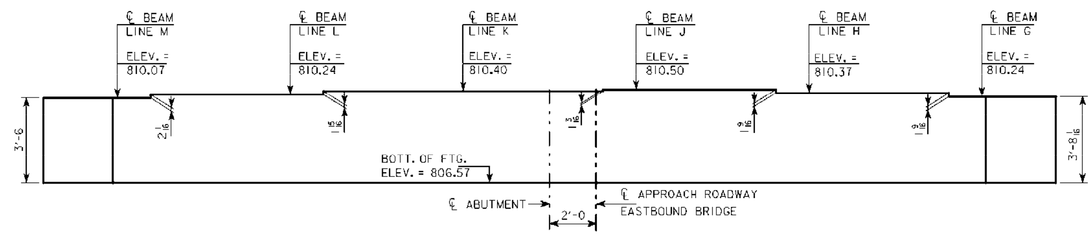
(WEST ABUTMENT SHOWN - EAST ABUTMENT SIMILAR)

NOTE :
9 - HP10x57 STEEL BEARING PILING
REQUIRED AT EACH ABUTMENT.



REAR ELEVATION - WEST ABUTMENT

(LOOKING EAST)



REAR ELEVATION - EAST ABUTMENT

(LOOKING WEST)

DESIGN FOR 23° SKEW (R.A.)

DUAL 218'-0 x 40' PRETENSIONED PRESTRESSED CONCRETE BEAM BRIDGES

50'-9 END SPANS 116'-6 INTERIOR SPAN

ABUTMENT DETAILS - EASTBOUND

STATION : 1416+93.83 (℄ RELOCATED U.S. 34)
STATION : 24382+81.76 (℄ IOWA 16) JULY, 2005

WAPELLO COUNTY

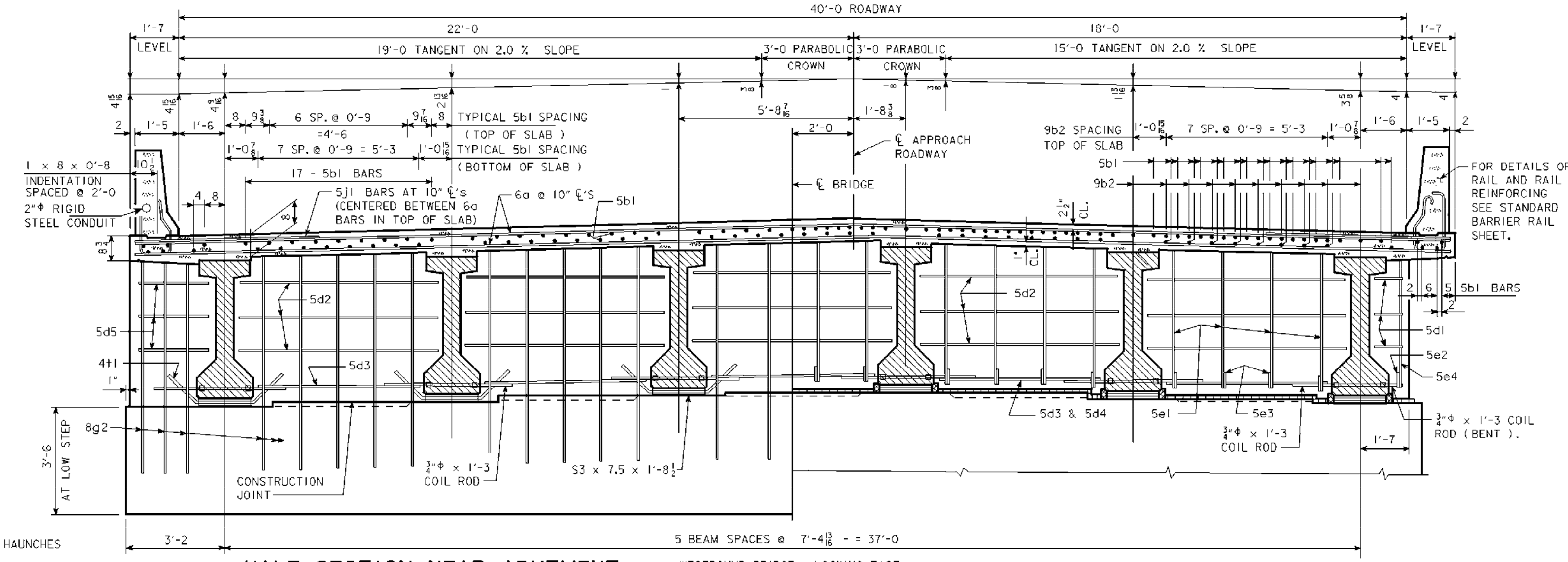
IOWA DEPARTMENT OF TRANSPORTATION - HIGHWAY DIVISION

DESIGN SHEET NO. 12 OF 31 FILE NO. 29907 DESIGN NO. 305

DESIGNED BY N.KOTLERS CHECKED BY E.SOUHRADA
DETAILED BY R.RYSAVY CADD FILE

WAPELLO COUNTY | PROJECT NUMBER NHSX-034-7 (62)--3H-90 | SHEET NUMBER 13

27-APR-2005 09:48 rrysavy w:\projects\90034060A94\BRFinal\h900305.s12 \\NTPLTSVR1\Bridge1Tif



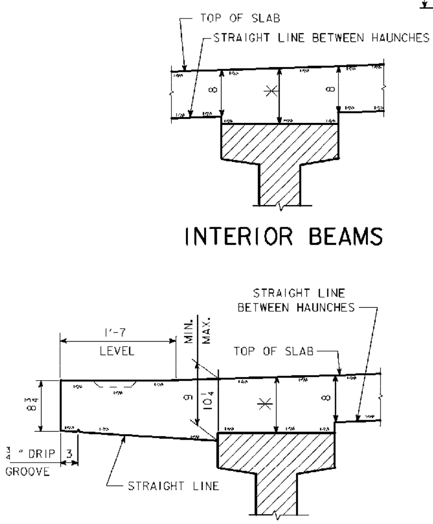
HALF SECTION NEAR ABUTMENT

WESTBOUND BRIDGE - LOOKING EAST
EASTBOUND BRIDGE - LOOKING WEST

HALF SECTION NEAR PIER

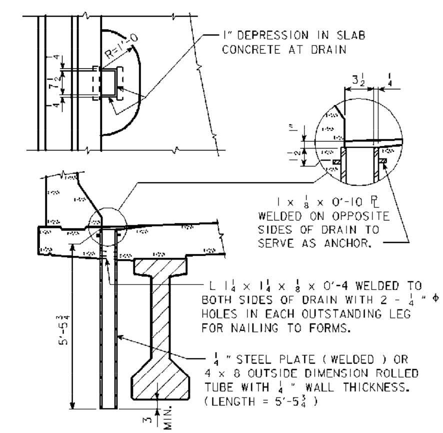
SLAB AREA = 29.39 SQ. FT.
SLAB AREA DOES NOT INCLUDE THE NOMINAL 1/2 INCH HAUNCH.

NOTE : FOR DETAILS OF INTERMEDIATE DIAPHRAGMS SEE DESIGN SHEET 22.



TYPICAL SLAB AND HAUNCH DETAIL

* FOR SLAB THICKNESS OVER BEAMS SEE " SLAB THICKNESS DETAILS " ON DESIGN SHEETS NO. 18 & 20.



DRAIN DETAILS

NOTE :
DRAINS ARE TO BE GALVANIZED. 8 DRAINS PER BRIDGE REQUIRED, 16 DRAINS REQUIRED TWO BRIDGES. SEE "SITUATION PLAN" ON DESIGN SHEET 2 FOR LOCATION.
WEIGHT OF DRAINS IS INCLUDED IN THE QUANTITY FOR "STRUCTURAL CONCRETE (BRIDGE)". WEIGHT (106 LBS./DRAIN) IS BASED ON ROLLED TUBE.

SUPERSTRUCTURE NOTES:

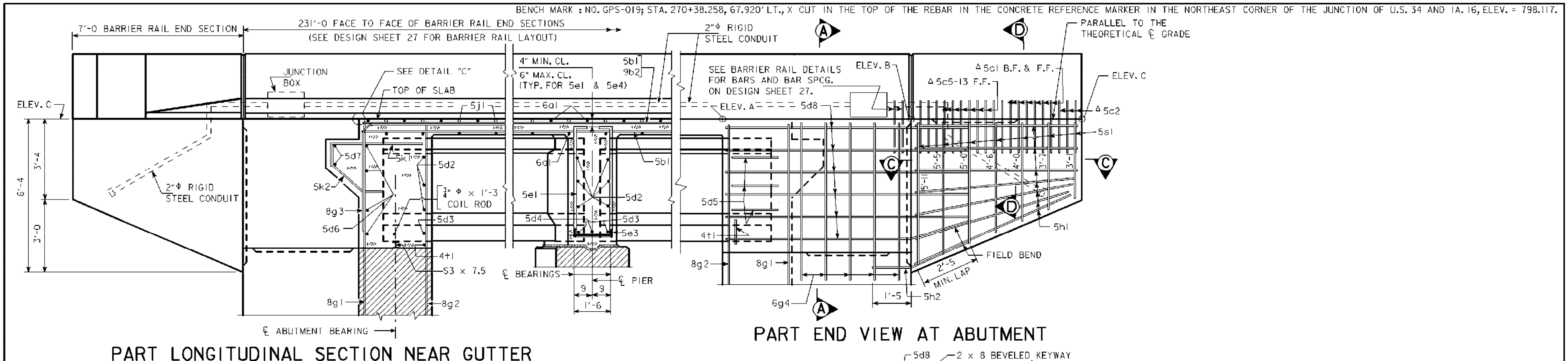
THE FLOOR SLAB AS SHOWN INCLUDES 1/2" INTEGRAL WEARING SURFACE.
THE PIER AND ABUTMENT DIAPHRAGM CONCRETE IS TO BE PLACED MONOLITHICALLY WITH THE FLOOR SLAB.
COST OF ALL PREFORMED EXPANSION JOINT FILLER MATERIAL IS TO BE INCLUDED IN THE PRICE BID FOR "STRUCTURAL CONCRETE (BRIDGE)".
ALL BEAMS ARE TO BE SET VERTICAL.
FORMS FOR THE SLAB AND BARRIER RAIL ARE TO BE SUPPORTED BY THE PRESTRESSED CONCRETE BEAMS.
CLEAR DISTANCE FROM FACE OF CONCRETE TO NEAR REINFORCING BAR SHALL BE 2 INCHES UNLESS OTHERWISE NOTED OR SHOWN.
ALL SLAB AND DIAPHRAGM REINFORCING IS TO BE WIRED IN PLACE AND ADEQUATELY SUPPORTED BEFORE CONCRETE IS PLACED.
TOP TRANSVERSE REINFORCING STEEL IS TO BE PARALLEL TO AND 2 1/2" CLEAR BELOW TOP OF SLAB. BOTTOM TRANSVERSE REINFORCING STEEL IS TO BE PARALLEL TO AND 1" CLEAR ABOVE BOTTOM OF SLAB. TOP AND BOTTOM REINFORCING STEEL IS TO BE SUPPORTED BY INDIVIDUAL EPOXY COATED METAL BAR CHAIRS SPACED AT NOT MORE THAN 3'-0 CENTERS LONGITUDINALLY AND TRANSVERSELY, OR BY CONTINUOUS ROWS OF EPOXY COATED METAL BAR HIGH CHAIRS OR SLAB BOLSTERS SPACED 4'-0 APART.
COST OF BEARING MATERIAL IS TO BE INCLUDED IN THE PRICE BID FOR "PRETENSIONED PRESTRESSED CONCRETE BEAMS".
TRANSVERSE SLAB REINFORCING MAY BE SPLICED WITH ONE LAP LOCATED AS FOLLOWS:
TOP BARS - LAP MIDWAY BETWEEN BEAMS (MIN. LAP = 2'-5).
BOTTOM BARS - LAP OVER BEAMS (MIN. LAP = 2'-5).
PAYMENT FOR REINFORCING BARS SHALL BE BASED ON NO SPLICES, AND NO ALLOWANCE SHALL BE MADE FOR THE ADDITIONAL LENGTH OF BAR REQUIRED FOR THE USE OF SPLICES.

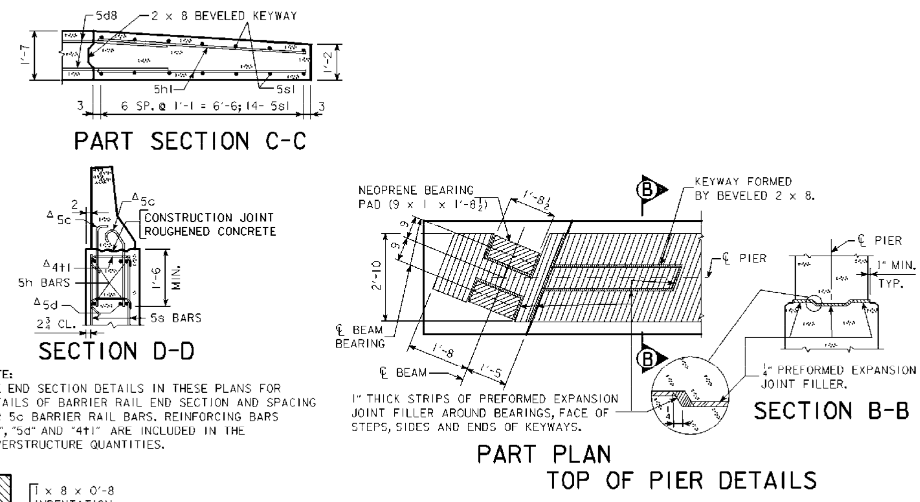
DESIGN FOR 23° SKEW (R.A.)
DUAL 218'-0 x 40' PRETENSIONED PRESTRESSED CONCRETE BEAM BRIDGES
50'-9 END SPANS — 116'-6 INTERIOR SPAN
SUPERSTRUCTURE DETAILS
STATION : 1416+93.83 (℄ RELOCATED U.S. 34)
STATION : 24382+81.76 (℄ IOWA 16) — JULY, 2005
WAPELLO COUNTY
IOWA DEPARTMENT OF TRANSPORTATION - HIGHWAY DIVISION
DESIGN SHEET NO. 13 OF 31 — FILE NO. 29907 — DESIGN NO. 305

REVISED 09-03 - FOOTING EXTENDED 1" TO ACCOMMODATE C AND D BEAMS. NOTE ADDED TO ADJUST FOR A AND B BEAMS. 110' & 115' b2 BARS ADDED.
RE4383.S01 (HSTD04383.S01)--LEP: THIS SHEET REDRAWN, DEVICE:Z:HAOX:200:0041ARCH.TAPE NO. 15 DATE 9-8-88

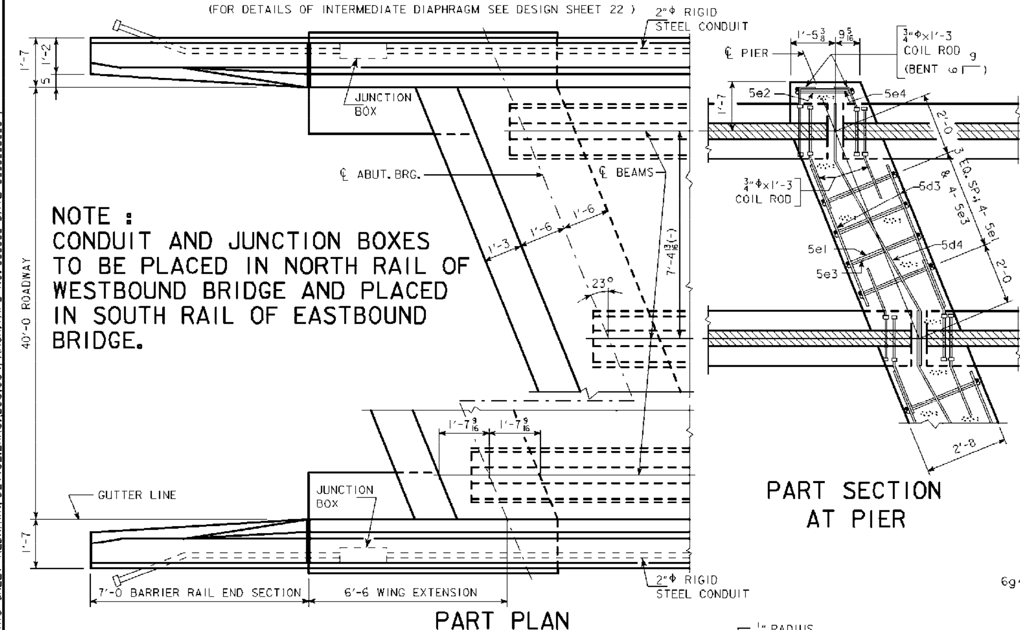
DESIGNED BY N.KOTLERS / DETAILED BY R.RYSAVY	CHECKED BY E.SOUHRADA / CADD FILE	40' RDWY. PPCB (ALL BEAMS - INTEGRAL ABUT.) CROSS SECTION	STANDARD SHEET 4383	WAPELLO COUNTY	PROJECT NUMBER NHSX-034-7 (62)--3H-90	SHEET NUMBER 14

BENCH MARK : NO. GPS-019; STA. 270+38.258, 67.920' LT., X CUT IN THE TOP OF THE REBAR IN THE CONCRETE REFERENCE MARKER IN THE NORTHEAST CORNER OF THE JUNCTION OF U.S. 34 AND IA. 16, ELEV. = 798.117.





Δ NOTE:
SEE END SECTION DETAILS IN THESE PLANS FOR DETAILS OF BARRIER RAIL END SECTION AND SPACING FOR 5c BARRIER RAIL BARS. REINFORCING BARS "5c", "5d" AND "4t1" ARE INCLUDED IN THE SUPERSTRUCTURE QUANTITIES.



NOTE :
CONDUIT AND JUNCTION BOXES TO BE PLACED IN NORTH RAIL OF WESTBOUND BRIDGE AND PLACED IN SOUTH RAIL OF EASTBOUND BRIDGE.

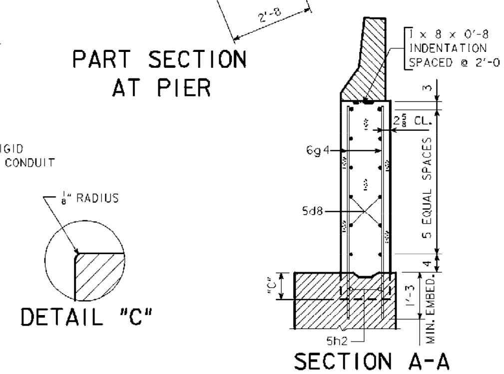


TABLE OF WINGWALL ELEVATIONS - WESTBOUND BRIDGE				
LOCATION	DIM. "C"	ELEV. A	ELEV. B	ELEV. C
S.W. CORNER	10¾	816.49	816.50	816.51
N.W. CORNER	10¾	816.43	816.43	816.44
S.E. CORNER	11¾	815.81	815.77	815.73
N.E. CORNER	11⅝	815.82	815.78	815.75

TABLE OF WINGWALL ELEVATIONS - EASTBOUND BRIDGE				
LOCATION	DIM. "C"	ELEV. A	ELEV. B	ELEV. C
S.W. CORNER	10⅝	816.35	816.37	816.38
N.W. CORNER	10⅝	816.46	816.47	816.48
S.E. CORNER	11⅞	815.50	815.46	815.41
N.E. CORNER	11¾	815.68	815.64	815.59

DESIGN FOR 23° SKEW (R.A.)

DUAL 218'-0 × 40' PRETENSIONED PRESTRESSED CONCRETE BEAM BRIDGES

50'-9 END SPANS 116'-6 INTERIOR SPAN

SUPERSTRUCTURE DETAILS

STATION : 1416+93.83 (℄ RELOCATED U.S. 34)
STATION : 24382+81.76 (℄ IOWA 16) JULY, 2005

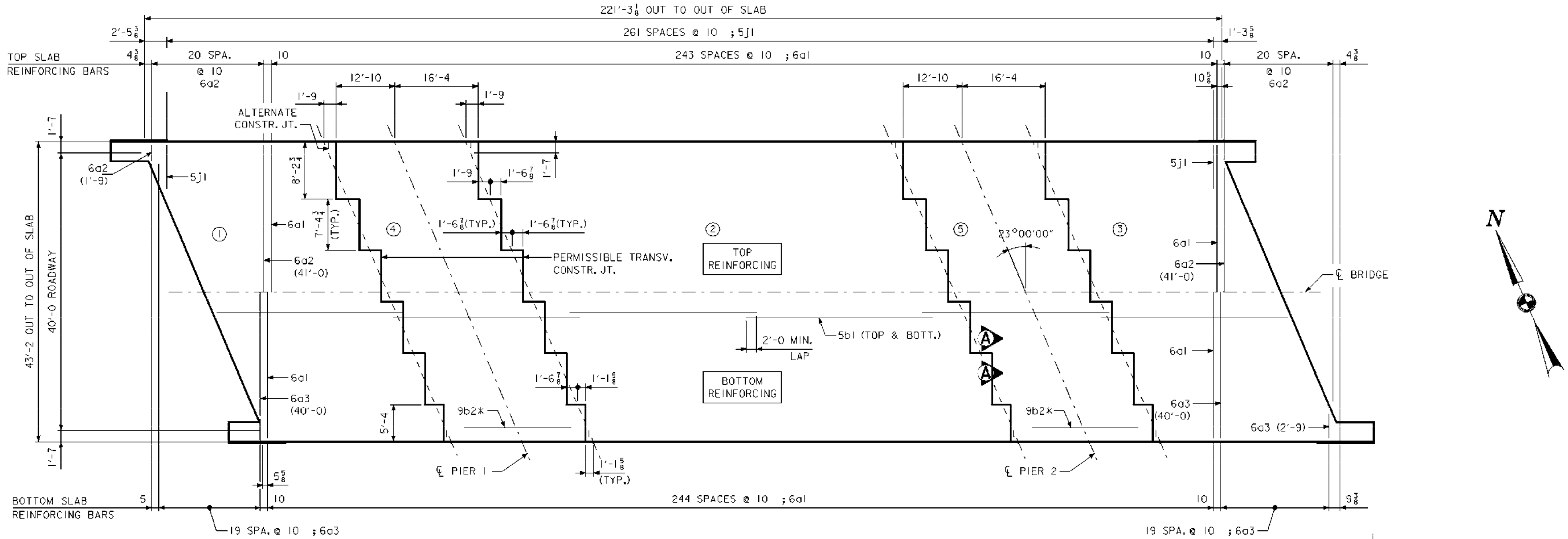
WAPELLO COUNTY

IOWA DEPARTMENT OF TRANSPORTATION - HIGHWAY DIVISION
DESIGN SHEET NO. 14 OF 31 FILE NO. 29907 DESIGN NO. 305

DESIGNED BY N.KOTLERS CHECKED BY E.SOUHRADA
DETAILED BY R.RYSAVY CADD FILE
"C" OR "D" BEAMS - PART PLAN & LONGIT. SECTION - (R.A.) 15°01'-30° SKEW
STANDARD SHEET 4513 MODIFIED
WAPELLO COUNTY
PROJECT NUMBER NHSX-034-7 (62)--3H-90
SHEET NUMBER 15

REVISED 09-01 - ADDITIONAL 5d8 & 5h BARS IN WING. BARRIER RAIL END SECTION DETAILS CHANGED.
HE4513.S01 (HST004513.S01)--LEP; THIS SHEET REDRAWN, DEVICE: ZHAO (200.004) ARCH. TAPE NO. 19 ... DATE 9-8-88 ...

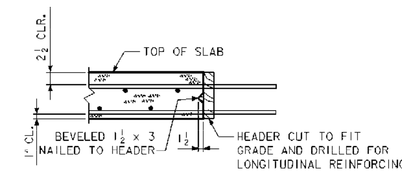
27-APR-2005 09:49 rrysavy w:\projects\90034060A94\BRFinal\h900305.s14 \\NTPLTSVR1\Bridge1Tif



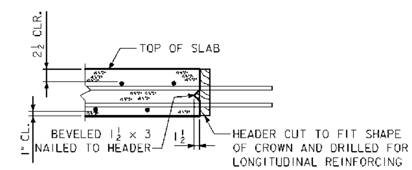
CONCRETE PLACEMENT DIAGRAM AND LONGITUDINAL REINFORCING LAYOUT

ROADWAY SLAB SHALL BE PLACED IN SECTIONS AND IN SEQUENCE INDICATED. ALTERNATE PROCEDURES FOR PLACING SLAB CONCRETE MAY BE SUBMITTED FOR APPROVAL TOGETHER WITH A STATEMENT OF THE PROPOSED METHOD AND EVIDENCE THAT THE CONTRACTOR POSSESSES THE NECESSARY EQUIPMENT AND FACILITIES TO ACCOMPLISH THE REQUIRED RESULT.

* BARS SHALL BE CENTERED OVER PIER



SECTION A-A



TRANSVERSE SLAB CONSTRUCTION JOINT

ESTIMATED QUANTITIES - SUPERSTRUCTURE
TWO BRIDGES (TWO SUPERSTRUCTURES AND FOUR ABUTMENTS)

ITEM		UNITS	WESTBOUND BRIDGE	EASTBOUND BRIDGE	QUANTITY
STRUCTURAL CONCRETE (BRIDGE)		CU.YDS.	405.6	406.2	811.8
REINFORCING STEEL EPOXY COATED		LBS.	90,225	90,225	180,450
REINFORCING STEEL		LBS.	8,404	8,404	16,808
STRUCTURAL STEEL		LBS.	848	848	1696
PRETENSIONED PRESTRESSED CONCRETE BEAMS LXD50		EACH	12	12	24
PRETENSIONED PRESTRESSED CONCRETE BEAMS SLXD115		EACH	6	6	12
CLASS 20 EXCAVATION		CU.YDS.	181	210	391
HP 10x57 STEEL BEARING PILING	FURNISH	LIN.FT.	9 @ 95' W.A.; 9 @ 95' E.A.	9 @ 95' W.A.; 9 @ 95' E.A.	3420
	DRIVE	LIN.FT.	9 @ 95' W.A.; 9 @ 95' E.A.	9 @ 95' W.A.; 9 @ 95' E.A.	3420
PREBORED HOLES		LIN.FT.	9 @ 15' W.A.; 9 @ 15' E.A.	9 @ 15' W.A.; 9 @ 15' E.A.	540

DESIGN FOR 23° SKEW (R.A.)

DUAL 218'-0 x 40' PRETENSIONED PRESTRESSED CONCRETE BEAM BRIDGES

50'-9 END SPANS 116'-6 INTERIOR SPAN

SUPERSTRUCTURE DETAILS

STATION : 1416+93.83 (℄ RELOCATED U.S. 34)
STATION : 24382+81.76 (℄ IOWA 16) JULY, 2005

WAPELLO COUNTY

IOWA DEPARTMENT OF TRANSPORTATION - HIGHWAY DIVISION

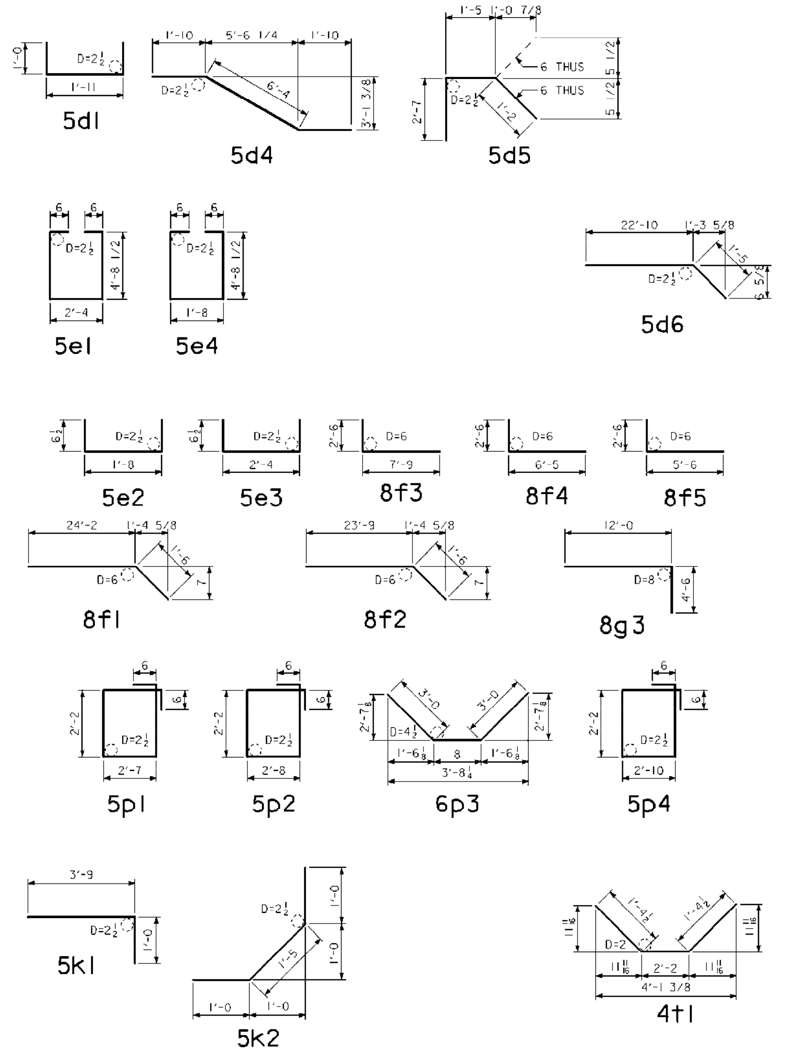
DESIGN SHEET NO. 15 OF 31 FILE NO. 29907 DESIGN NO. 305

DESIGNED BY N.KOTLERS CHECKED BY E.SOUHRADA
DETAILED BY R.RYSAVY CADD FILE

AUTO-SP-RA-HIGH WAPELLO COUNTY PROJECT NUMBER NHSX-034-7(62)--3H-90 SHEET NUMBER 16

27-APR-2005 09:49 rrysavy w:\projects\90034060A94\BRFinal\h900305.s15 \\NTPLTSVR1\Bridge1T1f

BENT BAR DETAILS



NOTE: ALL DIMENSIONS ARE OUT TO OUT. D= PIN DIAMETER.

REINFORCING BAR LIST - NON-COATED
(ONE SUPERSTRUCTURE AND TWO ABUTMENTS)

BAR	LOCATION	SHAPE	NO.	LENGTH	WEIGHT
5d1	PIER DIAHP. ENDS		12	3'-11	49
5d2	PIER & ABUT. DIAPH. LONGIT.		90	7'-2	673
5d3	PIER & ABUT. DIAPH. LONGIT.		30	5'-10	183
5d4	PIER DIAPH. LONGIT.		10	10'-0	104
5d5	ABUT. DIAPH. ENDS		12	5'-2	65
5d8	ABUT. DIAPH. WING EXT. LONGIT.		48	10'-7	530
5e1	PIER DIAPH. HOOPS		40	12'-9	532
5e2	PIER DIAPH. TIES ENDS		4	2'-9	11
5e3	PIER DIAPH. TIES		40	3'-5	143
5e4	PIER DIAPH. HOOPS ENDS		4	12'-1	50
8f2	ABUT. FOOTING LONGIT. F.F.		20	25'-3	1,348
8f3	ABUT. EXTENSION LONGIT.		16	10'-3	438
8f4	ABUT. EXTENSION LONGIT.		8	8'-11	190
8f5	ABUT. EXTENSION LONGIT.		8	8'-0	171
8g2	ABUT. VERT. F.F.		62	7'-5	1,228
6g4	ABUT. DIAPH. WING EXT. VERT.		40	6'-7	396
5h1	ABUT. WING HORIZ.		56	6'-8	389
5h2	ABUT. TO WING ANCHOR		8	4'-0	33
5p2	ABUT. EXTENSION HOOPS		24	10'-8	267
5s1	WING VERT.		56	VARIES	263
4t1	UNDER BEAMS AT ABUTMENTS		12	4'-11	39
#2	PILE SPIRAL		18	38'-6	116
	SPIRAL SPACERS, L 7/8 x 7/8 x 1/8 x 0.70		36	1'-10	46
	INTERM. DIAPH. - SEE DES. SHT. NO. 22				1,140
	REINFORCING STEEL (NON-COATED) - TOTAL (LBS.)				8,404

REINFORCING BAR LIST - EPOXY COATED
(ONE SUPERSTRUCTURE AND TWO ABUTMENTS)

BAR	LOCATION	SHAPE	NO.	LENGTH	WEIGHT
6a1	SLAB TRANSV. TOP & BOTT.		489	42'-10	31,460
6a2	SLAB TRANSV. TOP ENDS		42	VARIES	1,348
6a3	SLAB TRANSV. BOTT. ENDS		40	VARIES	1,284
5b1	SLAB LONGITUDINAL, TOP & BOTT.		582	38'-6	23,371
9b2	SLAB LONGITUDINAL @ PIER		92	28'-10	9,020
5d6	ABUT. DIAPH. LONGIT. B.F.		16	24'-3	405
5d7	PAVING NOTCH LONGIT.		8	24'-0	200
8f1	ABUT. FOOTING LONGIT. B.F.		16	25'-8	1,096
8g1	ABUT. VERT. B.F.		70	8'-6	1,589
8g3	ABUT. DIAPH. VERT. B.F.		62	16'-6	2,731
5j1	TOP OF SLAB TRANSV. (AT RAIL)		524	6'-3	3,416
5k1	PAVING NOTCH TRANSV.		64	4'-9	317
5k2	PAVING NOTCH TRANSV.		64	3'-5	228
5p1	ABUTMENT HOOPS		128	10'-6	1,402
6p3	ABUT. BOTT. AT PILES		28	6'-8	280
5p4	ABUT. HOOPS AT ENDS		8	11'-0	92
	BARRIER RAIL - SEE DESIGN SHT. NO. 27				11,986
	REINFORCING STEEL (EPOXY COATED) - TOTAL (LBS.)				90,225

ESTIMATED QUANTITIES - SUPERSTRUCTURE
(ONE SUPERSTRUCTURE AND TWO ABUTMENTS)

ITEM		UNIT	QUANTITY
STRUCTURAL CONCRETE (BRIDGE)		CU.YDS.	405.6
REINFORCING STEEL EPOXY COATED		LBS.	90,225
REINFORCING STEEL		LBS.	8,404
STRUCTURAL STEEL		LBS.	848
PRETENSIONED PRESTRESSED CONCRETE BEAMS LXD50		EACH	12
PRETENSIONED PRESTRESSED CONCRETE BEAMS SLXD115		EACH	6
CLASS 20 EXCAVATION		CU.YDS.	181
HP10x57 STEEL BEARING PILING	FURNISH 9 @ 95' W.A.; 9 @ 95' E.A.	LIN.FT.	1710
	DRIVE 9 @ 95' W.A.; 9 @ 95' E.A.	LIN.FT.	1710
PREBORED HOLES	9 @ 15' W.A.; 9 @ 15' E.A.	LIN.FT.	270

CONCRETE PLACEMENT QUANTITIES - C.Y.
(ONE SUPERSTRUCTURE AND TWO ABUTMENTS)

SECTION	TOTAL
SECTION 1 - SLAB, ABUT. DIAPH., WINGWALLS	71.4
SECTION 2 - SLAB	97.2
SECTION 3 - SLAB, ABUT. DIAPH., WINGWALLS	71.4
SECTION 4 - SLAB, PIER DIAPH.	50.2
SECTION 5 - SLAB, PIER DIAPH.	50.2
WEST ABUTMENT FOOTING	23.1
EAST ABUTMENT FOOTING	22.9
ABUT. WINGS 4 AT 1.8 CU.YDS. EACH	7.2
INTERMEDIATE DIAPH. 15 AT 0.8 CU. YDS. EACH	12.0
TOTAL C.Y.	405.6

DESIGN FOR 23° SKEW (R.A.)

DUAL 218'-0 x 40' PRETENSIONED PRESTRESSED CONCRETE BEAM BRIDGES

50'-9 END SPANS 116'-6 INTERIOR SPAN

SUPERSTRUCTURE DETAILS - WESTBOUND BRIDGE

STATION : 1416+93.83 (℄ RELOCATED U.S. 34)
STATION : 24382+81.76 (℄ IOWA 16) JULY, 2005

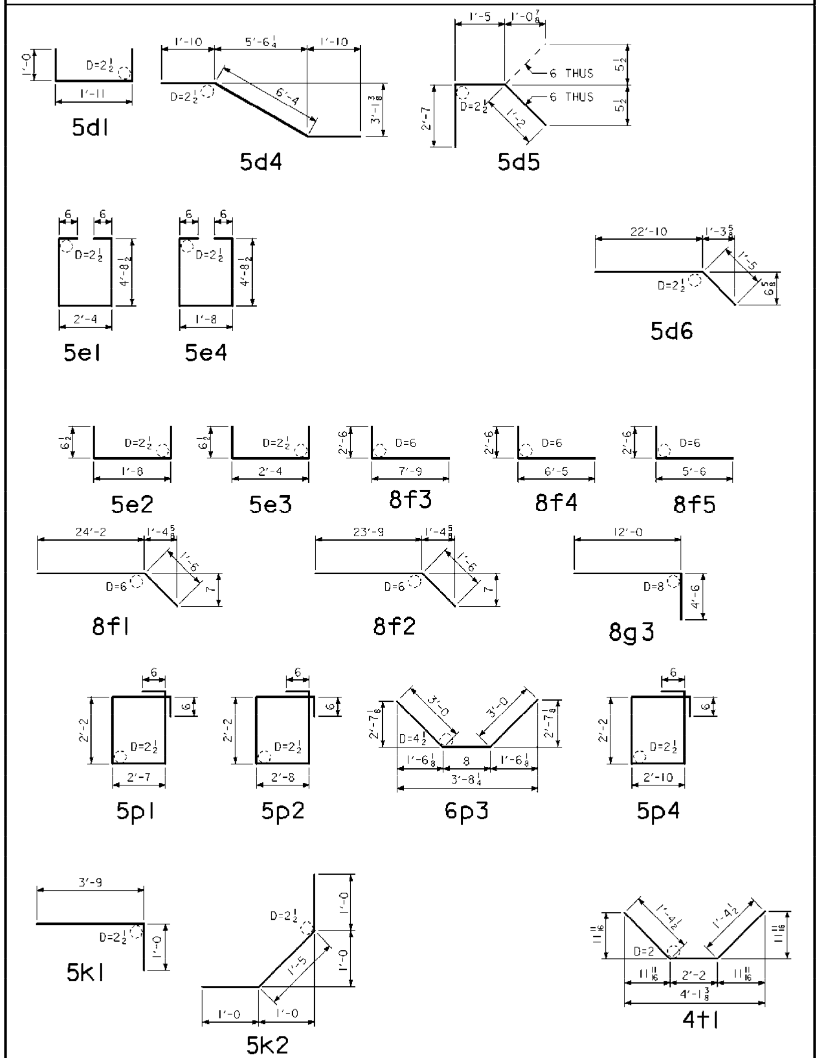
WAPELLO COUNTY

IOWA DEPARTMENT OF TRANSPORTATION - HIGHWAY DIVISION

DESIGN SHEET NO. 16 OF 31 FILE NO. 29907 DESIGN NO. 305

DESIGNED BY N.KOTLERS CHECKED BY E.SOUHRADA
DETAILED BY R.RYSAVY CADD FILE
SUPERSTRUCTURE DETAILS AUTO-QUANT WAPELLO COUNTY PROJECT NUMBER NHSX-034-7 (62)--3H-90 SHEET NUMBER 17

BENT BAR DETAILS



NOTE: ALL DIMENSIONS ARE OUT TO OUT. D= PIN DIAMETER.

REINFORCING BAR LIST - NON-COATED
(ONE SUPERSTRUCTURE AND TWO ABUTMENTS)

BAR	LOCATION	SHAPE	NO.	LENGTH	WEIGHT
5d1	PIER DIAHP. ENDS		12	3'-11	49
5d2	PIER & ABUT. DIAPH. LONGIT.		90	7'-2	673
5d3	PIER & ABUT. DIAPH. LONGIT.		30	5'-10	183
5d4	PIER DIAPH. LONGIT.		10	10'-0	104
5d5	ABUT. DIAPH. ENDS		12	5'-2	65
5d8	ABUT. DIAPH. WING EXT. LONGIT.		48	10'-7	530
5e1	PIER DIAPH. HOOPS		40	12'-9	532
5e2	PIER DIAPH. TIES ENDS		4	2'-9	11
5e3	PIER DIAPH. TIES		40	3'-5	143
5e4	PIER DIAPH. HOOPS ENDS		4	12'-1	50
8f2	ABUT. FOOTING LONGIT. F.F.		20	25'-3	1,348
8f3	ABUT. EXTENSION LONGIT.		16	10'-3	438
8f4	ABUT. EXTENSION LONGIT.		8	8'-11	190
8f5	ABUT. EXTENSION LONGIT.		8	8'-0	171
8g2	ABUT. VERT. F.F.		62	7'-5	1,228
6g4	ABUT. DIAPH. WING EXT. VERT.		40	6'-7	396
5h1	ABUT. WING HORIZ.		56	6'-8	389
5h2	ABUT. TO WING ANCHOR		8	4'-0	33
5p2	ABUT. EXTENSION HOOPS		24	10'-8	267
5s1	WING VERT.		56	VARIES	263
4t1	UNDER BEAMS AT ABUTMENTS		12	4'-11	39
#2	PILE SPIRAL		18	38'-6	116
	SPIRAL SPACERS, L$\frac{7}{8}$x$\frac{7}{8}$x$\frac{1}{8}$x 0.70		36	1'-10	46
	INTERM. DIAPH. - SEE DES. SHT. NO. 22				1,140
	REINFORCING STEEL (NON-COATED) - TOTAL (LBS.)				8,404

REINFORCING BAR LIST - EPOXY COATED
(ONE SUPERSTRUCTURE AND TWO ABUTMENTS)

BAR	LOCATION	SHAPE	NO.	LENGTH	WEIGHT
6a1	SLAB TRANSV. TOP & BOTT.		489	42'-10	31,460
6a2	SLAB TRANSV. TOP ENDS		42	VARIES	1,348
6a3	SLAB TRANSV. BOTT. ENDS		40	VARIES	1,284
5b1	SLAB LONGITUDINAL, TOP & BOTT.		582	38'-6	23,371
9b2	SLAB LONGITUDINAL @ PIER		92	28'-10	9,020
5d6	ABUT. DIAPH. LONGIT. B.F.		16	24'-3	405
5d7	PAVING NOTCH LONGIT.		8	24'-0	200
8f1	ABUT. FOOTING LONGIT. B.F.		16	25'-8	1,096
8g1	ABUT. VERT. B.F.		70	8'-6	1,589
8g3	ABUT. DIAPH. VERT. B.F.		62	16'-6	2,731
5j1	TOP OF SLAB TRANSV. (AT RAIL)		524	6'-3	3,416
5k1	PAVING NOTCH TRANSV.		64	4'-9	317
5k2	PAVING NOTCH TRANSV.		64	3'-5	228
5p1	ABUTMENT HOOPS		128	10'-6	1,402
6p3	ABUT. BOTT. AT PILES		28	6'-8	280
5p4	ABUT. HOOPS AT ENDS		8	11'-0	92
	BARRIER RAIL - SEE DESIGN SHT. NO. 27				11,986
	REINFORCING STEEL (EPOXY COATED) - TOTAL (LBS.)				90,225

ESTIMATED QUANTITIES - SUPERSTRUCTURE
(ONE SUPERSTRUCTURE AND TWO ABUTMENTS)

ITEM		UNIT	QUANTITY
STRUCTURAL CONCRETE (BRIDGE)		CU.YDS.	406.2
REINFORCING STEEL EPOXY COATED		LBS.	90,225
REINFORCING STEEL		LBS.	8,404
STRUCTURAL STEEL		LBS.	848
PRETENSIONED PRESTRESSED CONCRETE BEAMS LXD50		EACH	12
PRETENSIONED PRESTRESSED CONCRETE BEAMS SLXD115		EACH	6
CLASS 20 EXCAVATION		CU.YDS.	210
HP10x57 STEEL BEARING PILING	FURNISH 9 @ 95' W.A.; 9 @ 95' E.A.	LIN.FT.	1710
	DRIVE 9 @ 95' W.A.; 9 @ 95' E.A.	LIN.FT.	1710
PREBORED HOLES	9 @ 15' W.A.; 9 @ 15' E.A.	LIN.FT.	270

CONCRETE PLACEMENT QUANTITIES - C.Y.
(ONE SUPERSTRUCTURE AND TWO ABUTMENTS)

SECTION	TOTAL
SECTION 1 - SLAB, ABUT. DIAPH., WINGWALLS	71.4
SECTION 2 - SLAB	97.2
SECTION 3 - SLAB, ABUT. DIAPH., WINGWALLS	71.4
SECTION 4 - SLAB, PIER DIAPH.	50.2
SECTION 5 - SLAB, PIER DIAPH.	50.2
WEST ABUTMENT FOOTING	23.2
EAST ABUTMENT FOOTING	23.4
ABUT. WINGS 4 AT 1.8 CU.YDS. EACH	7.2
INTERMEDIATE DIAPH. 15 AT 0.8 CU. YDS. EACH	12.0
STRUCTURAL CONCRETE - TOTAL C.Y.	406.2

DESIGN FOR 23° SKEW (R.A.)

DUAL 218'-0 x 40' PRETENSIONED PRESTRESSED CONCRETE BEAM BRIDGES

50'-9 END SPANS 116'-6 INTERIOR SPAN

SUPERSTRUCTURE DETAILS - EASTBOUND BRIDGE

STATION : 1416+93.83 (℄ RELOCATED U.S. 34)
STATION : 24382+81.76 (℄ IOWA 16) JULY, 2005

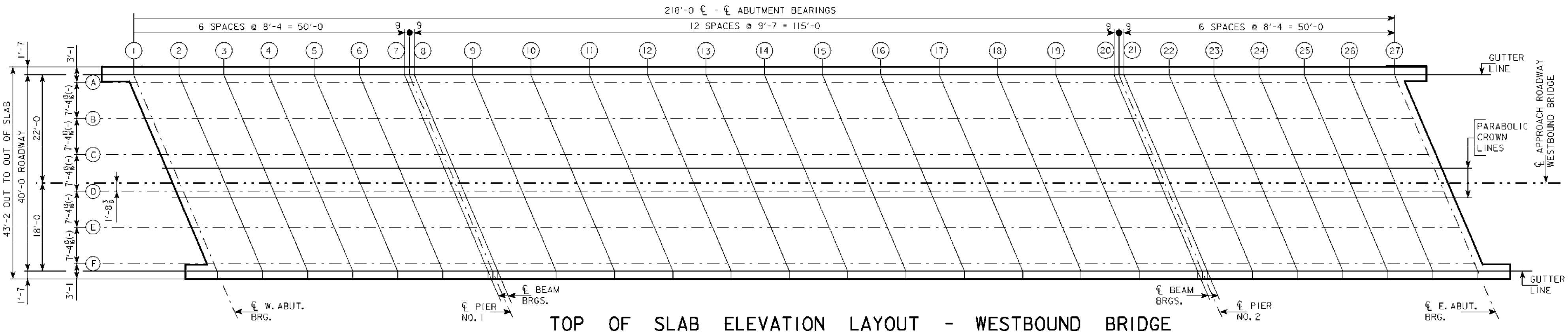
WAPELLO COUNTY

IOWA DEPARTMENT OF TRANSPORTATION - HIGHWAY DIVISION

DESIGN SHEET NO. 17 OF 31 FILE NO. 29907 DESIGN NO. 305

DESIGNED BY N.KOTLERS CHECKED BY E.SOUHRADA
DETAILED BY R.RYSAVY CADD FILE
SUPERSTRUCTURE DETAILS AUTO-QUANT WAPELLO COUNTY PROJECT NUMBER NHSX-034-7 (62)--3H-90 SHEET NUMBER 18

BENCH MARK : NO. GPS-019; STA. 270+38.258, 67.920' LT., X CUT IN THE TOP OF THE REBAR IN THE CONCRETE REFERENCE MARKER IN THE NORTHEAST CORNER OF THE JUNCTION OF U.S. 34 AND IA. 16, ELEV. = 798.117.



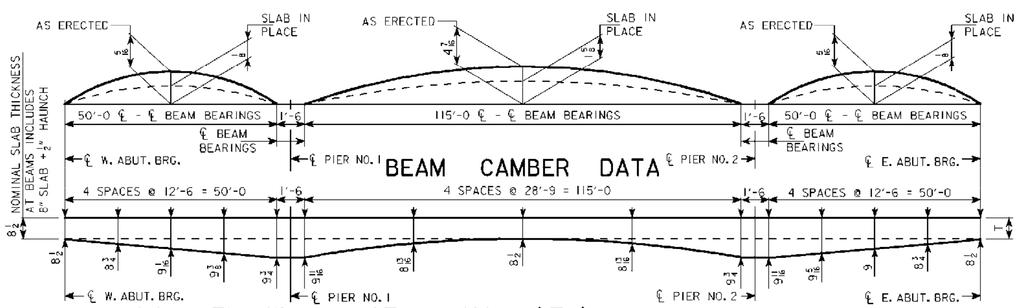
TOP OF SLAB ELEVATION LAYOUT - WESTBOUND BRIDGE

TABLE OF TOP OF SLAB ELEVATIONS - WESTBOUND BRIDGE

	℄ W. ABUT. BRG.						℄ PIER NO. 1 BEARINGS						
LOCATION	1	2	3	4	5	6	7	8	9	10	11	12	13
NORTH GUTTER LINE	16.43	16.42	16.42	16.41	16.40	16.38	16.37	16.37	16.35	16.33	16.31	16.29	16.27
BEAM LINE A	16.46	16.45	16.45	16.44	16.43	16.41	16.40	16.40	16.38	16.36	16.34	16.32	16.29
BEAM LINE B	16.60	16.60	16.59	16.58	16.57	16.56	16.54	16.54	16.52	16.50	16.48	16.46	16.43
BEAM LINE C	16.75	16.74	16.74	16.73	16.71	16.70	16.69	16.68	16.66	16.64	16.62	16.60	16.57
℄ APPROACH ROADWAY	16.83	16.83	16.82	16.81	16.79	16.78	16.77	16.76	16.74	16.72	16.70	16.68	16.65
BEAM LINE D	16.82	16.81	16.81	16.79	16.78	16.77	16.75	16.75	16.73	16.71	16.69	16.66	16.64
BEAM LINE E	16.68	16.67	16.66	16.65	16.64	16.62	16.61	16.60	16.58	16.56	16.54	16.51	16.49
BEAM LINE F	16.52	16.52	16.50	16.49	16.48	16.47	16.45	16.45	16.43	16.40	16.38	16.35	16.33
SOUTH GUTTER LINE	16.49	16.48	16.47	16.46	16.45	16.43	16.42	16.41	16.39	16.37	16.35	16.32	16.29

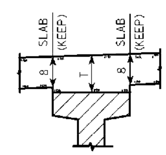
							℄ PIER NO. 2 BEARINGS							℄ E. ABUT. BRG.
LOCATION	14	15	16	17	18	19	20	21	22	23	24	25	26	27
NORTH GUTTER LINE	16.24	16.21	16.18	16.15	16.12	16.08	16.05	16.04	16.01	15.97	15.93	15.90	15.86	15.82
BEAM LINE A	16.27	16.24	16.21	16.18	16.14	16.11	16.07	16.07	16.03	16.00	15.96	15.92	15.88	15.84
BEAM LINE B	16.40	16.38	16.35	16.31	16.28	16.24	16.21	16.20	16.17	16.13	16.09	16.05	16.01	15.97
BEAM LINE C	16.55	16.52	16.49	16.45	16.42	16.38	16.34	16.34	16.30	16.27	16.23	16.19	16.15	16.11
℄ APPROACH ROADWAY	16.62	16.59	16.56	16.53	16.49	16.46	16.42	16.41	16.38	16.34	16.30	16.26	16.22	16.18
BEAM LINE D	16.61	16.58	16.55	16.51	16.48	16.44	16.40	16.40	16.36	16.32	16.29	16.25	16.21	16.16
BEAM LINE E	16.46	16.43	16.40	16.36	16.33	16.29	16.25	16.24	16.21	16.17	16.13	16.09	16.05	16.01
BEAM LINE F	16.30	16.27	16.23	16.20	16.16	16.13	16.08	16.08	16.04	16.00	15.96	15.92	15.88	15.84
SOUTH GUTTER LINE	16.27	16.23	16.20	16.17	16.13	16.09	16.05	16.05	16.01	15.97	15.93	15.89	15.85	15.80

NOTE : ADD 800.00 TO ALL ELEVATIONS.



BEAM CAMBER DATA

SLAB THICKNESS AT BEAMS (T) (USED TO DETERMINE BEAM SEAT ELEVATIONS)



SLAB THICKNESS DETAILS

NOTE :
THE SLAB THICKNESS (T) AT BEAMS IS BASED ON THE ANTICIPATED BEAM CAMBER REMAINING AFTER PLACING THE SLAB, BUT IS NOT GUARANTEED FOR CONSTRUCTION.

DESIGN FOR 23° SKEW (R.A.)

DUAL 218'-0 × 40' PRETENSIONED PRESTRESSED CONCRETE BEAM BRIDGES

50'-9 END SPANS 116'-6 INTERIOR SPAN

SUPERSTRUCTURE DETAILS - WESTBOUND

STATION : 1416+93.83 (℄ RELOCATED U.S. 34)
STATION : 24382+81.76 (℄ IOWA 16) JULY, 2005

WAPELLO COUNTY

IOWA DEPARTMENT OF TRANSPORTATION - HIGHWAY DIVISION

DESIGN SHEET NO. 18 OF 31 FILE NO. 29907 DESIGN NO. 305

DESIGNED BY N.KOTLERS CHECKED BY E.SOUHRADA
DETAILED BY R.RYSAVY CADD FILE

WAPELLO COUNTY | PROJECT NUMBER NHSX-034-7(62)--3H-90 | SHEET NUMBER 19

BENCH MARK : NO. GPS-019; STA. 270+38.258, 67.920' LT., X CUT IN THE TOP OF THE REBAR IN THE CONCRETE REFERENCE MARKER IN THE NORTHEAST CORNER OF THE JUNCTION OF U.S. 34 AND IA. 16, ELEV. = 798.117.

TABLE OF BEAM LINE HAUNCH ELEVATIONS - WESTBOUND BRIDGE (SEE NOTE 1)

	℄ W. ABUT. BEARING						℄ PIER #1 BEARINGS						
	1	2	3	4	5	6	7	8	9	10	11	12	13
BEAM LINE A	15.79	15.79	15.79	15.78	15.77	15.75	15.73	15.73	15.78	15.82	15.85	15.86	15.85
BEAM LINE B	15.94	15.94	15.93	15.93	15.91	15.90	15.88	15.87	15.93	15.97	15.99	16.00	15.99
BEAM LINE C	16.08	16.08	16.08	16.07	16.06	16.04	16.02	16.02	16.07	16.11	16.13	16.14	16.13
BEAM LINE D	16.16	16.15	16.15	16.14	16.13	16.11	16.09	16.08	16.14	16.17	16.20	16.21	16.20
BEAM LINE E	16.01	16.01	16.00	15.99	15.98	15.96	15.94	15.93	15.99	16.02	16.05	16.05	16.05
BEAM LINE F	15.86	15.86	15.85	15.84	15.82	15.81	15.78	15.78	15.83	15.87	15.89	15.90	15.89

							℄ PIER #2 BEARINGS							℄ E. ABUT. BEARING
	14	15	16	17	18	19	20	21	22	23	24	25	26	27
BEAM LINE A	15.83	15.80	15.75	15.69	15.61	15.51	15.40	15.40	15.37	15.34	15.30	15.27	15.22	15.17
BEAM LINE B	15.97	15.94	15.89	15.82	15.74	15.65	15.54	15.53	15.51	15.47	15.44	15.40	15.35	15.31
BEAM LINE C	16.11	16.08	16.03	15.96	15.88	15.78	15.67	15.67	15.64	15.61	15.57	15.53	15.49	15.44
BEAM LINE D	16.18	16.14	16.09	16.02	15.94	15.85	15.74	15.73	15.70	15.67	15.63	15.59	15.55	15.50
BEAM LINE E	16.02	15.99	15.94	15.87	15.79	15.69	15.58	15.57	15.54	15.51	15.47	15.43	15.39	15.34
BEAM LINE F	15.87	15.83	15.78	15.71	15.63	15.53	15.42	15.41	15.38	15.35	15.31	15.27	15.22	15.17

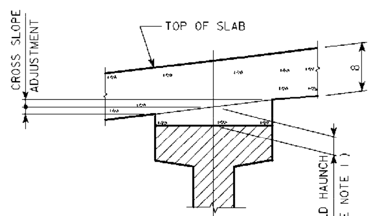
NOTE : ADD 800.00 TO ALL ELEVATIONS.

MISCELLANEOUS DATA TABLE

	BEAM LINE	℄ W. ABUT. BEARING						℄ PIER #1 BEARINGS						
		1	2	3	4	5	6	7	8	9	10	11	12	13
ANTICIPATED DEFLECTION DUE TO SLAB (in.)	ALL	0	$\frac{1}{16}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{16}$	0	0	$\frac{7}{8}$	$1\frac{9}{16}$	$2\frac{1}{8}$	$2\frac{1}{2}$	$2\frac{3}{4}$

	BEAM LINE							℄ PIER #2 BEARINGS							℄ E. ABUT. BEARING
		14	15	16	17	18	19	20	21	22	23	24	25	26	27
ANTICIPATED DEFLECTION DUE TO SLAB (in.)	ALL	$2\frac{13}{16}$	$2\frac{3}{4}$	$2\frac{1}{2}$	$2\frac{1}{8}$	$1\frac{9}{16}$	$\frac{7}{8}$	0	0	$\frac{1}{16}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{16}$	0

			Locations 1–27
CROSS SLOPE ADJUSTMENTS	A,B,C,D,E,F		$+/-\frac{3}{16}$
ALLOWABLE FIELD HAUNCH	MAX.	ALL	2
ALLOWABLE FIELD HAUNCH	MIN.	ALL	$-\frac{5}{16}$



HAUNCH DETAIL

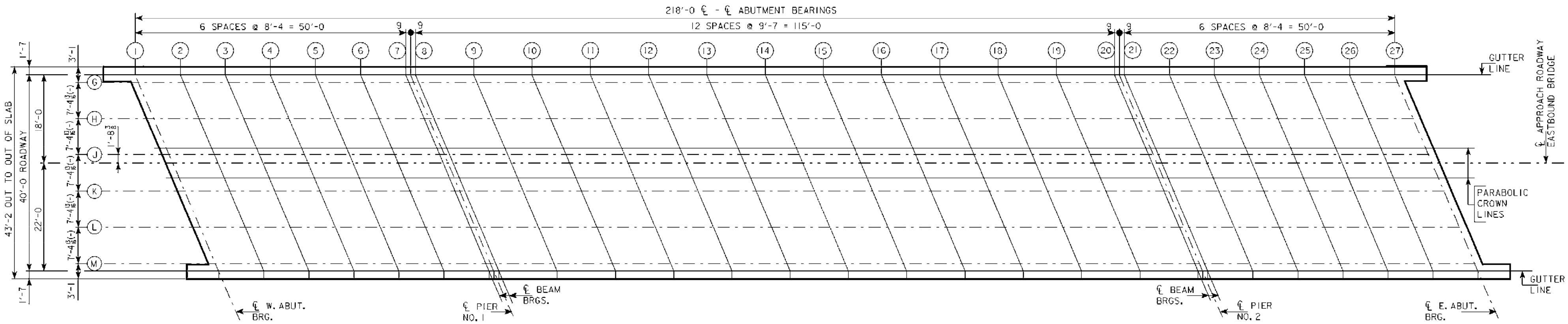
NOTE:
BRIDGE SEAT ELEVATIONS ARE SET BASED ON THEORETICAL CAMBER AND BEAM DEFLECTIONS. THESE BRIDGE SEATS WILL PROVIDE A THEORETICAL BEAM HAUNCH WITHIN DESIGN PARAMETERS. ACTUAL HAUNCHES ARE DETERMINED USING SURVEYED TOP OF BEAM ELEVATIONS AND "BEAM LINE HAUNCH ELEVATION" DATA. ALLOWABLE MAXIMUM AND MINIMUM "FIELD HAUNCH" VALUES ARE GIVEN IN THE "MISCELLANEOUS DATA" TABLE. "CROSS SLOPE ADJUSTMENT" VALUES FROM THE "MISCELLANEOUS DATA" TABLE WILL AID THE CONTRACTOR IN DETERMINING ACTUAL FORMED HAUNCH DIMENSIONS AT THE EDGES OF THE TOP FLANGE.

NOTE 1 :
TO CALCULATE FIELD HAUNCH REQUIRED AT EACH LOCATION, SURVEY THE BEAM TOPS CONSISTENT WITH THE SPACINGS SHOWN ON THE "TOP OF SLAB ELEVATIONS LAYOUT" ON DESIGN SHEET 18. SUBTRACT THE SURVEYED BEAM SHOT FROM THE "BEAM LINE HAUNCH ELEVATION". THIS VALUE WILL BE THE HAUNCH NEEDED (SEE "FIELD HAUNCH" IN HAUNCH DETAIL). THE "BEAM LINE HAUNCH ELEVATION" INCLUDES ADJUSTMENTS FOR SLAB THICKNESSES AND ANTICIPATED DEFLECTIONS. NO ADDITIONAL CALCULATIONS ARE REQUIRED. IF THE FIELD HAUNCH EXCEEDS THE MAXIMUMS AND MINIMUMS INDICATED IN THE MISCELLANEOUS DATA TABLE, ADJUSTMENTS TO THE GRADE OR ADDITIONAL HAUNCH REINFORCEMENT WILL BE REQUIRED.

NOTE :
HAUNCH LOCATIONS ARE AT THE SAME LOCATION AS THE ENCIRCLED LETTERS AND NUMBERS SHOWN ON DESIGN SHEET 18.

DESIGN FOR 23° SKEW (R.A.)
DUAL 218'-0 × 40' PRETENSIONED PRESTRESSED CONCRETE BEAM BRIDGES
50'-9 END SPANS — 116'-6 INTERIOR SPAN
SUPERSTRUCTURE DETAILS - WESTBOUND
STATION : 1416+93.83 (℄ RELOCATED U.S. 34)
STATION : 24382+81.76 (℄ IOWA 16) — JULY, 2005
WAPELLO COUNTY
IOWA DEPARTMENT OF TRANSPORTATION - HIGHWAY DIVISION
DESIGN SHEET NO. 19 OF 31 — FILE NO. 29907 — DESIGN NO. 305

BENCH MARK : NO. GPS-019; STA. 270+38.258, 67.920' LT., X CUT IN THE TOP OF THE REBAR IN THE CONCRETE REFERENCE MARKER IN THE NORTHEAST CORNER OF THE JUNCTION OF U.S. 34 AND IA. 16, ELEV. = 798.117.



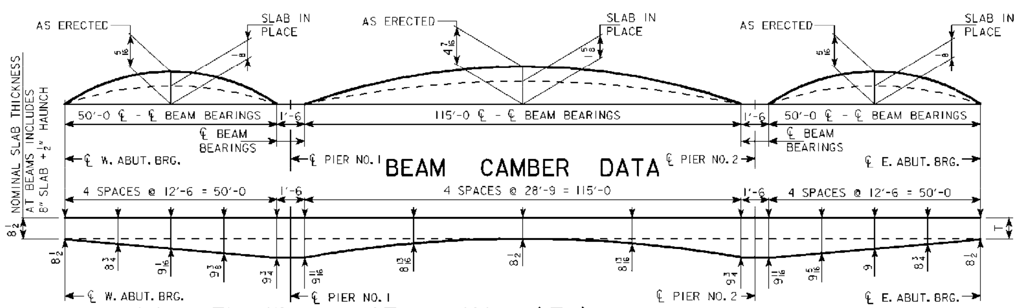
TOP OF SLAB ELEVATION LAYOUT - EASTBOUND BRIDGE

N

TABLE OF TOP OF SLAB ELEVATIONS - EASTBOUND BRIDGE

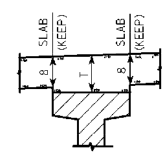
	℄ W. ABUT. BRG.						℄ PIER NO. 1 BEARINGS													℄ PIER NO. 2 BEARINGS							℄ E. ABUT. BRG.
LOCATION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
NORTH GUTTER LINE	16.46	16.45	16.44	16.42	16.40	16.39	16.36	16.36	16.34	16.31	16.28	16.25	16.22	16.19	16.15	16.11	16.08	16.03	15.99	15.95	15.94	15.90	15.86	15.82	15.77	15.72	15.68
BEAM LINE G	16.49	16.48	16.47	16.45	16.43	16.41	16.39	16.39	16.37	16.34	16.31	16.28	16.25	16.21	16.18	16.14	16.10	16.06	16.02	15.97	15.97	15.92	15.88	15.84	15.79	15.75	15.70
BEAM LINE H	16.64	16.63	16.61	16.59	16.58	16.56	16.53	16.53	16.51	16.48	16.45	16.42	16.39	16.35	16.32	16.28	16.24	16.20	16.15	16.11	16.10	16.06	16.02	15.97	15.93	15.88	15.83
BEAM LINE J	16.78	16.76	16.75	16.73	16.71	16.69	16.67	16.67	16.64	16.61	16.58	16.55	16.52	16.48	16.45	16.41	16.37	16.32	16.28	16.23	16.23	16.18	16.14	16.10	16.05	16.00	15.96
℄ APPROACH ROADWAY	16.78	16.77	16.75	16.74	16.72	16.70	16.68	16.67	16.65	16.62	16.59	16.56	16.53	16.49	16.45	16.41	16.37	16.33	16.29	16.24	16.24	16.19	16.15	16.10	16.06	16.01	15.96
BEAM LINE K	16.70	16.68	16.67	16.65	16.63	16.61	16.59	16.58	16.56	16.53	16.50	16.47	16.43	16.40	16.36	16.32	16.28	16.24	16.19	16.14	16.14	16.10	16.05	16.01	15.96	15.91	15.86
BEAM LINE L	16.54	16.53	16.51	16.49	16.47	16.45	16.43	16.43	16.40	16.37	16.34	16.31	16.27	16.23	16.20	16.16	16.12	16.07	16.03	15.98	15.97	15.93	15.89	15.84	15.79	15.74	15.70
BEAM LINE M	16.39	16.37	16.36	16.34	16.32	16.30	16.27	16.27	16.24	16.21	16.18	16.15	16.11	16.07	16.04	16.00	15.95	15.91	15.86	15.82	15.81	15.77	15.72	15.68	15.63	15.58	15.53
SOUTH GUTTER LINE	16.36	16.34	16.32	16.31	16.29	16.26	16.24	16.24	16.21	16.18	16.15	16.11	16.08	16.04	16.00	15.96	15.92	15.88	15.83	15.78	15.78	15.73	15.69	15.64	15.59	15.55	15.50

NOTE : ADD 800.00 TO ALL ELEVATIONS.



BEAM CAMBER DATA

SLAB THICKNESS AT BEAMS (T) (USED TO DETERMINE BEAM SEAT ELEVATIONS)



SLAB THICKNESS DETAILS

NOTE :
THE SLAB THICKNESS (T) AT BEAMS IS BASED ON THE ANTICIPATED BEAM CAMBER REMAINING AFTER PLACING THE SLAB, BUT IS NOT GUARANTEED FOR CONSTRUCTION.

DESIGN FOR 23° SKEW (R.A.)

DUAL 218'-0 × 40' PRETENSIONED PRESTRESSED CONCRETE BEAM BRIDGES

50'-9 END SPANS 116'-6 INTERIOR SPAN

SUPERSTRUCTURE DETAILS - EASTBOUND

STATION : 1416+93.83 (℄ RELOCATED U.S. 34)
STATION : 24382+81.76 (℄ IOWA 16) JULY, 2005

WAPELLO COUNTY
IOWA DEPARTMENT OF TRANSPORTATION - HIGHWAY DIVISION
DESIGN SHEET NO. 20 OF 31 FILE NO. 29907 DESIGN NO. 305

DESIGNED BY N.KOTLERS CHECKED BY E.SOUHRADA
DETAILED BY R.RYSAVY CADD FILE

WAPELLO COUNTY | PROJECT NUMBER NHSX-034-7 (62)--3H-90 | SHEET NUMBER 21

BENCH MARK : NO. GPS-019; STA. 270+38.258, 67.920' LT., X CUT IN THE TOP OF THE REBAR IN THE CONCRETE REFERENCE MARKER IN THE NORTHEAST CORNER OF THE JUNCTION OF U.S. 34 AND IA. 16, ELEV. = 798.117.

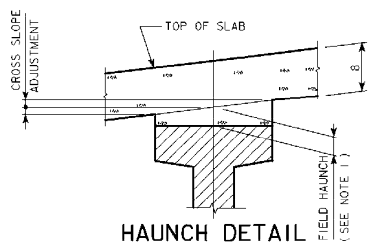
TABLE OF BEAM LINE HAUNCH ELEVATIONS - EASTBOUND BRIDGE (SEE NOTE 1)

	℄ W. ABUT. BEARING						℄ PIER #1 BEARINGS													℄ PIER #2 BEARINGS							℄ E. ABUT. BEARING
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
BEAM LINE G	15.83	15.82	15.81	15.80	15.78	15.75	15.73	15.72	15.77	15.80	15.82	15.82	15.81	15.78	15.74	15.68	15.61	15.52	15.42	15.30	15.30	15.26	15.23	15.18	15.14	15.09	15.03
BEAM LINE H	15.97	15.96	15.95	15.94	15.92	15.90	15.87	15.86	15.91	15.94	15.96	15.96	15.95	15.92	15.87	15.82	15.74	15.66	15.56	15.44	15.43	15.40	15.36	15.32	15.27	15.22	15.16
BEAM LINE J	16.11	16.10	16.09	16.07	16.06	16.03	16.00	16.00	16.04	16.08	16.09	16.09	16.08	16.05	16.01	15.95	15.88	15.79	15.68	15.57	15.56	15.53	15.49	15.44	15.40	15.35	15.29
BEAM LINE K	16.03	16.02	16.01	15.99	15.97	15.95	15.92	15.92	15.96	15.99	16.01	16.01	15.99	15.96	15.92	15.86	15.79	15.70	15.59	15.48	15.47	15.43	15.40	15.35	15.30	15.25	15.20
BEAM LINE L	15.88	15.87	15.85	15.84	15.82	15.79	15.76	15.76	15.80	15.83	15.85	15.85	15.83	15.80	15.76	15.70	15.62	15.54	15.43	15.31	15.31	15.27	15.23	15.19	15.14	15.09	15.03
BEAM LINE M	15.72	15.71	15.70	15.68	15.66	15.64	15.61	15.60	15.65	15.68	15.69	15.69	15.67	15.64	15.60	15.54	15.46	15.37	15.27	15.15	15.14	15.11	15.07	15.02	14.97	14.92	14.86

NOTE : ADD 800.00 TO ALL ELEVATIONS.

MISCELLANEOUS DATA TABLE

	BEAM LINE		℄ W. ABUT. BEARING						℄ PIER #1 BEARINGS													℄ PIER #2 BEARINGS							℄ E. ABUT. BEARING
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
ANTICIPATED DEFLECTION DUE TO SLAB (in.)	ALL		0	$\frac{1}{16}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{16}$	0	0	$\frac{7}{8}$	$1\frac{9}{16}$	$2\frac{1}{8}$	$2\frac{1}{2}$	$2\frac{3}{4}$	$2\frac{13}{16}$	$2\frac{3}{4}$	$2\frac{1}{2}$	$2\frac{1}{8}$	$1\frac{9}{16}$	$\frac{7}{8}$	0	0	$\frac{1}{16}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{16}$	0
CROSS SLOPE ADJUSTMENTS	G,H,J,K,L,M		$+/-\frac{3}{16}$																										
ALLOWABLE FIELD HAUNCH	MAX.	ALL	2																										
	MIN.	ALL	$-\frac{5}{16}$																										



HAUNCH DETAIL

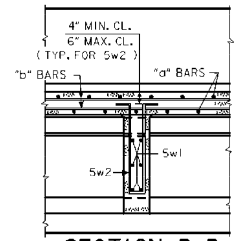
NOTE:
BRIDGE SEAT ELEVATIONS ARE SET BASED ON THEORETICAL CAMBER AND BEAM DEFLECTIONS. THESE BRIDGE SEATS WILL PROVIDE A THEORETICAL BEAM HAUNCH WITHIN DESIGN PARAMETERS. ACTUAL HAUNCHES ARE DETERMINED USING SURVEYED TOP OF BEAM ELEVATIONS AND "BEAM LINE HAUNCH ELEVATION" DATA. ALLOWABLE MAXIMUM AND MINIMUM "FIELD HAUNCH" VALUES ARE GIVEN IN THE "MISCELLANEOUS DATA" TABLE. "CROSS SLOPE ADJUSTMENT" VALUES FROM THE "MISCELLANEOUS DATA" TABLE WILL AID THE CONTRACTOR IN DETERMINING ACTUAL FORMED HAUNCH DIMENSIONS AT THE EDGES OF THE TOP FLANGE.

NOTE 1 :
TO CALCULATE FIELD HAUNCH REQUIRED AT EACH LOCATION, SURVEY THE BEAM TOPS CONSISTENT WITH THE SPACINGS SHOWN ON THE "TOP OF SLAB ELEVATIONS LAYOUT" ON DESIGN SHEET 20. SUBTRACT THE SURVEYED BEAM SHOT FROM THE "BEAM LINE HAUNCH ELEVATION". THIS VALUE WILL BE THE HAUNCH NEEDED (SEE "FIELD HAUNCH" IN HAUNCH DETAIL). THE "BEAM LINE HAUNCH ELEVATION" INCLUDES ADJUSTMENTS FOR SLAB THICKNESSES AND ANTICIPATED DEFLECTIONS. NO ADDITIONAL CALCULATIONS ARE REQUIRED. IF THE FIELD HAUNCH EXCEEDS THE MAXIMUMS AND MINIMUMS INDICATED IN THE MISCELLANEOUS DATA TABLE, ADJUSTMENTS TO THE GRADE OR ADDITIONAL HAUNCH REINFORCEMENT WILL BE REQUIRED.

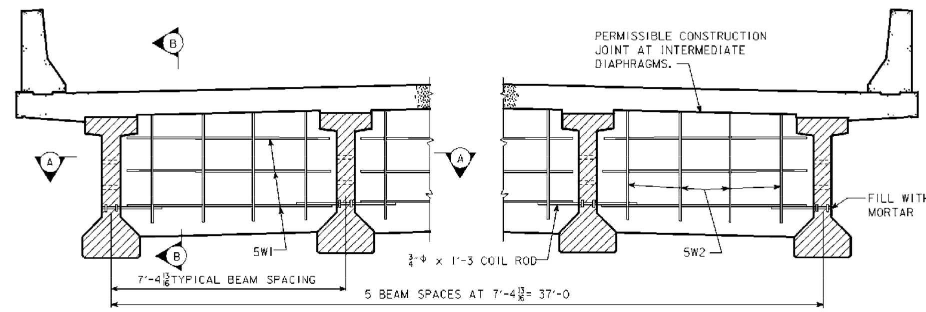
NOTE :
HAUNCH LOCATIONS ARE AT THE SAME LOCATION AS THE ENCIRCLED LETTERS AND NUMBERS SHOWN ON DESIGN SHEET 20.

DESIGN FOR 23° SKEW (R.A.)
DUAL 218'-0 × 40' PRETENSIONED PRESTRESSED CONCRETE BEAM BRIDGES
50'-9 END SPANS 116'-6 INTERIOR SPAN
SUPERSTRUCTURE DETAILS - EASTBOUND
STATION : 1416+93.83 (℄ RELOCATED U.S. 34)
STATION : 24382+81.76 (℄ IOWA 16) JULY, 2005
WAPELLO COUNTY
IOWA DEPARTMENT OF TRANSPORTATION - HIGHWAY DIVISION
DESIGN SHEET NO. 21 OF 31 FILE NO. 29907 DESIGN NO. 305

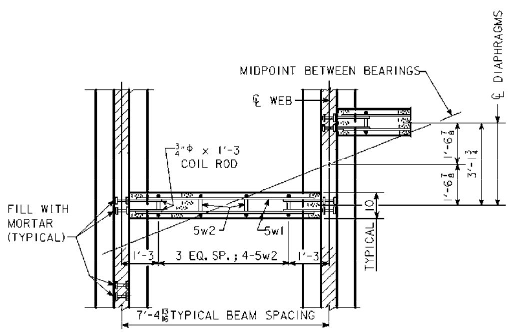
DESIGNED BY N.KOTLERS CHECKED BY E.SOUHRADA
DETAILED BY R.RYSAVY CADD FILE
WAPELLO COUNTY
PROJECT NUMBER NHSX-034-7 (62)--3H-90
SHEET NUMBER 22



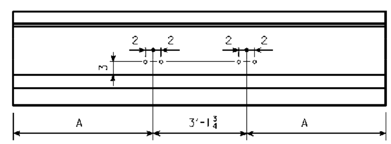
SECTION B-B



SECTION SHOWING INTERMEDIATE DIAPHRAGM

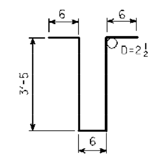


SECTION A-A



INTERMEDIATE DIAPHRAGM
BEAM COIL TIE LOCATIONS

"A' DIMENSION	
SPAN	"A"
SPAN 1	23'-11 1/8
SPAN 2	56'-5 1/8
SPAN 3	23'-11 1/8



5w2

NOTE: ALL DIMENSIONS ARE OUT TO OUT. D=PIN DIAMETER.

REINFORCING BAR LIST INTERMEDIATE DIAPHRAGMS

BAR	LOCATION	SHAPE	NO.	LENGTH	WEIGHT
5w1	INTERMEDIATE DIAPH. LONGIT.	——	90	6'-7	618
5w2	INTERMEDIATE DIAPH. HOOPS	⊔	60	8'-4	522
WEST BOUND BRIDGE - REINFORCING STEEL-TOTAL (LBS.)					1,140
EAST BOUND BRIDGE - REINFORCING STEEL-TOTAL (LBS.)					1,140

CONCRETE PLACEMENT QUANTITIES INTERMEDIATE DIAPHRAGMS

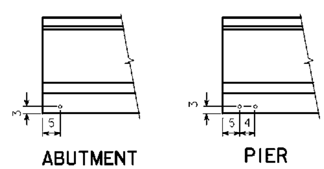
QUANTITY	TOTAL
15 INTERMEDIATE DIAPHRAGMS AT 0.8 CU.YDS. EA. - WEST BOUND BRIDGE	12 CU.YDS.
15 INTERMEDIATE DIAPHRAGMS AT 0.8 CU.YDS. EA. - EAST BOUND BRIDGE	12 CU.YDS.

NOTE:

MINIMUM CLEAR DISTANCE FROM FACE OF CONCRETE TO NEAR REINFORCING BAR IS TO BE 2" UNLESS OTHERWISE NOTED OR SHOWN.

ALL INTERMEDIATE DIAPHRAGM QUANTITIES FOR STRUCTURAL CONCRETE AND REINFORCING STEEL ARE INCLUDED IN THE SUPERSTRUCTURE QUANTITIES ON DES. SHEETS 16 & 17.

AT LOCATIONS UNDER LONGITUDINAL BRIDGE FLOOR CONSTRUCTION JOINTS THE INTERMEDIATE CONCRETE DIAPHRAGM IS TO BE OMITTED.



BEAM COIL TIE LOCATIONS AT ENDS OF BEAMS

DESIGN FOR 23° SKEW (R.A.)

DUAL 218'-0 × 40' PRETENSIONED PRESTRESSED CONCRETE BEAM BRIDGES

50'-9 END SPANS 116'-6 INTERIOR SPAN

CONCRETE INTERMEDIATE DIAPHRAGM DETAILS

STATION : 1416+93.83 (℄ RELOCATED U.S. 34)
STATION : 24382+81.76 (℄ IOWA 16) JULY, 2005

WAPELLO COUNTY

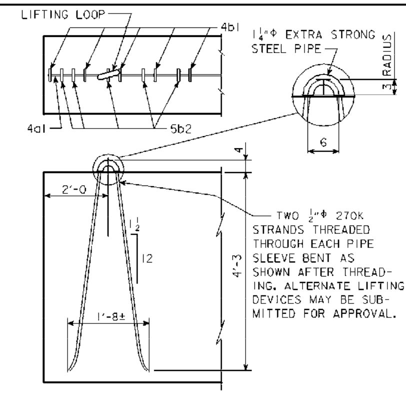
IOWA DEPARTMENT OF TRANSPORTATION - HIGHWAY DIVISION

DESIGN SHEET NO. 22 OF 31 FILE NO. 29907 DESIGN NO. 305

DESIGNED BY N.KOTLERS CHECKED BY E.SOUHRADA
DETAILED BY R.RYSAVY CADD FILE

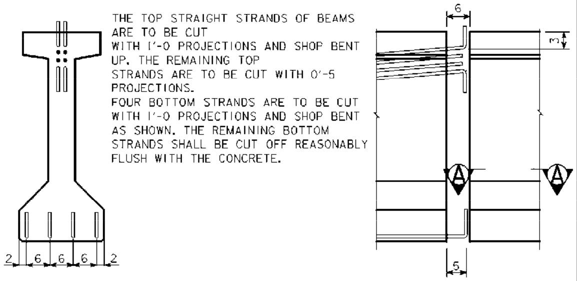
CONCRETE INTERMEDIATE DIAPHRAGMS FOR PC BM BRIDGES AUTO-ID-CONC WAPELLO COUNTY

PROJECT NUMBER NHSX-034-7 (62)--3H-90 SHEET NUMBER 23

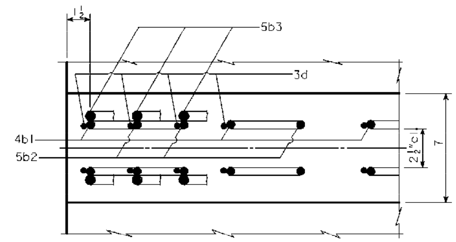


LIFTING LOOP DETAIL

THE TOP STRAIGHT STRANDS OF BEAMS ARE TO BE CUT WITH 1'-0 PROJECTIONS AND SHOP BENT UP. THE REMAINING TOP STRANDS ARE TO BE CUT WITH 0'-5 PROJECTIONS.
FOUR BOTTOM STRANDS ARE TO BE CUT WITH 1'-0 PROJECTIONS AND SHOP BENT AS SHOWN. THE REMAINING BOTTOM STRANDS SHALL BE CUT OFF REASONABLY FLUSH WITH THE CONCRETE.

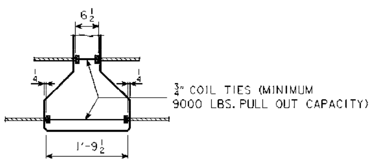


STRAND PROJECTION AT BEAM ENDS WHEN EMBEDDED IN CONCRETE END DIAPHRAGMS



SECTION A-A SHOWING PLACEMENT OF STIRRUPS NEAR END OF BEAM

NUMBER AND EXACT LOCATION OF COIL TIES TO BE AS DETAILED ON SPECIFIC BRIDGE DESIGN.



COIL TIE DETAIL

SPECIFICATIONS:

CONSTRUCTION: STANDARD SPECIFICATIONS OF THE IOWA DEPARTMENT OF TRANSPORTATION, CURRENT SERIES, WITH CURRENT APPLICABLE SPECIAL PROVISIONS AND SUPPLEMENTAL SPECIFICATIONS.

DESIGN: A.A.S.H.T.O., SERIES OF 1989, WITH MINOR MODIFICATIONS.

DESIGN STRESSES:

DESIGN STRESSES FOR THE FOLLOWING MATERIALS ARE TO BE IN ACCORDANCE WITH A.A.S.H.T.O. STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, SERIES OF 1989:

REINFORCING STEEL IN ACCORDANCE WITH SECTION 8, GRADE 60.

CONCRETE IN ACCORDANCE WITH SECTION 9, f'c = 5000 psi. (EXCEPT AS NOTED).

PRESTRESSING STEEL IN ACCORDANCE WITH SECTION 9, f's = 270,000 psi.

LXD BEAM DATA

BEAM	SPAN LENGTH ℄-℄ BEARING	OVERALL BEAM LENGTH (L)	STRAND SIZE #	NO. OF STRANDS STRAIGHT	NO. OF STRANDS DEFLECTED	TOTAL INITIAL PRESTRESS KIPS ③	HOLD DOWN FORCE-KIPS	CAMBER (in.) AT RELEASE		CAMBER (in.) AFTER LOSSES		DEFLECTION (in.) Δ_D IMMEDIATE ① (ELASTIC) Δ_I CONC. DIAPH.		DEFLECTION TIME ② (PLASTIC) Δ_T CONC. DIAPH.		PERMISSIBLE SPACING		PERMISSIBLE SPACING HS20 LOADING CONC. DIAPH.		WEIGHT (TONS)		CONCRETE (C.Y.)	REINFORCING STEEL - (lbs.)
LXD50	50'-0	51'-0	$\frac{1}{2}$"Φ	16	—	480	—	0.17		0.30		0.13		0.03				7'-6		17.0		8.4	509

① DEFLECTIONS AT MID-SPAN DUE TO WEIGHT OF SLAB AND DIAPHRAGM. THE DEFLECTIONS SHOWN ARE FOR A SLAB WEIGHT OF 760 #/FT. (8" SLAB AND 7'-6 BEAM SPACING) AND ONE CONCRETE DIAPHRAGM (3191 #) AT ℄ OF SPAN. FOR DIFFERENT SLAB AND DIAPHRAGM WEIGHTS, DEFLECTIONS WILL BE DIRECTLY PROPORTIONAL.

② DEFLECTIONS DUE TO THE COMBINED EFFECT OF CREEP DUE TO WEIGHT OF SLAB AND SHRINKAGE OF SLAB.

TOTAL BEAM DEFLECTIONS AT ℄ OF SPAN, Δ_D, DUE TO WEIGHT OF SLAB AND DIAPHRAGMS FOR DETAILING PURPOSE:
(A) $\Delta_D = \Delta_I + \Delta_T$ FOR SIMPLE SPAN.
(B) $\Delta_D = \Delta_I + \frac{3}{4}\Delta_T$ FOR END SPANS OF CONTINUOUS BRIDGE.
(C) $\Delta_D = \Delta_I + \frac{1}{2}\Delta_T$ FOR INTERIOR SPANS OF CONTINUOUS BRIDGE.

③ TOTAL INITIAL PRESTRESS FOR LXD50 IS BASED ON 72.664% f's.
f's = 270 ksi AND As = 0.153 sq. in.

NOTES:

THESE BEAMS ARE DESIGNED FOR AASHTO LIVE LOADS AS INDICATED IN ABOVE TABLE WITH AN ALLOWANCE OF 20 lb. PER SQUARE FOOT OF ROADWAY FOR FUTURE WEARING SURFACE.

HOLD DOWN POINTS FOR DEFLECTED STRANDS MAY BE MOVED TOWARD ENDS OF BEAM A DISTANCE OF 0.05 L MAXIMUM AT PRODUCER'S OPTION.

ALL PRESTRESSING STRANDS SHALL CONFORM TO ASTM A416 GRADE 270 LOW RELAXATION STRANDS.

TOPS OF BEAMS ARE TO BE STRUCK OFF LEVEL & INTENTIONALLY ROUGHENED TRANSVERSELY TO A FULL AMPLITUDE OF APPROXIMATELY $\frac{1}{4}$" EXCEPT A 2 INCH WIDE FINISH SHALL BE PROVIDED ON THE TOP EDGE ON ONE SIDE ONLY OF THE BEAM.

BEARINGS SHALL BE AS DETAILED ON OTHER DESIGN SHEETS.

BEAMS TO BE USED IN BRIDGES MADE CONTINUOUS BY THE POURED IN PLACE FLOOR, ARE TO BE AT LEAST 28 DAYS OLD BEFORE THE FLOOR IS PLACED UNLESS A SHORTER CURING TIME IS APPROVED BY THE BRIDGE ENGINEER.

THE PORTIONS OF THE PRESTRESS BEAMS THAT ARE TO BE EMBEDDED IN THE ABUTMENT AND PIER DIAPHRAGMS SHALL BE ROUGHENED FOR A DISTANCE OF 10" FROM THE BEAM END BY SANDBLASTING OR OTHER APPROVED METHODS TO PROVIDE SUITABLE BOND BETWEEN THE BEAM AND THE DIAPHRAGM IN IN ACCORDANCE WITH ARTICLE 2403.14 OF THE SPECIFICATIONS.

UNLESS OTHERWISE NOTED ALL BEAMS ARE TO BE INCREASED IN LENGTH BY .0005L TO COMPENSATE FOR ELASTIC SHORTENING, CREEP AND SHRINKAGE.

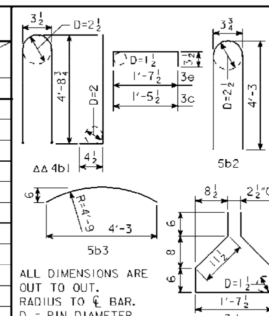
FOR TRANSPORTING, THE OVERHANG SHALL BE IN ACCORDANCE WITH ART. 2407.13 OF STD. SPECIFICATION.

$\frac{1}{2}$" DIAMETER STRANDS STRESSED TO NOT MORE THAN 3,000 LBS. EACH MAY BE USED IN LIEU OF THE a BARS WHICH RUN THE FULL LENGTH OF THE BEAM IN THE TOP FLANGE.

ΔΔ 4b1 BARS TO BE EPOXY COATED

REINFORCING BAR LIST

	BAR	SHAPE	LXD50 50'-0 NO.	LXD50 50'-0 LENGTH
	4a1		2	4'-0
	a2		—	—
	a3		—	—
ΔΔ	4b1		43	10'-4
	5b2		6	8'-8
	5b3		4	4'-4
	3c		43	2'-1
	3d		43	5'-7
	3e		12	2'-3



ALL DIMENSIONS ARE OUT TO OUT.
RADIUS TO ℄ BAR.
D = PIN DIAMETER.

DESIGN FOR 23° SKEW (R.A.)

DUAL 218'-0 × 40' PRETENSIONED PRESTRESSED CONCRETE BEAM BRIDGES

50'-9 END SPANS — 116'-6 INTERIOR SPAN

BEAM DETAILS

STATION : 1416+93.83 (℄ RELOCATED U.S. 34)
STATION : 24382+81.76 (℄ IOWA 16)
JULY, 2005

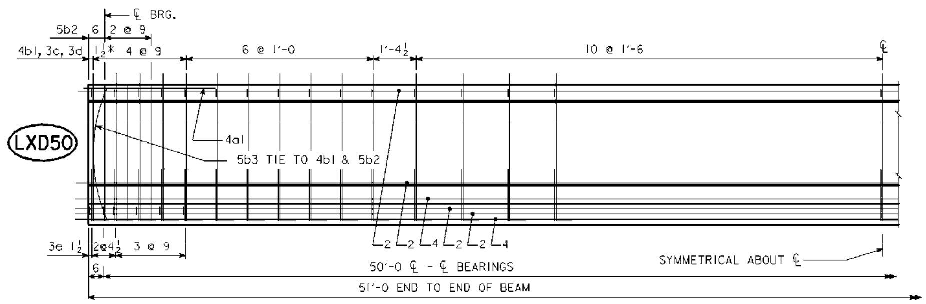
WAPELLO COUNTY

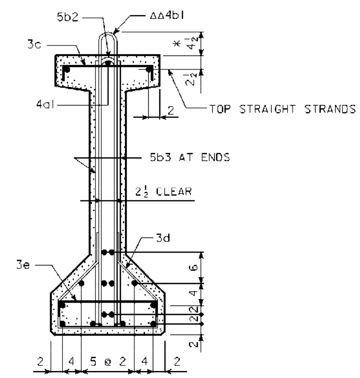
IOWA DEPARTMENT OF TRANSPORTATION - HIGHWAY DIVISION

DESIGN SHEET NO. 23 OF 31 FILE NO. 29907 DESIGN NO. 305

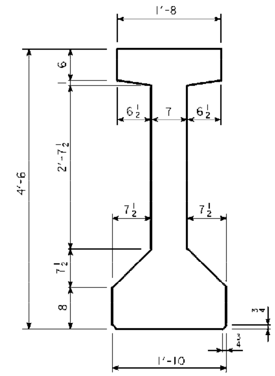
REVISED 05-04 - BARS 4b1 CHANGED TO EPOXY COATED.
HLXD4630.S01 - ISSUED DATE 06-01-90

DESIGNED BY N.KOTLERS / DETAILED BY R.RYSAVY	CHECKED BY E.SOUHRADA / CADD FILE	LXD BEAMS	STANDARD SHEET 4630	WAPELLO COUNTY	PROJECT NUMBER NHSX-034-7 (62)--3H-90	SHEET NUMBER 24





BEAM LXD50



TYPICAL "LXD" BEAM CROSS SECTION

AREA = 638.75 $in.^2$
Y_b = 24.37 in.
I = 214,974 $in.^4$

* KEEP
ΔΔ EPOXY COATED BARS

DESIGN FOR 23° SKEW (R.A.)

DUAL 218'-0 x 40' PRETENSIONED PRESTRESSED CONCRETE BEAM BRIDGES

50'-9 END SPANS 116'-6 INTERIOR SPAN

BEAM DETAILS

STATION : 1416+93.83 (℄ RELOCATED U.S. 34)
STATION : 24382+81.76 (℄ IOWA 16) JULY, 2005

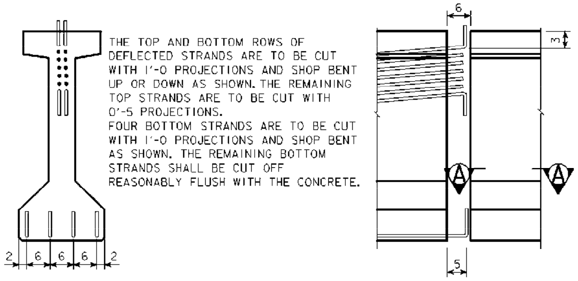
WAPELLO COUNTY

IOWA DEPARTMENT OF TRANSPORTATION - HIGHWAY DIVISION

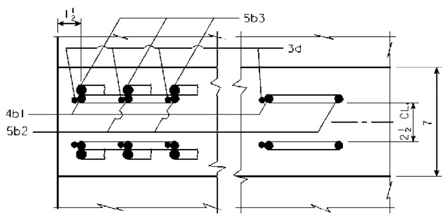
DESIGN SHEET NO. 24 OF 31 FILE NO. 29907 DESIGN NO. 305

DESIGNED BY N.KOTLERS DETAILED BY R.RYSAVY	CHECKED BY E.SOUHRADA CADD FILE	LXD BEAMS	STANDARD SHEET 4632 ISSUE DATE 06-01-90	WAPELLO COUNTY	PROJECT NUMBER NHSX-034-7 (62)--3H-90	SHEET NUMBER 25

REVISED 05-04 - BARS 4b1 CHANGED TO EPOXY COATED.
HLXD4632.S01 (HLXD04632.S01--GJP: THIS SHEET REISSUED, DEVICE:ZHA1:(200,005) ARCH. TAPE 9 DATE 05-24-90)



STRAND PROJECTION AT BEAM ENDS WHEN EMBEDDED IN CONCRETE END DIAPHRAGMS



PART SECTION A-A SHOWING PLACEMENT OF STIRRUPS NEAR END OF BEAM

NOTES:

THESE BEAMS ARE DESIGNED FOR AASHTO LIVE LOADS AS INDICATED IN BEAM DATA TABLE WITH AN ALLOWANCE OF 20 lb. PER SQUARE FOOT OF ROADWAY FOR FUTURE WEARING SURFACE.

HOLD DOWN POINTS FOR DEFLECTED STRANDS MAY BE MOVED TOWARD ENDS OF BEAM A DISTANCE OF 0.05 L MAXIMUM AT PRODUCER'S OPTION.

ALL PRESTRESSING STRANDS SHALL CONFORM TO ASTM A416 GRADE 270 LOW RELAXATION STRANDS.

TOPS OF BEAMS ARE TO BE STRUCK OFF LEVEL AND INTENTIONALLY ROUGHENED TRANSVERSELY TO A FULL AMPLITUDE OF APPROXIMATELY ¼" EXCEPT A 2 INCH WIDE FINISH SHALL BE PROVIDED ON THE TOP EDGE ON ONE SIDE ONLY OF THE BEAM.

BEARINGS SHALL BE AS DETAILED ON OTHER DESIGN SHEETS.

BEAMS TO BE USED IN BRIDGES MADE CONTINUOUS BY THE POURED IN PLACE FLOOR, ARE TO BE AT LEAST 28 DAYS OLD BEFORE THE FLOOR IS PLACED UNLESS A SHORTER CURING TIME IS APPROVED BY THE BRIDGE ENGINEER.

THE PORTIONS OF THE PRESTRESS BEAMS THAT ARE TO BE EMBEDDED IN THE ABUTMENT AND PIER DIAPHRAGMS SHALL BE ROUGHENED FOR A DISTANCE OF 10" FROM THE BEAM END BY SANDBLASTING OR OTHER APPROVED METHODS TO PROVIDE SUITABLE BOND BETWEEN THE BEAM AND THE DIAPHRAGM IN ACCORDANCE WITH ARTICLE 2403.14 OF THE SPECIFICATIONS.

UNLESS OTHERWISE NOTED ALL BEAMS ARE TO BE INCREASED IN LENGTH BY .0005L TO COMPENSATE FOR ELASTIC SHORTENING, CREEP AND SHRINKAGE.

FOR TRANSPORTING, THE OVERHANG SHALL BE IN ACCORDANCE WITH ART. 2407.13 OF STD. SPECIFICATIONS, EXCEPT THE OVERHANG MAY BE INCREASED TO A MAXIMUM OF 14 FEET.

THE CONTRACTOR SHALL ASSURE THE LATERAL STABILITY OF THE BEAMS DURING HANDLING, TRANSPORTING AND ERECTION BY PROVIDING TEMPORARY BRACING AS NEEDED.

½" DIAMETER STRANDS STRESSED TO NOT MORE THAN 3,000 LBS. EACH MAY BE USED IN LIEU OF THE a BARS WHICH RUN THE FULL LENGTH OF THE BEAM IN THE TOP FLANGE.

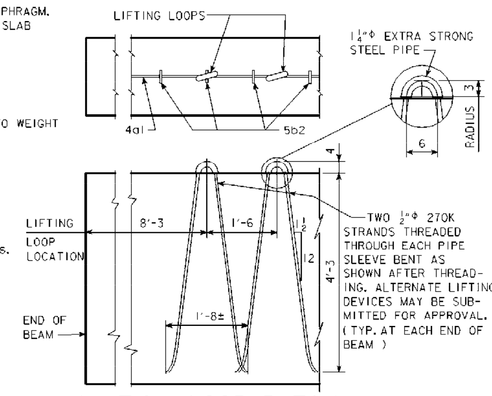
SLXD115 BEAM DATA

BEAM	SPAN LENGTH ℄-℄ BEARING	OVERALL BEAM LENGTH (L)	STRAND SIZE	NO. OF STRANDS STRAIGHT	NO. OF STRANDS DEFLECTED	TOTAL INITIAL PRESTRESS KIPS ③	HOLD DOWN FORCE-KIPS	CAMBER (in.) AT RELEASE		CAMBER (in.) AFTER LOSSES		DEFLECTION (in.) Δ_0 IMMEDIATE ① (ELASTIC) Δ_I CONC. DIAPH.		DEFLECTION (in.) Δ_0 TIME ② (PLASTIC) Δ_T CONC. DIAPH.		PERMISSIBLE SPACING		PERMISSIBLE SPACING HS20 LOADING CONC. DIAPH.		WEIGHT (TONS)		CONCRETE (C.Y.)	REINFORCING STEEL - (lbs.)
SLXD115	115'-0	116'-0	½"Φ	36	14	1549	32.29	2.53		4.44		2.50		0.62				7'-4 13/16		38.6		19.1	1636

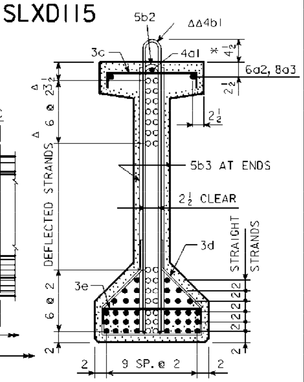
① DEFLECTIONS AT MID-SPAN DUE TO WEIGHT OF SLAB AND DIAPHRAGM. THE DEFLECTIONS SHOWN ARE FOR A SLAB WEIGHT OF 735#/FT. (8" SLAB AND 7'-3 BEAM SPACING) AND ONE CONCRETE DIAPHRAGM (3071#) FOR DIFFERENT SLAB AND DIAPHRAGM WEIGHTS, DEFLECTIONS WILL BE DIRECTLY PROPORTIONAL.

② DEFLECTIONS DUE TO THE COMBINED EFFECT OF CREEP DUE TO WEIGHT OF SLAB AND SHRINKAGE OF SLAB.
TOTAL BEAM DEFLECTIONS AT ℄ OF SPAN, Δ_0, DUE TO WEIGHT OF SLAB AND DIAPHRAGMS FOR DETAILING PURPOSE:
(A) $\Delta_0 = \Delta_I + \Delta_T$ FOR SIMPLE SPAN.
(B) $\Delta_0 = \Delta_I + \frac{3}{4}\Delta_T$ FOR END SPANS OF CONTINUOUS BRIDGE.
(C) $\Delta_0 = \Delta_I + \frac{1}{2}\Delta_T$ FOR INTERIOR SPANS OF CONTINUOUS BRIDGE.

③ TOTAL INITIAL PRESTRESS FOR SLXD115 IS BASED ON 75% f's. f's = 270 ksi AND As = 0.153 sq. in.



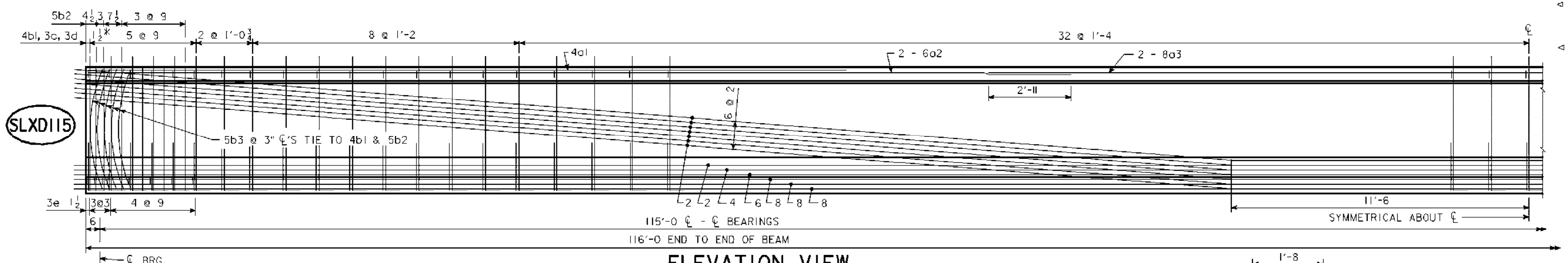
LIFTING LOOP DETAIL BEAM SLXD115



BEAM SLXD115

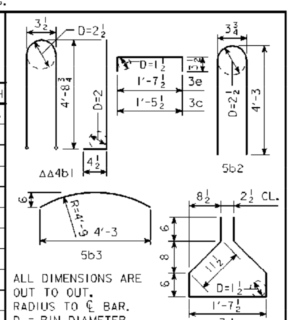
NOTE: DIMENSIONS FOR THE LOCATION OF THE DEFLECTED STRANDS ARE AT ℄ BEAM AND END OF BEAM.

o DEFLECTED STRANDS
* KEEP
Δ DIMENSIONS AT END OF BEAM
ΔΔ EPOXY COATED BARS



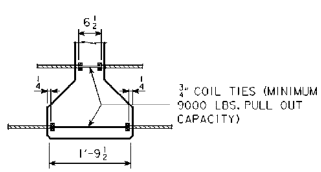
ELEVATION VIEW

REINFORCING BAR LIST BEAM SLXD115				
	BAR	SHAPE	NO.	LENGTH
	4a1		2	26'-6
	6a2		4	40'-9
	8a3		2	40'-0
ΔΔ	4b1		95	10'-4
	5b2		12	8'-8
	5b3		20	4'-4
	3c		95	2'-1
	3d		95	5'-7
	3e		16	2'-3



ALL DIMENSIONS ARE OUT TO OUT.
RADIUS TO ℄ BAR.
D = PIN DIAMETER.

ΔΔ 4b1 BARS TO BE EPOXY COATED



COIL TIE DETAIL

NUMBER AND EXACT LOCATION OF COIL TIES TO BE AS DETAILED ON SPECIFIC BRIDGE DESIGN.

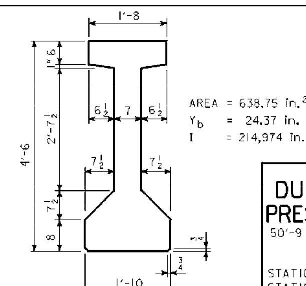
SPECIFICATIONS:

CONSTRUCTION: STANDARD SPECIFICATIONS OF THE IOWA DEPARTMENT OF TRANSPORTATION, CURRENT SERIES, WITH CURRENT APPLICABLE SPECIAL PROVISIONS AND SUPPLEMENTAL SPECIFICATIONS.

DESIGN: A.A.S.H.T.O., SERIES OF 1996, WITH MINOR MODIFICATIONS.

DESIGN STRESSES:

DESIGN STRESSES FOR THE FOLLOWING MATERIALS ARE TO BE IN ACCORDANCE WITH A.A.S.H.T.O. STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, SERIES OF 1996:
REINFORCING STEEL IN ACCORDANCE WITH SECTION 8, GRADE 60.
CONCRETE IN ACCORDANCE WITH SECTION 9.
MINIMUM CONCRETE f'c (AT 28 DAYS) SHALL BE 8000 psi.
MINIMUM f'ci AT RELEASE SHALL BE 6500 psi.
PRESTRESSING STEEL IN ACCORDANCE WITH SECTION 9, f's = 270,000 psi.



AREA = 638.75 in.^{2}
Y_b = 24.37 in.
I = 214,974 in.^{4}

SLXD115 BEAM CROSS SECTION

DESIGN FOR 23° SKEW (R.A.)

DUAL 218'-0 × 40' PRETENSIONED PRESTRESSED CONCRETE BEAM BRIDGES

50'-9 END SPANS | 116'-6 INTERIOR SPAN

BEAM DETAILS

STATION : 1416+93.83 (℄ RELOCATED U.S. 34)
STATION : 24382+81.76 (℄ IOWA 16) JULY, 2005

WAPELLO COUNTY

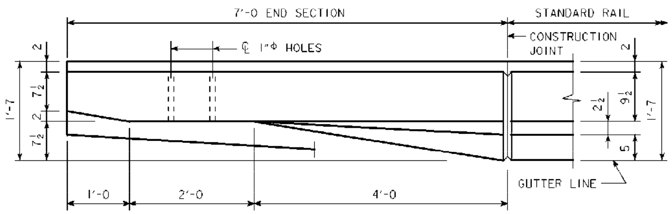
IOWA DEPARTMENT OF TRANSPORTATION - HIGHWAY DIVISION

DESIGN SHEET NO. 25 OF 31 FILE NO. 29907 DESIGN NO. 305

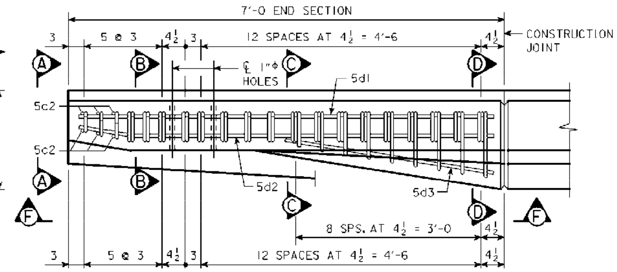
REVISED 05-04 - BARS 4b1 CHANGED TO EPOXY COATED.
HLXD4637.S01 - 12-99 THIS SHEET ISSUED.

DESIGNED BY N.KOTLERS / DETAILED BY R.RYSAVY	CHECKED BY E.SOUHRADA / CADD FILE	LXD BEAMS	STANDARD SHEET 4637 MODIFIED	WAPELLO COUNTY	PROJECT NUMBER NHSX-034-7 (62)--3H-90	SHEET NUMBER 26

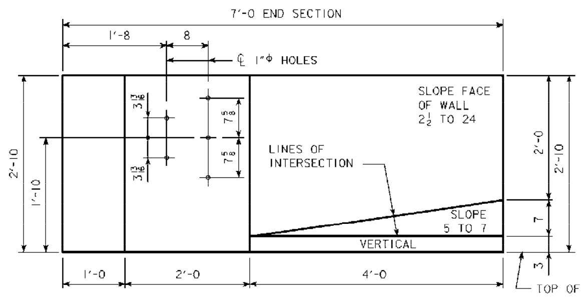
27-APR-2005 09:50 rrysavy w:\projects\90034060A94\BRFinal\h900305.s25 \\NTPLTSVR1\Bridge1T1f



PART PLAN VIEW

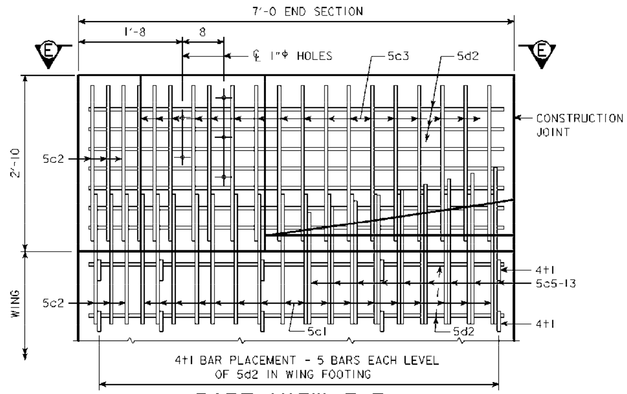


PART VIEW E-E



PART ELEVATION VIEW

PROVIDE 5 HOLES FORMED WITH 1"Φ PLASTIC CONDUIT. COST TO BE INCLUDED IN PRICE BID FOR CONCRETE BARRIER RAILING.



PART VIEW F-F

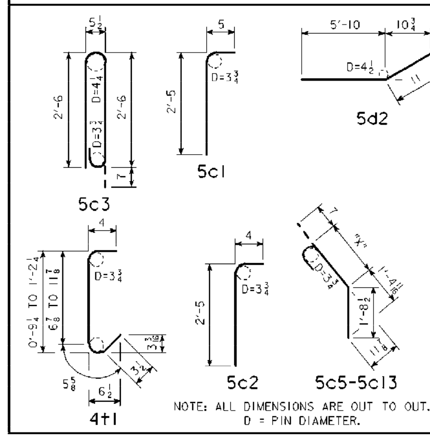
EPOXY REINFORCING STEEL - ONE END SECTION

BAR	LOCATION	SHAPE	NO.	LENGTH	WEIGHT
5c1	VERTICAL, RAIL TO WING FOOTING		34	2'-10	100
5c2	VERTICAL AT NOSE, RAIL TO WING FOOTING		12	2'-9	34
5c3	VERTICAL		17	6'-1	108
5c5-13	VERTICAL		9	VARIES	35
5d1	HORIZONTAL		7	6'-8	49
5d2	HORIZONTAL		9	6'-9	63
5d3	HORIZONTAL		3	3'-5	11
4t1	WING FOOTING TIE BARS		10	VARIES	13
(INCLUDE WITH BARRIER RAIL REINFORCING)				TOTAL WEIGHT (LBS.)	413

CONCRETE PLACEMENT SUMMARY

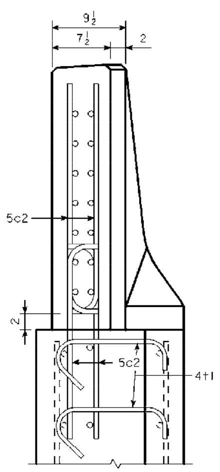
SECTION	TOTAL
BARRIER RAIL ONE END SECTION	0.62 CU. YD.

BENT BAR DETAILS

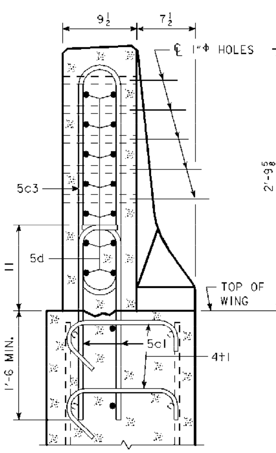


BAR	"X"
5c5	1'-0 3/16
5c6	1'-1 7/16
5c7	1'-2 11/16
5c8	1'-3 15/16
5c9	1'-4 1/8
5c10	1'-6 3/8
5c11	1'-7 5/8
5c12	1'-8 7/8
5c13	1'-10 1/8

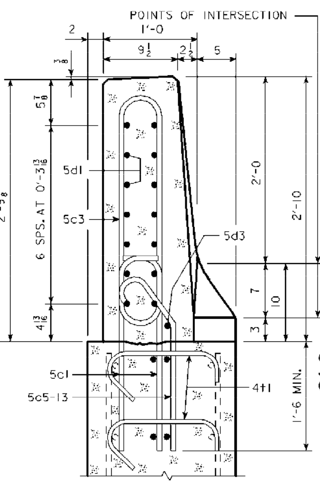
NOTE: ALL DIMENSIONS ARE OUT TO OUT.
D = PIN DIAMETER.



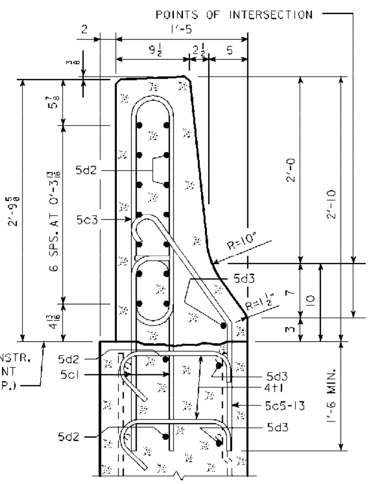
VIEW A-A



SECTION B-B



SECTION C-C



SECTION D-D

NOTE:
CONSTRUCTION JOINT BETWEEN TOP OF WING AND BARRIER RAIL IS ROUGHENED CONCRETE.

NOTE:
THE 10" RADIUS AND 1½" RADIUS ARE TYPICAL AND SHALL BE USED WHEN CONSTRUCTING THE CORNERS FOR VIEW A-A, SECTION B-B, SECTION C-C AND SECTION D-D.

NOTE:
THE 5c1, 6 - 5c2, 5c5-13, 2 - 5d2, 2 - 5d3 AND 4t1 BARS ARE TO BE PLACED WITH THE ABUTMENT WING FOOTING. THE DETAILS FOR PLACEMENT ARE SHOWN ON THE SUPERSTRUCTURE DETAIL SHEET.

NOTE:
DASHED LINES BELOW THE TOP OF WING ARE THE ABUTMENT WING REINFORCING STEEL. SEE SUPERSTRUCTURE DETAIL SHEETS FOR PLACEMENT.

DESIGN FOR 23° SKEW (R.A.)

DUAL 218'-0 × 40' PRETENSIONED PRESTRESSED CONCRETE BEAM BRIDGES

50'-9 END SPANS 116'-6 INTERIOR SPAN

END SECTION DETAILS - WEST & EAST

STATION : 1416+93.83 (℄ RELOCATED U.S. 34)
STATION : 24382+81.76 (℄ IOWA 16) JULY, 2005

WAPELLO COUNTY

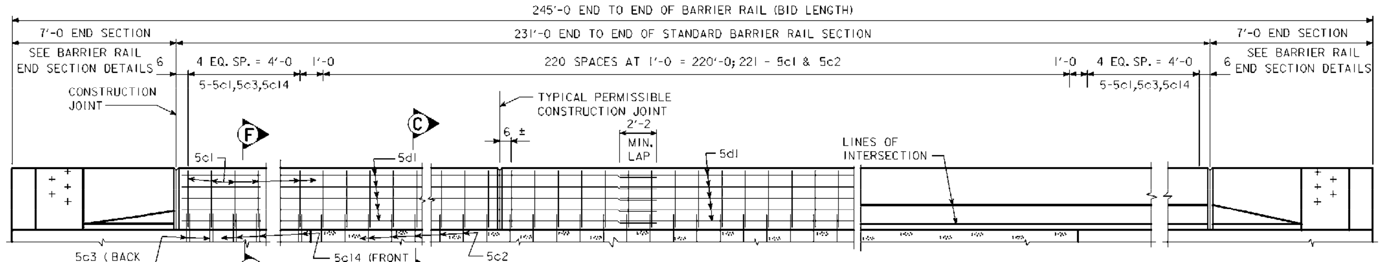
IOWA DEPARTMENT OF TRANSPORTATION - HIGHWAY DIVISION

DESIGN SHEET NO. 26 OF 31 FILE NO. 29907 DESIGN NO. 305

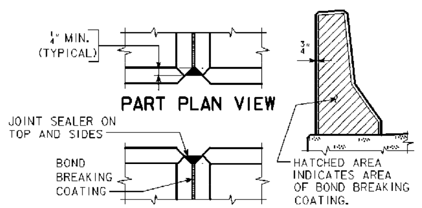
CORRECTIONS 09-03 - MINOR CHANGES TO NOTES.
HE1017SD1 - 09-01 THIS SHEET ISSUED.

DESIGNED BY N.KOTLERS CHECKED BY E.SOUHRADA
DETAILED BY R.RYSAVY CADD FILE

BARRIER RAIL END SECTION DETAILS WITH 7'-0 WING | STANDARD SHEET 1017 | WAPELLO COUNTY | PROJECT NUMBER NHSX-034-7 (62)--3H-90 | SHEET NUMBER 27



ELEVATION OF BARRIER RAIL LAYOUT



BARRIER RAIL JOINT DETAILS

REINFORCING BAR LIST - F-SHAPE BARRIER RAIL
(ONE BRIDGE WITH WING EXTENSIONS - TWO RAILS)

EPOXY COATED

SECTION	BAR	LOCATION	SHAPE	NO.	LENGTH	WEIGHT
STD. SECT.	5c1	VERTICAL		462	5'-11	2,851
	5c2	VERTICAL		442	6'-0	2,766
	5c3	VERTICAL		20	2'-10	59
	5c14	VERTICAL		20	3'-10	80
	5d1	LONGITUDINAL		126	34'-10	4,578
END SECT.	BARRIER RAIL END SECTIONS 4 @ 413					1,652
WESTBOUND BRIDGE (INCLUDE WITH SUPERSTRUCTURE REINFORCING TOTAL (LB)						11,986
EASTBOUND BRIDGE (INCLUDE WITH SUPERSTRUCTURE REINFORCING TOTAL (LB)						11,986

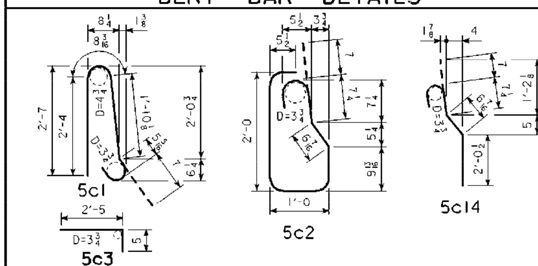
CONCRETE PLACEMENT SUMMARY
(ONE BRIDGE WITH WING EXTENSIONS - TWO RAILS)

SECTION	TOTAL
STANDARD SECTION 462 FT. AT 0.1052 C.Y. PER FT.	48.6
BARRIER RAIL END SECTIONS 4 AT 0.62 C.Y.	2.5
WESTBOUND BRIDGE - TOTAL C.Y.	51.1
EASTBOUND BRIDGE - TOTAL C.Y.	51.1

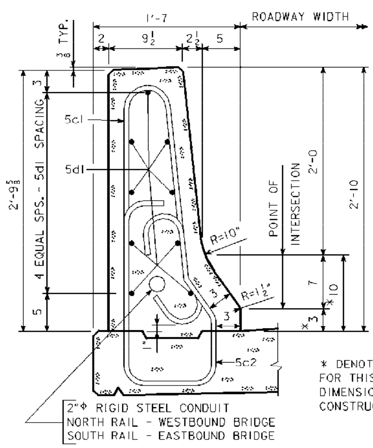
CONCRETE BARRIER RAIL QUANTITIES

ITEM	UNIT	QUANTITY
WESTBOUND BRIDGE - CONCRETE BARRIER RAILING	L.F.	490
EASTBOUND BRIDGE - CONCRETE BARRIER RAILING	L.F.	490

BENT BAR DETAILS

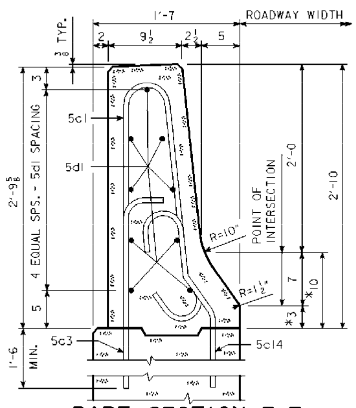


ALL DIMENSIONS ARE OUT TO OUT. D = PIN DIAMETER.



* DENOTES THE MAXIMUM VALUE FOR THIS DIMENSION. THIS DIMENSION MAY VARY DUE TO CONSTRUCTION INACCURACIES.

PART SECTION C-C



PART SECTION F-F

BARRIER RAIL NOTES:

MINIMUM CLEAR DISTANCE FROM FACE OF CONCRETE TO NEAR REINFORCING BAR IS TO BE 2" UNLESS OTHERWISE NOTED OR SHOWN.

THE PERMISSIBLE CONSTRUCTION JOINTS ARE TO BE PLACED BETWEEN VERTICAL BARS AT A MINIMUM SPACING OF 20 FEET. CONSTRUCTION JOINT CONTACT SURFACES ARE TO BE COATED WITH AN APPROVED BOND BREAKER.

COST OF THE JOINT SEALER AND BOND BREAKER SHALL BE CONSIDERED INCIDENTAL TO OTHER CONSTRUCTION.

ALL BARRIER RAIL REINFORCING STEEL IS TO BE EPOXY COATED.

THE CONCRETE BARRIER RAIL IS TO BE BID ON A LINEAL FOOT BASIS. THE NUMBER OF LINEAL FEET OF BARRIER RAIL INSTALLED WILL BE PAID FOR AT THE CONTRACT PRICE PER LINEAL FOOT BASED ON PLAN QUANTITIES. PRICE BID FOR CONCRETE BARRIER RAILING SHALL BE FULL COMPENSATION FOR FURNISHING ALL MATERIAL, EXCLUDING REINFORCING STEEL, AND ALL OF THE EQUIPMENT AND LABOR REQUIRED TO ERECT THE RAIL IN ACCORDANCE WITH THESE PLANS AND CURRENT SPECIFICATIONS. IF CONDUIT IS REQUIRED IN THIS PLAN THE RIGID STEEL CONDUIT, JUNCTION BOXES AND FITTINGS INCLUDING LABOR AND ANY ADDITIONAL WORK TO DO THE INSTALLATION IS CONSIDERED INCIDENTAL TO THE COST OF THE RAILING.

ALL BARRIER RAIL REINFORCING STEEL IS TO BE INCLUDED WITH THE SUPERSTRUCTURE REINFORCING STEEL.

THE JOINT SEALER SHALL BE LIGHT GRAY NONSAG LATEX CAULKING SEALER MARKETED FOR OUTDOOR USE. NO TESTING OR CERTIFICATION IS REQUIRED.

TOP OF THE BARRIER RAIL IS TO BE PARALLEL TO THE THEORETICAL ℄ GRADE.

CROSS SECTIONAL AREA OF THE STANDARD SECTION OF THE BARRIER RAIL = 2.84 SQUARE FEET.

DESIGN FOR 23° SKEW (R.A.)

DUAL 218'-0 × 40' PRETENSIONED PRESTRESSED CONCRETE BEAM BRIDGES

50'-9 END SPANS 116'-6 INTERIOR SPAN

BARRIER RAIL DETAILS - WEST & EAST

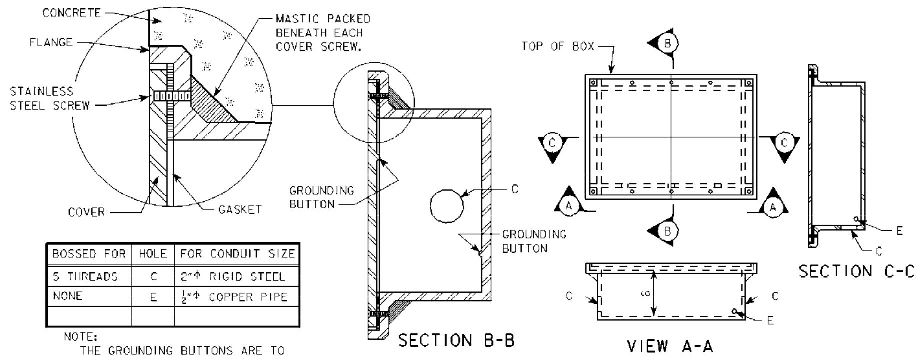
STATION : 1416+93.83 (℄ RELOCATED U.S. 34)
STATION : 24382+81.76 (℄ IOWA 16) JULY, 2005

WAPELLO COUNTY

IOWA DEPARTMENT OF TRANSPORTATION - HIGHWAY DIVISION

DESIGN SHEET NO. 27 OF 31 FILE NO. 29907 DESIGN NO. 305

REVISED 09-03 - JUNCTION BOX DETAILS CHANGED, ANCHOR BOLTS TO BE GALVANIZED, CONDUIT USED FOR LIGHT POLE CHANGED FROM 1" TO 2", ANCHOR PLATE CHANGED TO 3" SLOT.
HE1030A.SQ1 (HSTD1030A.SQ1--LEP; THIS SHEET REDRAWN, DEVICE:ZHAO(200,004) ARCH,TAPE NO. 15 DATE 9-8-88)



BOSSED FOR	HOLE	FOR CONDUIT SIZE
5 THREADS	C	2"Φ RIGID STEEL
NONE	E	½"Φ COPPER PIPE

NOTE:
THE GROUNDING BUTTONS ARE TO BE BLIND DRILLED AND TAPPED FOR ⅜"Φ x 0'-0¾ BOLTS.

RM-37, TYPE I JUNCTION BOX

WATERTIGHT , CAST IRON - FLUSH MOUNT

(SEE STANDARD ROAD PLAN RM-37 FOR ADDITIONAL DETAILS)

LIGHTING NOTES:

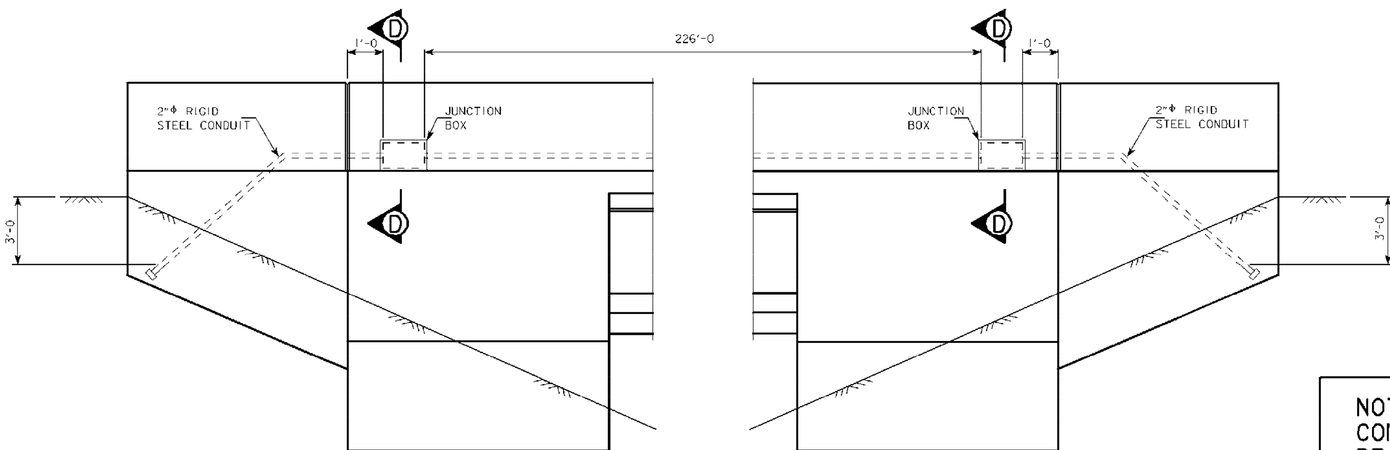
CONSTRUCTION SHALL CONFORM TO THE CURRENT IOWA D.O.T. STANDARD AND SUPPLEMENTAL SPECIFICATIONS AND SPECIAL PROVISIONS.

CONDUIT INSTALLATION SHALL COMPLY WITH THE ARTICLE "ELECTRICAL DUCTS", SECTION 2523.

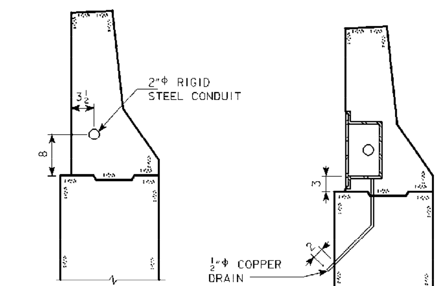
ALL "C" ENTRANCE HOLES IN JUNCTION BOXES SHALL BE DRILLED AND TAPPED FOR THE SPECIFIED CONDUIT SIZE. ALL OTHER HOLES SHALL HAVE A CONCRETE - TIGHT SLIP FIT. CONDUIT ENDS SHALL NOT PROTRUDE INTO JUNCTION BOX MORE THAN ¼". DRAIN PIPE END SHALL BE FLUSH WITH INSIDE SURFACE OF BOX. GROUNDING BUTTONS SHALL BE LOCATED APPROXIMATELY 3" FROM THE INSIDE SURFACE OF THE BOX WALL, AND NOT CLOSER THAN 3" TO THE EDGE OF ANY HOLE IN THE BOX FLOOR. HOLES FOR DRAIN PIPE SHALL BE PLACED IN THE LOW CORNER OF THE BOX, WITH A MINIMUM CLEARANCE OF 1" BETWEEN THE EDGE OF THE HOLE AND THE INSIDE SURFACE OF THE BOX WALL. TYPICAL DETAILS ARE SHOWN ON THIS SHEET.

THE RIGID STEEL CONDUIT, JUNCTION BOXES AND FITTINGS INCLUDING LABOR AND ANY ADDITIONAL WORK TO DO THE INSTALLATION IS CONSIDERED INCIDENTAL TO THE COST OF THE RAILING.

CONDUIT LENGTH			
2"Φ RIGID STEEL CONDUIT	WESTBOUND BRIDGE	250.0	LIN. FT.
2"Φ RIGID STEEL CONDUIT	EASTBOUND BRIDGE	250.0	LIN. FT.



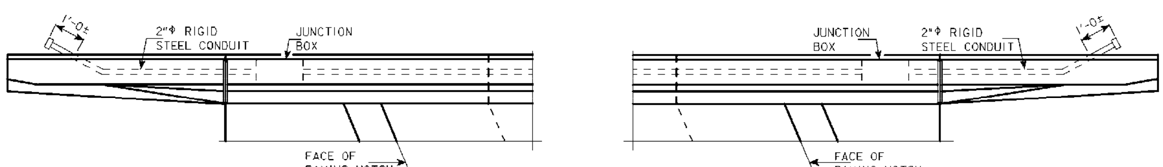
WESTBOUND EXTERIOR ELEVATION - NORTH BARRIER RAIL - LOOKING SOUTH
EASTBOUND EXTERIOR ELEVATION - SOUTH BARRIER RAIL - LOOKING NORTH



SECTION THRU BARRIER RAIL

SECTION D-D

NOTE :
CONDUIT AND JUNCTION BOXES TO BE PLACED IN NORTH RAIL OF WESTBOUND BRIDGE AND PLACED IN SOUTH RAIL OF EASTBOUND BRIDGE.

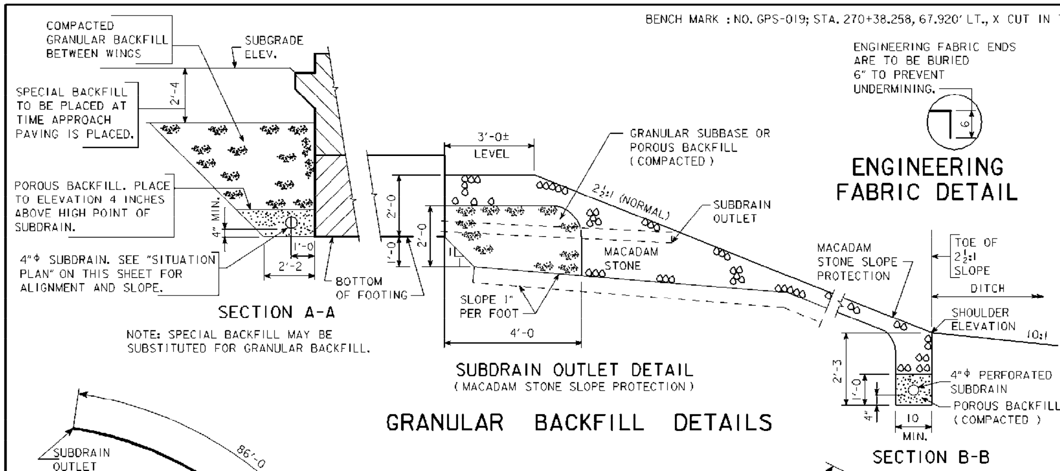


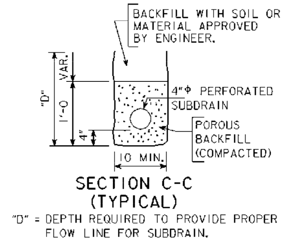
PART PLAN

DESIGN FOR 23° SKEW (R.A.)
DUAL 218'-0 x 40' PRETENSIONED PRESTRESSED CONCRETE BEAM BRIDGES
50'-9 END SPANS 116'-6 INTERIOR SPAN
LIGHTING DETAILS
STATION : 1416+93.83 (℄ RELOCATED U.S. 34)
STATION : 24382+81.76 (℄ IOWA 16) JULY, 2005
WAPELLO COUNTY
IOWA DEPARTMENT OF TRANSPORTATION - HIGHWAY DIVISION
DESIGN SHEET NO. 28 OF 31 FILE NO. 29907 DESIGN NO. 305

DESIGNED BY N.KOTLERS / DETAILED BY R.RYSAVY	CHECKED BY E.SOUHRADA / CADD FILE	LIGHTING DETAILS (1 OF 2)	STANDARD SHEET 1030A	WAPELLO COUNTY	PROJECT NUMBER NHSX-034-7 (62)--3H-90	SHEET NUMBER 29

BENCH MARK : NO. GPS-019; STA. 270+38.258, 67.920' LT., X CUT IN THE TOP OF THE REBAR IN THE CONCRETE REFERENCE MARKER IN THE NORTHEAST CORNER OF THE JUNCTION OF U.S. 34 AND IA. 16, ELEV. = 798.117.





SUBDRAIN NOTES:

THIS PLAN SHEET SHOWS DETAILS FOR PLACING ALL SUBDRAINS AND SUBDRAIN OUTLETS REQUIRED FOR THIS STRUCTURE.

THE SUBDRAINS SHALL BE 4" IN DIAMETER AND MEET THE REQUIREMENTS OF SECTION 4143.01 B OF THE CURRENT I.D.O.T. STANDARD SPECIFICATION. THE SUBDRAIN OUTLET SHALL CONSIST OF A 6'-0 LENGTH OF PIPE WITH A REMOVABLE RODENT GUARD AS DETAILED ON THIS SHEET.

THE COST OF FURNISHING AND PLACING SUBDRAIN (INCLUDING EXCAVATION), GRANULAR BACKFILL, POROUS BACKFILL, AND SUBDRAIN OUTLET IS TO BE INCLUDED IN THE PRICE BID FOR "STRUCTURAL CONCRETE (BRIDGE)". NO EXTRA PAYMENT WILL BE MADE.

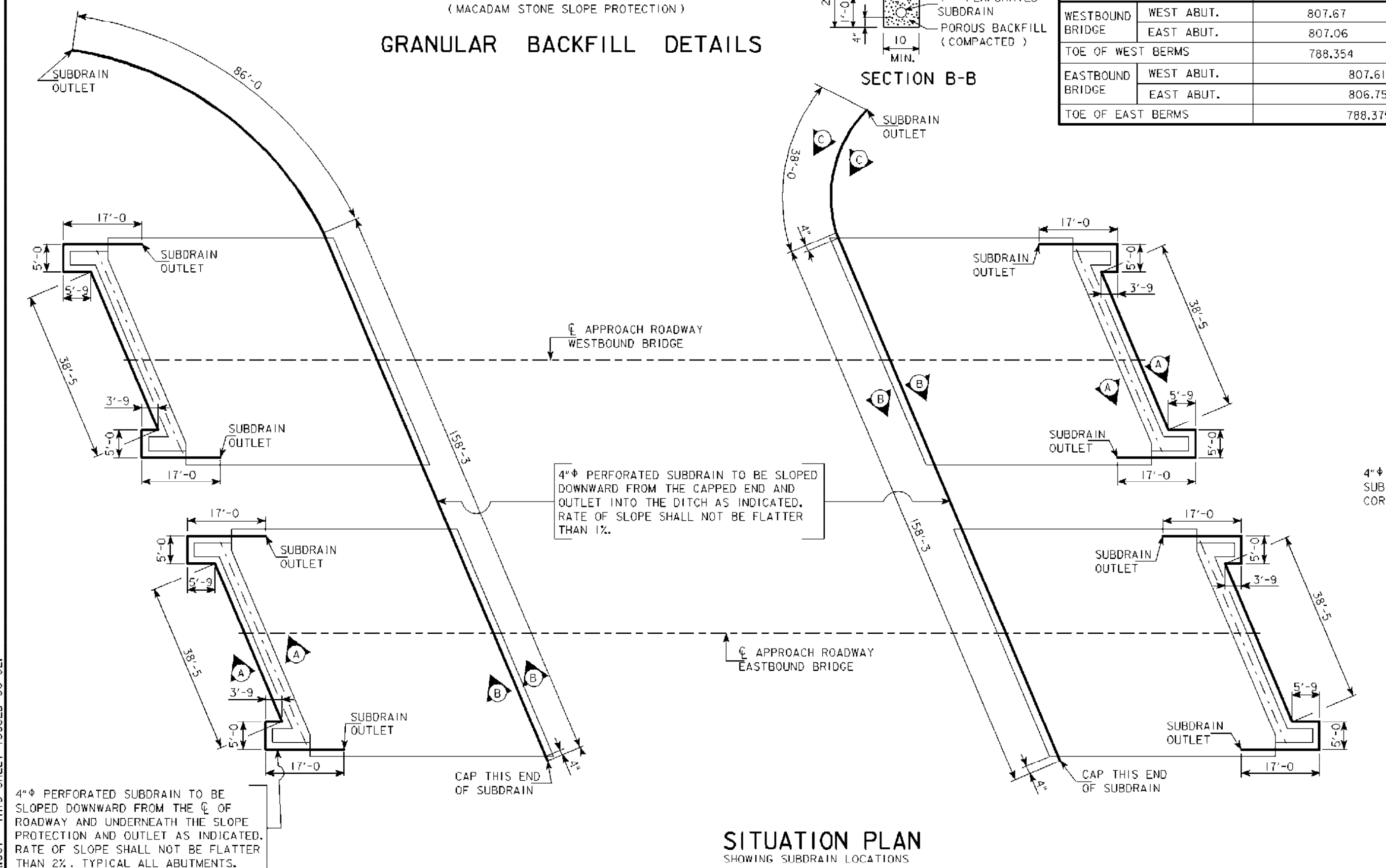
THE DIMENSIONS SHOWN FOR THE PROPOSED SUBDRAINS ARE BASED ON THE PROPOSED GRADING LAYOUT OF BRIDGE BERMS. THE DIMENSIONS SHOWN ARE FOR ESTIMATING ONLY. REQUIRED LENGTHS AND GENERAL LOCATIONS OF SUBDRAINS ARE SUBJECT TO CHANGE DUE TO FIELD ADJUSTMENTS OF THE GRADING LAYOUT.

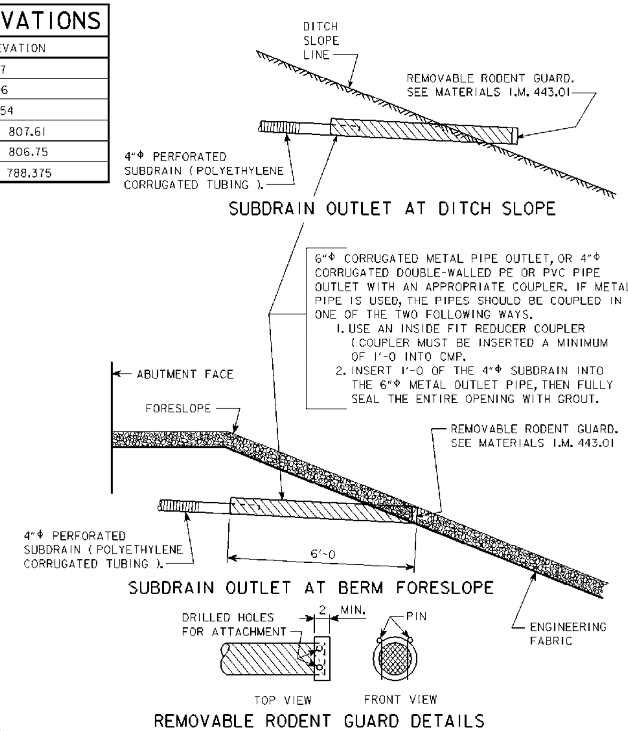
THE UPHILL END OF THE PERFORATED SUBDRAIN AT THE TOE OF SLOPE PROTECTION SHALL BE CAPPED AS APPROVED BY THE ENGINEER.

THE POROUS BACKFILL AND SUBDRAIN ARE TO BE CARRIED AROUND PIER COLUMNS IF THE COLUMN PLACEMENT INTERFERES WITH ALIGNMENT OF SUBDRAIN AS SHOWN ON THIS SHEET.

SUBDRAIN OUTLET ELEVATIONS

LOCATION		ELEVATION
WESTBOUND BRIDGE	WEST ABUT.	807.67
	EAST ABUT.	807.06
TOE OF WEST BERMS		788.354
EASTBOUND BRIDGE	WEST ABUT.	807.61
	EAST ABUT.	806.75
TOE OF EAST BERMS		788.375





OUTLET DETAILS

DESIGN FOR 23° SKEW (R.A.)

DUAL 218'-0 × 40' PRETENSIONED PRESTRESSED CONCRETE BEAM BRIDGES

50'-9 END SPANS — 116'-6 INTERIOR SPAN

SUBDRAIN DETAILS

STATION : 1416+93.83 (℄ RELOCATED U.S. 34)
STATION : 24382+81.76 (℄ IOWA 16) — JULY, 2005

WAPELLO COUNTY

IOWA DEPARTMENT OF TRANSPORTATION - HIGHWAY DIVISION

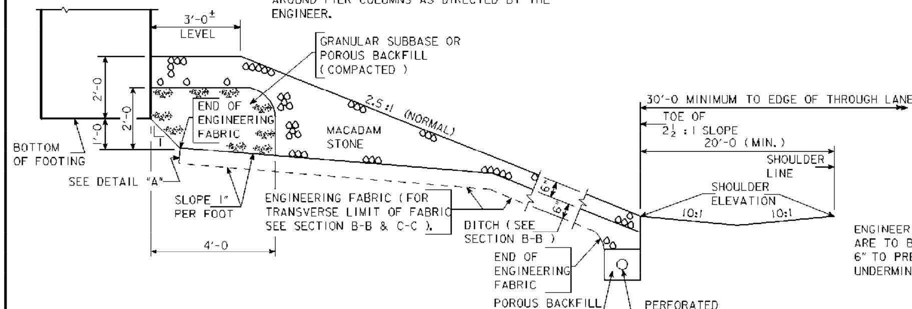
DESIGN SHEET NO. 29 OF 31 — FILE NO. 29907 — DESIGN NO. 305

DESIGNED BY N.KOTLERS / DETAILED BY R.RYSAVY	CHECKED BY E.SOUHRADA / CADD FILE	SUBDRAIN DETAILS FOR 3 OR MORE SPAN BRIDGES (MACADAM STONE SLOPE PROTECTION)	STANDARD SHEET 1007A MODIFIED	WAPELLO COUNTY	PROJECT NUMBER NHSX-034-7 (62)--3H-90	SHEET NUMBER 30

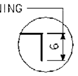
HE1007A.S01 - THIS SHEET ISSUED 06-02.

BENCH MARK : NO. GPS-019; STA. 270+38.258, 67.920' LT., X CUT IN THE TOP OF THE REBAR IN THE CONCRETE REFERENCE MARKER IN THE NORTHEAST CORNER OF THE JUNCTION OF U.S. 34 AND IA. 16, ELEV. = 798.117.

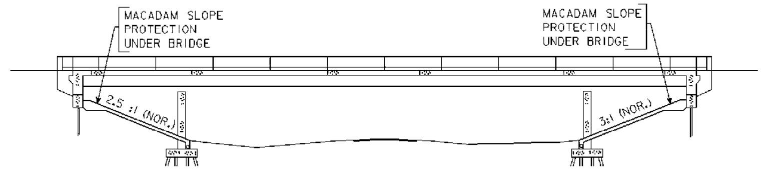
NOTE :
THE CONTRACTOR IS TO SHAPE THE MACADAM STONE, ENGINEERING FABRIC AND SUBDRAINS AROUND PIER COLUMNS AS DIRECTED BY THE ENGINEER.



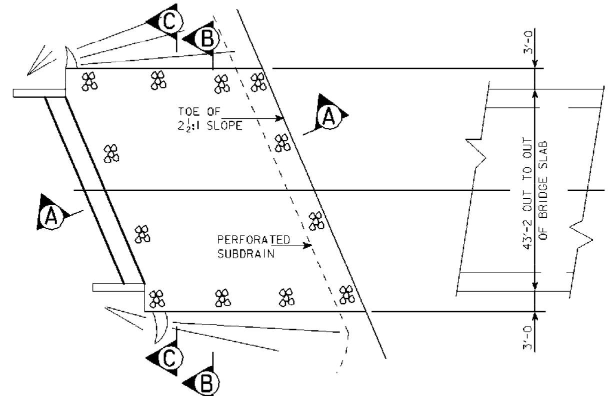
SECTION A-A



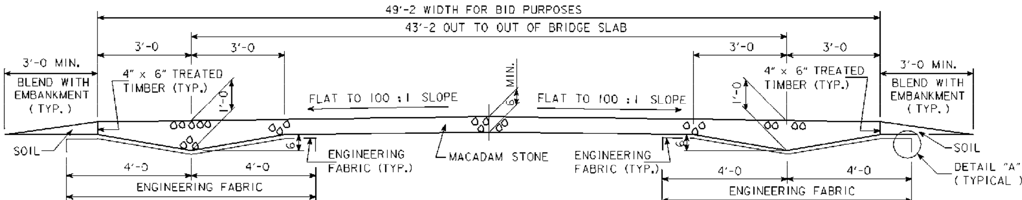
DETAIL "A"



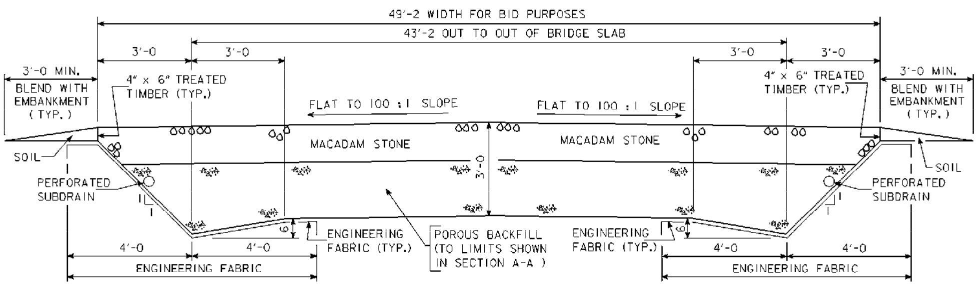
LONGITUDINAL SECTION ALONG ℄ ROADWAY



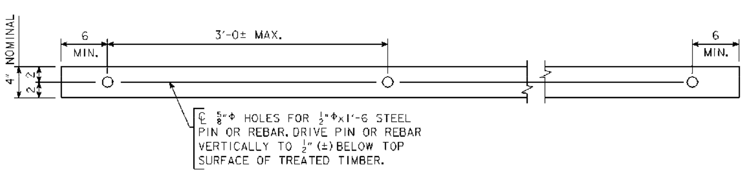
SLOPE PROTECTION LAYOUT



SECTION B-B



SECTION C-C



4 x 6 TREATED TIMBER EDGING DETAILS

GENERAL NOTES:

THIS PLAN SHEET SHOWS DETAILS FOR PLACING A "MACADAM STONE SLOPE PROTECTION" UNDER OVERHEAD STRUCTURES.

THE BRIDGE BERM FORESLOPE SHALL BE COMPACTED AND SHAPED AS SHOWN ON THIS SHEET, THE SITUATION PLAN AND AS DIRECTED BY THE ENGINEER. THE BERM FORESLOPE SHALL BE FIRM WHEN THE ENGINEERING FABRIC AND MACADAM STONE ARE PLACED.

THE ENGINEERING FABRIC SHALL MEET THE REQUIREMENTS OF 4196.01 C. IF THE ENGINEERING FABRIC IS LAPPED THE LAPS SHALL BE A MINIMUM OF ONE FOOT IN LENGTH, SHINGLE FASHION WITH UP SLOPE LAP PIECE ON TOP AND STAPLED FOR CONTINUITY.

THE MACADAM STONE SHALL MEET THE REQUIREMENTS OF 4122.02, COARSE MATERIAL (NO CHOKE STONE IS ALLOWED).

WOOD PRESERVATIVE TREATMENT FOR THE TIMBER EDGING SHALL MEET THE REQUIREMENTS FOR GUARDRAIL POSTS, SAWED FOUR SIDES, AS SPECIFIED IN 4161.

THE MACADAM STONE SHALL BE DEPOSITED, SPREAD, CONSOLIDATED AND SHAPED BY MECHANICAL OR HAND METHODS THAT WILL PROVIDE UNIFORM DEPTH AND DENSITY AND PROVIDE UNIFORM SURFACE APPEARANCE.

PAYMENT FOR "MACADAM STONE SLOPE PROTECTION" WILL BE MADE ON A SQUARE YARD BASIS FOR SLOPE PROTECTION CONSTRUCTED. THE UNIT PRICE BID PER SQUARE YARD SHALL INCLUDE ALL COSTS FOR MATERIAL AND LABOR REQUIRED TO CONSTRUCT THE SLOPE PROTECTION SHOWN ON THESE PLANS.

THE BERM FORESLOPE SHAPING AND COMPACTING AND THE DISPOSAL OF EXCESS SOIL FROM SHAPING OR TRENCHING SHALL BE CONSIDERED INCIDENTAL TO PLACING THE SLOPE PROTECTION. WHERE EROSION CONTROL WORK HAS BEEN COMPLETED THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY PLANT MATERIALS DESTROYED ADJACENT TO THE SLOPE PROTECTION AREA. THE CONTRACTOR SHALL REPLANT, RESEED AND REMULCH ALL DISTURBED AREAS, DESIGNATED BY THE ENGINEER, IN ACCORDANCE WITH SECTION 2601 OF THE CURRENT STANDARD SPECIFICATIONS, AT THE CONTRACTOR'S EXPENSE.

THE BRIDGE CONTRACTOR IS TO INSTALL SUBDRAINS AS DETAILED ON THE SUBDRAIN DETAILS SHEET.

ESTIMATED QUANTITIES

DESCRIPTION		LOCATION	QUANTITY
MACADAM STONE SLOPE PROTECTION	WESTBOUND BRIDGE	WEST ABUT.	316 SQ. YDS.
		EAST ABUT.	316 SQ. YDS.
MACADAM STONE SLOPE PROTECTION	EASTBOUND BRIDGE	WEST ABUT.	316 SQ. YDS.
		EAST ABUT.	316 SQ. YDS.
		TOTAL	1264 SQ. YDS.

ITEMS TO BE INCLUDED IN "MACADAM STONE SLOPE PROTECTION":
- EXCAVATING, SHAPING AND COMPACTING
- ENGINEERING FABRIC
- MACADAM STONE
- 4" x 6" TREATED TIMBER EDGING
- ½"Φ STEEL PINS (OR REBARS)
- POROUS BACKFILL OR GRANULAR SUBBASE BACKFILL AT FRONT FACE ABUTMENT FOOTING

DESIGN FOR 23° SKEW (R.A.)

DUAL 218'-0 x 40' PRETENSIONED PRESTRESSED CONCRETE BEAM BRIDGES

50'-9 END SPANS 116'-6 INTERIOR SPAN

MACADAM STONE SLOPE PROTECTION

STATION : 1416+93.83 (℄ RELOCATED U.S. 34)
STATION : 24382+81.76 (℄ IOWA 16) JULY, 2005

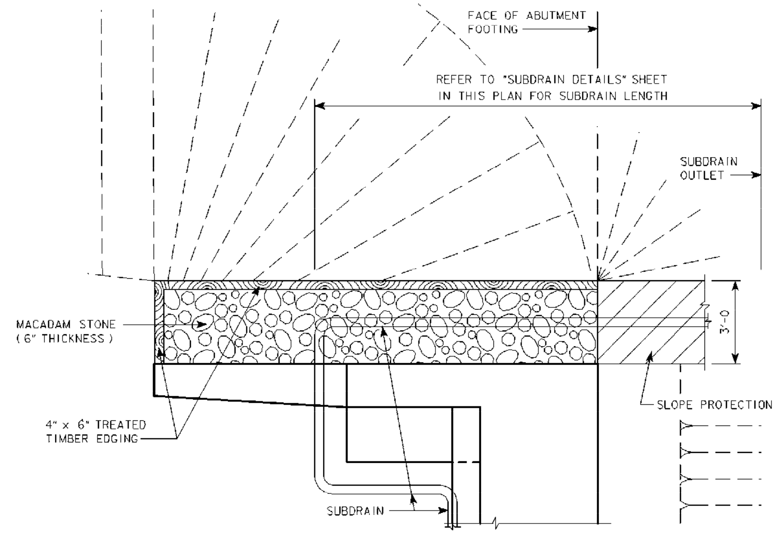
WAPELLO COUNTY

IOWA DEPARTMENT OF TRANSPORTATION - HIGHWAY DIVISION

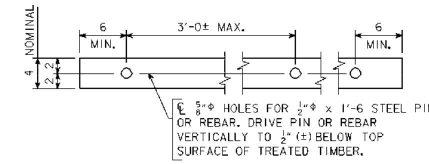
DESIGN SHEET NO. 30 OF 31 FILE NO. 29907 DESIGN NO. 305

REVISION 06-02 - SUBDRAIN ADDED TO SECTION C-C. RE10060.S01 (HSTD10060.S01 ISSUED DATE : 9/16/92)

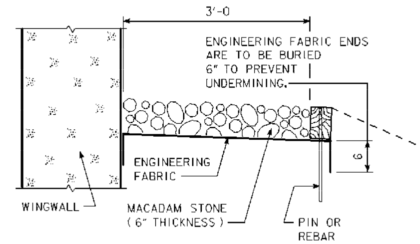
DESIGNED BY N.KOTLERS DETAILED BY R.RYSAVY	CHECKED BY E.SOUHRADA CADD FILE	MACADAM STONE SLOPE PROTECTION (INTEGRAL ABUTMENT)	STANDARD SHEET 10060	WAPELLO COUNTY	PROJECT NUMBER NHSX-034-7 (62)--3H-90	SHEET NUMBER 31



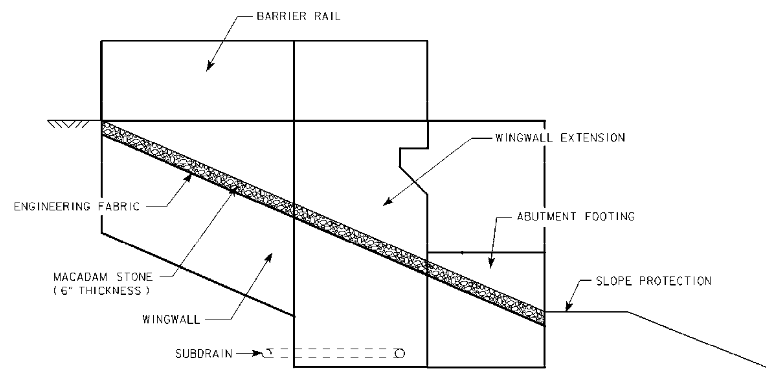
TOP VIEW OF WING ARMORING WITH WING EXTENSION



4" x 6" TREATED TIMBER EDGING DETAILS



DETAIL "A"



PROFILE VIEW OF WING ARMORING WITH WING EXTENSION

GENERAL NOTES:

MACADAM STONE SHALL BE PLACED ALONG THE SIDE OF THE WING AND ABUTMENT FOOTING AS SHOWN IN DETAIL "A". THIS IS TYPICAL AT EACH CORNER OF THE BRIDGE UNLESS OTHERWISE NOTED IN THE PLANS. THE MACADAM STONE AT THESE LOCATIONS SHALL BE UNDERLAYED WITH ENGINEERING FABRIC MEETING THE REQUIREMENTS OF 4196.01 C.

THE MACADAM STONE SHALL MEET THE REQUIREMENTS OF 4122.02, COARSE MATERIAL (NO CHOKE STONE IS ALLOWED).

WOOD PRESERVATIVE TREATMENT FOR THE TIMBER EDGING SHALL MEET THE REQUIREMENTS FOR GUARDRAIL POSTS, SAWED FOUR SIDES, AS SPECIFIED IN 4161.

THE MACADAM STONE SHALL BE DEPOSITED, SPREAD, CONSOLIDATED AND SHAPED BY MECHANICAL OR HAND METHODS THAT WILL PROVIDE UNIFORM 6" DEPTH AND DENSITY AND PROVIDE UNIFORM SURFACE APPEARANCE.

PAYMENT FOR THE BRIDGE WING ARMORING SHALL BE INCIDENTAL TO THE BID ITEM "STRUCTURAL CONCRETE (BRIDGE)" AND SHALL INCLUDE COSTS OF ALL MATERIAL AND LABOR TO CONSTRUCT THE WING ARMORING AS SHOWN ON THESE PLANS.

DESIGN FOR 23° SKEW (R.A.)

DUAL 218'-0 x 40' PRETENSIONED PRESTRESSED CONCRETE BEAM BRIDGES

50'-9 END SPANS 116'-6 INTERIOR SPAN

BRIDGE WING ARMORING - WEST & EAST

STATION : 1416+93.83 (℄ RELOCATED U.S. 34)
STATION : 24382+81.76 (℄ IOWA 16) JULY, 2005

WAPELLO COUNTY

IOWA DEPARTMENT OF TRANSPORTATION - HIGHWAY DIVISION

DESIGN SHEET NO. 31 OF 31 FILE NO. 29907 DESIGN NO. 305

CORRECTION 08-02 - PAYMENT FOR BRIDGE WING ARMOURING CLARIFIED IN NOTES.
HE1005.S01 THIS SHEET ISSUED 06-02.

DESIGNED BY N.KOTLERS DETAILED BY R.RYSAVY	CHECKED BY E.SOUHRADA CADD FILE	BRIDGE WING ARMORING - CONCRETE OR MACADAM STONE SLOPE PROTECTION	STANDARD SHEET 1005	WAPELLO COUNTY	PROJECT NUMBER NHSX-034-7 (62)--3H-90	SHEET NUMBER 32

THIS SHEET IS INCLUDED TO SHOW SOIL INFORMATION.
DETAILS AND NOTES SHOWN ELSEWHERE IN THESE PLANS SHALL BE USED FOR STRUCTURE CONSTRUCTION.

GEOTECHNICAL DESIGN

I hereby certify that this plan was prepared under my supervision and that engineering decisions with regard to the design were made by me or by other duly licensed Professional Engineers under the laws of the State of Iowa.

Robert Stanley 11-24-04

Robert L. Stanley

My license renewal date is December 31, 20 04

Pages or sheets covered by this seal: SPS.01 AND SPS.02

DESIGN FOR 23° SKEW R.A.

DUAL 218'-0 x 40'-0 PRETENSIONED PRESTRESSED CONC. BEAM BRIDGES

50'-9 END SPAN 116'-6 CENTER SPAN 50'-9 END SPAN

SITUATION PLAN

STATION: 1416+74.31 45.93 LT. (U.S. 34 W.B.)
STATION: 1417+13.34 45.93 RT. (U.S. 34 E.B.)

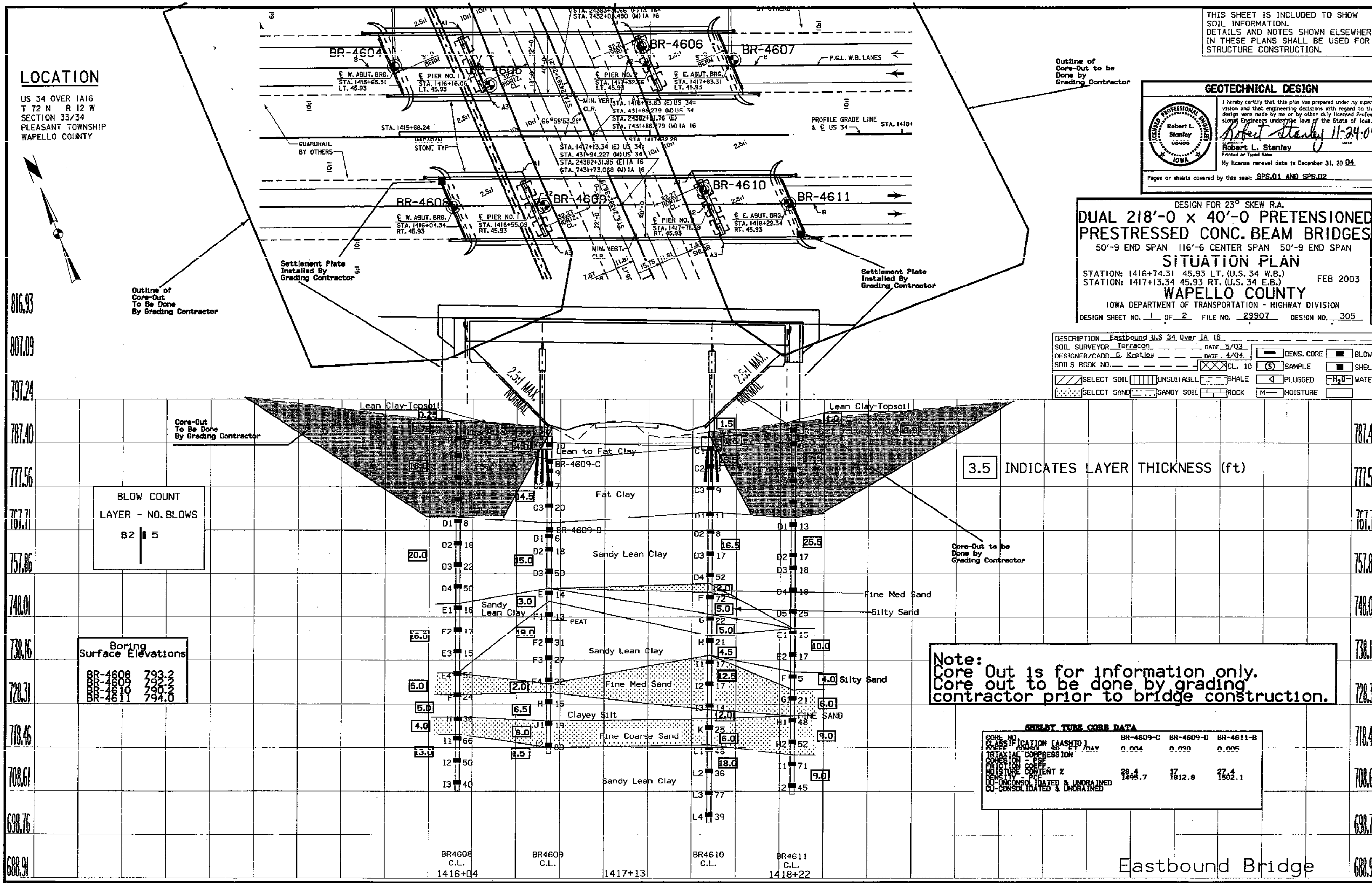
FEB 2003

WAPELLO COUNTY

IOWA DEPARTMENT OF TRANSPORTATION - HIGHWAY DIVISION

DESIGN SHEET NO. 1 OF 2 FILE NO. 29907 DESIGN NO. 305

DESCRIPTION Eastbound U.S 34 Over IA 16
SOIL SURVEYOR Terracon DATE 5/03
DESIGNER/CADD G. Kretlow DATE 4/04
SOILS BOOK NO.



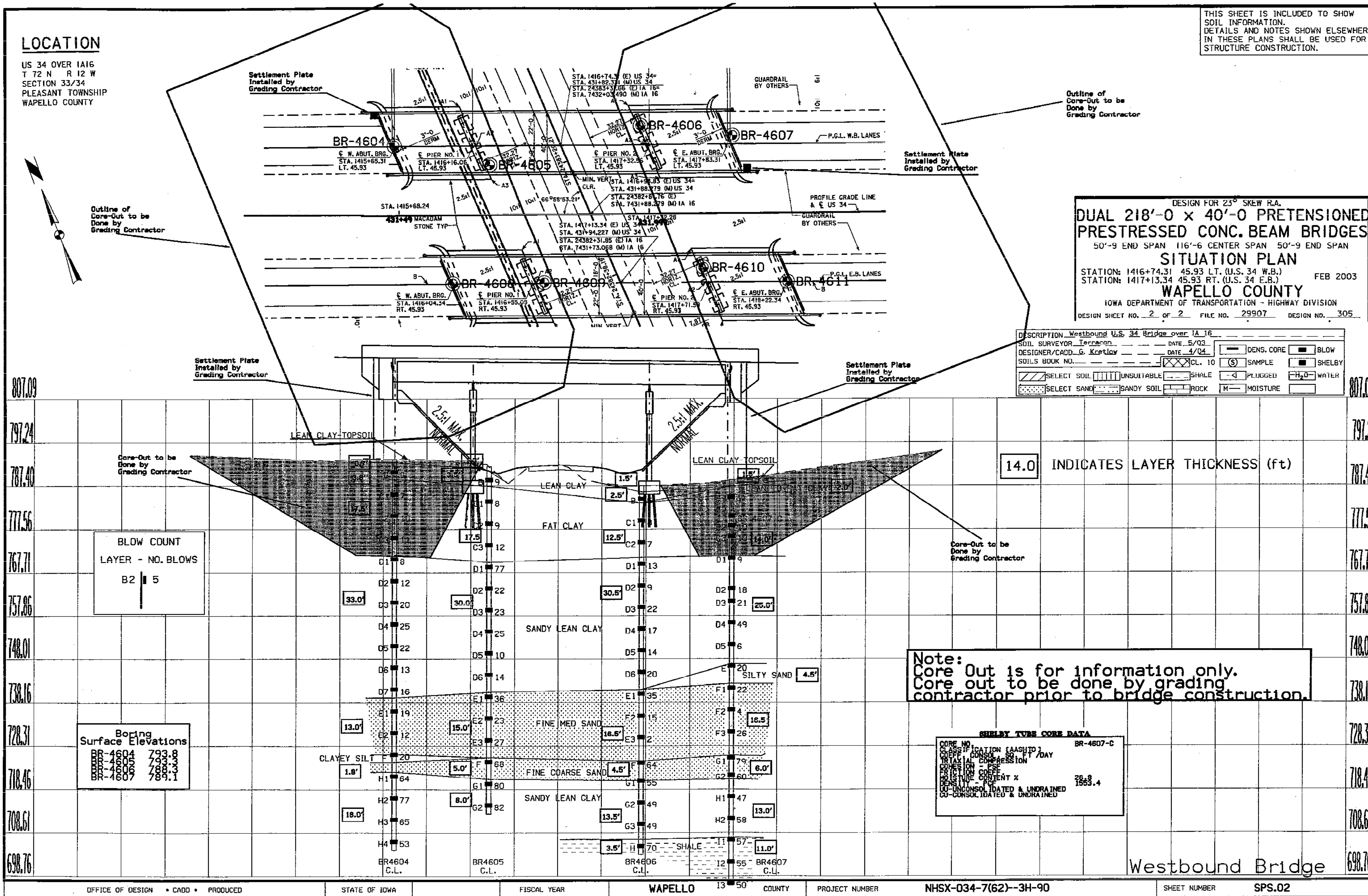
Boring Surface Elevations

BR-4608	793.2
BR-4609	792.2
BR-4610	790.2
BR-4611	794.0

Note:
Core Out is for information only.
Core out to be done by grading contractor prior to bridge construction.

SHELBY TUBE CORE DATA

CORE NO.	BR-4609-C	BR-4609-D	BR-4611-B
CLASSIFICATION [AASHTO]			
COEFF. CONSOL. SQ. FT./DAY	0.004	0.030	0.005
TRIAXIAL COMPRESSION			
COHESION - PSF			
FRICTION COEFF.			
MOISTURE CONTENT %	28.4	17	27.4
DENSITY - PCF	1495.7	1812.8	1502.1
UU-UNCONSOLIDATED & UNDRAINED			
CU-CONSOLIDATED & UNDRAINED			


LOCATION
US 34 OVER IA16
T 72 N R 12 W
SECTION 33/34
PLEASANT TOWNSHIP
WAPELLO COUNTY
THIS SHEET IS INCLUDED TO SHOW SOIL INFORMATION. DETAILS AND NOTES SHOWN ELSEWHERE IN THESE PLANS SHALL BE USED FOR STRUCTURE CONSTRUCTION.
Settlement Plate Installed by Grading Contractor
Outline of Core-Out to be Done by Grading Contractor
Core-Out to be Done by Grading Contractor
BR-4604
BR-4605
BR-4606
BR-4607
BR-4610
BR-4611
GUARDRAIL BY OTHERS
PROFILE GRADE LINE & ℄ US 34
P.G.L. W.B. LANES
P.G.L. E.B. LANES
DESIGN FOR 23° SKEW R.A.
DUAL 218'-0 x 40'-0 PRETENSIONED PRESTRESSED CONC. BEAM BRIDGES
50'-9 END SPAN 116'-6 CENTER SPAN 50'-9 END SPAN
SITUATION PLAN
STATION: 1416+74.31 45.93 LT. (U.S. 34 W.B.)
STATION: 1417+13.34 45.93 RT. (U.S. 34 E.B.)
FEB 2003
WAPELLO COUNTY
IOWA DEPARTMENT OF TRANSPORTATION - HIGHWAY DIVISION
DESIGN SHEET NO. 2 OF 2 FILE NO. 29907 DESIGN NO. 305
DESCRIPTION Westbound U.S. 34 Bridge over IA 16
SOIL SURVEYOR Terracon DATE 5/03
DESIGNER/CADD G. Kretlow DATE 4/04
LEAN CLAY-TOPSOIL
LEAN CLAY
FAT CLAY
SANDY LEAN CLAY
SILTY SAND
FINE MED SAND
CLAYEY SILT
FINE COARSE SAND
SHALE
14.0 INDICATES LAYER THICKNESS (ft)
BLOW COUNT
LAYER - NO. BLOWS
Note: Core Out is for information only. Core out to be done by grading contractor prior to bridge construction.
SHELBY TUBE CORE DATA
Boring Surface Elevations
BR-4604 793.8
BR-4605 793.3
BR-4606 788.3
BR-4607 789.1
807.09
797.24
787.40
777.56
767.71
757.86
748.01
738.16
728.31
718.46
708.61
698.76
Westbound Bridge
OFFICE OF DESIGN • CADD • PRODUCED
STATE OF IOWA
FISCAL YEAR
WAPELLO COUNTY
PROJECT NUMBER NHSX-034-7(62)--3H-90
SHEET NUMBER SPS.02

ESTIMATED ROADWAY QUANTITIES

100-0A
10-28-97

ITEM NO.	ITEM CODE	ITEM	UNIT	TOTAL	AS BUILT QUAN.
1	2301-0685120	BRIDGE APPROACH SECTIOS, DOUBLE-RE INFORC	SY	963.1	
2	2528-8445110	TRAFFIC CONTROL	LS	1	
3	2602-0000020	SILT FENCE	LF	1929	

ESTIMATE REFERENCE INFORMATION

100-4A
04-15-03

ITEM NO.	ITEM CODE	DESCRIPTION
1	2301-0685120	BRIDGE APPROACH SECTIOS, DOUBLE-RE INFORC See Tab. 112-6, Sheet C.02 for loactions and details
2	2528-8445110	TRAFFIC CONTROL See Traffic Control Plan on Sheet C.01
3	2602-0000020	SILT FENCE Tab quantity multiplied by 1.5. Use additional silt fence quantity for field adjustments and replacements. Refer to Tab. 100-17 on sheet C.02 for locations and detials.

TRAFFIC CONTROL PLAN

108-23A
09-27-94

1. Traffic will be maintained on U.S. 34 at all times.
   Co. Rd. V43 will be closed to traffic.

   Traffic will be detoured from Co. Rd. V43 east on 95th. to 20th. Ave.; then south on 20th. to existing U.S. 34.
2. Traffic control on this project shall be in accordance with Standard Road Plans RS-1, RS-2, RS-3, RS-15, RS-26A, RS-27, RS-61 AND RS-62. For additional complementary information, refer to Part VI of the Manual on Uniform Traffic Control Devices and the current Standard Specifications.
3. The contractor shall coordinate traffic control with other projects in the area.
4. All traffic control devices shall be furnished, erected, maintained, and removed by the contractor.
5. Where possible, all post mounted signs shall be placed at least 2.0 ft beyond the curb or edge of shoulder.
6. The location for storage of equipment by the contractor during non-working hours shall be as approved by the engineer in charge of construction.
7. The engineer may require modifications to the pavement marking details shown. Conflicting permanent edge lines, center lines, or lane lines shall be removed. As applicable, permanent edge lines, center lines, and lane lines shall be placed before the roadway is returned to normal traffic. The current Standard Specifications and supplemental specifications shall apply.
8. Proposed sign spacing may be modified as approved by the engineer to meet existing field conditions or to prevent obstruction of the motorist's view of permanent signing.
9. Permanent signing that conveys a message contrary to the message of the temporary signing and not applicable to the working conditions shall be covered by the contractor when directed by the engineer.
10. Proposed changes in the traffic control plan shall be reviewed for approval by RCE before changes are made.

04-03-01 203-2

During construction of this project, the contractor will be required to coordinate his operations with those of other contractors working within the same area. Other work in progress during the same period of the time will include construction of the following projects:

Project	Type of Work
NHSX-034-7(119)--3H-90	GRADING PROJECT
NHSX-034-7(059)--3H-90	GRADING PROJECT

ROADWAY DESIGN

LICENSED PROFESSIONAL ENGINEER
R. David Skogerboe
11459
IOWA

I hereby certify that this plan was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.

Signature: R. DAVID SKOGERBOE Date: 4/4/05

Printed or Typed Name

My license renewal date is December 31, 20 06

Pages or sheets covered by this seal: C.01-C.02

DESIGN NO. 305
FILE NO. 29907

POLLUTION PREVENTION PLAN

110-12A

All contractors/subcontractors shall conduct their operations in a manner that minimizes erosion and prevents sediments from leaving the highway right-of-way. The prime contractor shall be responsible for compliance and implementation of the Pollution Prevention Plan (PPP) for their entire contract. This responsibility shall be further shared with subcontractors whose work is a source of potential pollution as defined in this PPP.

1. SITE DESCRIPTION

This Pollution Prevention Plan (PPP) is for the construction of a 4 lane facility in Wapello County around the North side of Agency.
This PPP covers approximately 420 acres with an estimated 309 acres being disturbed. The portion of the PPP covered by this contract has 2 acres disturbed.
The PPP is located in an area of one type of soil association soil association (Lindley-Keswick-Weller).
The estimated average SCS runoff curve number for this PPP after completion will be 75

Refer to NHSX-034-7(119)--3H-90,NHSX-034-7(059)--3H-90 (WAPELLO CO.) plan sets for locations of typical slopes, ditch grades, and majorstructural and non-structural controls. A copy of this plan will be on file at the project engineer's office. Runoff from this work will flow into various unnamed ditches and waterwayswhich flow into the Sugar Creek and Des Moines River.

POTENTIAL SOURCES OF POLLUTION:
Site sources of pollution generated as a result of this work relate to silts and sediment which may be transported as a result of a storm event. However, this PPP provides conveyance for other (non-project related) operations. These other operations have storm water runoff, the regulation of which is beyond the control of this PPP. Potentially this runoff can contain various pollutants related to site-specific land uses. Examples are:

Rural Agricultural Activities:
Runoff from agricultural land use can potentially contain chemicals including herbicides, pesticides, fungicides and fertilizers.

Commercial and Industrial Activities:
Runoff from commercial, industrial, and commerce land use may contain constituents associated with the specific operation. Such operations are subject to potential leaks and spills which could be commingled with run-off from the facility. Pollutants associated with commercial and industrial activities are not readily available since they are typically proprietary.

2. CONTROLS

At locations where runoff can move offsite, silt fence shall be placed along the perimeter of the areas to be disturbed prior to beginning grading, excavation or clearing and grubbing operations. Vegetation in areas not needed for construction shall be preserved. As areas reach their final grade, additional silt fences, silt basins, intercepting ditches, sod flumes, letdowns, bridge end drains, and earth dikes shall be installed as specified in the plans and/or as required by the project engineer. This will include using silt fence as ditch checks and to protect intakes. Temporary stabilizing seeding shall be completed as the disturbed areas are constructed. If construction activity is not planned to occur in a disturbed area for at least 21 days, the area shall be stabilized by temporary seeding or mulching within 14 days. Other stabilizing methods shall be used outside the seeding time period.

This work shall be done in accordance with Section 2602 of the Standard Specification. If the work involved is not applicable to any contract items, the work shall be paid for according to Article 1109.03 paragraph B.

As the work progresses, additional erosion control items may be required as determined by the contractor after field investigation. The contractor will complete the construction with the establishment of permanent perennial vegetation of all disturbed areas.

3. OTHER CONTROLS

Contractor disposal of unused construction materials and construction material wastes shall comply with applicable state and local waste disposal, sanitary sewer, or septic system regulations. In the event of a conflict with other governmental laws, rules and regulations, the more restrictive laws, rules or regulations shall apply.

APPROVED STATE OR LOCAL PLANS:
During the course of this construction, it is possible that situations will arise where unknown materials will be encountered. When such situations are encountered, they will be handled according to all federal, state, and local regulations in effect at the time.

4. MAINTENANCE

The contractor is required to maintain all temporary erosion control measures in proper working order, including cleaning, repairing, or replacing them throughout the contract period. Cleaning of silt control devices shall begin when the features have lost 50% of their capacity.

5. INSPECTIONS

Inspections shall be made jointly by the contractor and the contracting authority every seven calendar days and after each rain event that is 0.5 in. or greater. The contractor shall immediately begin corrective action on all deficiencies found. The findings of this inspection shall be recorded in the project diary. This PPP may be revised based on the findings of the inspection. The contractor shall implement all revisions. All corrective actions shall be completed within 3 calendar days of the inspection.

6. NON-STORM DISCHARGES

This includes subsurface drains (i.e. longitudinal and standard subdrains), slope drains and bridge end drains. The velocity of the discharge from these features may be controlled by the use of patio blocks, Class A stone or erosion stone.

STANDARD ROAD PLANS

105-4
12-03-96

The following Standard Road Plans shall be considered applicable to construction work on this project.

NUMBER	DATE	NUMBER	DATE	NUMBER	DATE
RH-50	4/19/2005				
RH-51	4/20/2004				
RH-52	4/19/2005				
RK-20(1)	4/19/2005				
RK-20(2)	4/19/2005				
RK-20(3)	4/19/2005				
RK-21	4/19/2005				
RK-30	4/20/2004				
RM-37	4/27/1999				

BRIDGE APPROACH SECTION

Refer to the RK-Series Standard Road Plans.

112-6
04-19-05

* Not a bid item

Location		Approach Pavement						Subdrain							
Bridge Station	End	(T) Thickness	Pay Length	Non-Reinf. Pavement Area	Single-Reinf. Pavement Area	Double-Reinf. Pavement Area	Fixed or Movable Abutment	Perforated Subdrain 4" *	Subdrain Outlet *		Porous Backfill *	Class 'A' Crushed Stone Backfill *	Modified Subbase *	Polymer Grid *	Remarks
		Inches	Feet	Sq. Yds.	Sq. Yds.	Sq. Yds.	F or M	Lin. Ft.	Station	Side	Cu. Yds.	Cu. Yds.	Tons	Sq. Yds.	
1416+93.83	W	12	71.52	83.96	55.97	101.30	M	137.80	1415+00.56	L	75.86	1.31	257.9	276.3	
WB US34,	E	12	70.87	83.96	55.97	100.70	M	137.80	1418+45.37	L	85.02	1.31	257.9	276.3	
1416+93.83	W	12	70.21	83.96	55.97	100.70	M	196.85	1415+67.62	R	71.94	1.31	257.9	276.3	
EB US34	E	12	71.85	83.96	55.97	100.70	M	118.11	1418+86.06	R	53.63	1.05	257.9	276.3	

TABULATION OF SILT FENCES

100-17
11-10-83

Location			Length (Lin. Ft.)	Remarks
Station to Station		Side		
1415+18.88	1417+94.40	BOTH	1286	BERM AREAS

DESIGN NO. 305
FILE NO. 29907

DESIGN TEAM SKOGERBOE/KLUNDER	METRIC	IOWA DOT * OFFICE OF DESIGN	WAPELLO COUNTY	PROJECT NUMBER NHSX-034-7(62)--3H-90	SHEET NUMBER C.02

26-APR-2005 06:53 sgoetz W:\Projects\90034060A94\Design\Sec02\BRIDGE305.C01

Appendix C

Moment Magnification Calculations

Moment Magnification Calculations for Load Combination 1010 for Bottom of Column 1
Aashto Lrfd 5.7.4.3 and 4.5.3.2.2b

Factored Load Reactions from RC-Pier

Column 1	Column 2	Column 3
F_{y1} = 727.65 k	F_{y2} = 709.02 k	F_{y3} = 597.08 k
M_{x1} = 313.24 k*ft	M_{x2} = 311.86 k*ft	M_{x3} = 313.24 k*ft
M_{z1} = -25.43 k*ft	M_{z2} = -11.38 k*ft	M_{z3} = 23.60 k*ft

RC-Pier assumes minimum eccentricity according to Aashto Std. Spec. 8.16.5.2.8

e_{min} = 0.6 + 0.03*h = 0.6 + (0.03)*(30”) = 1.5” = 0.125’

$M_{x\_min1} = M_{z\_min1} = (F_{y1})*(e_{min})$ = (727.65 k)*(0.125’) = 90.956 k*ft
$M_{x\_min2} = M_{z\_min2} = (F_{y2})*(e_{min})$ = (709.02 k)*(0.125’) = 88.628 k*ft
$M_{x\_min3} = M_{z\_min3} = (F_{y3})*(e_{min})$ = (597.08 k)*(0.125’) = 74.635 k*ft

Factored Loads Considered

Column 1	Column 2	Column 3
F_{y1} = 727.65 k	F_{y2} = 709.02 k	F_{y3} = 597.08 k
M_{x1} = 313.24 k*ft	M_{x2} = 311.86 k*ft	M_{x3} = 313.24 k*ft
M_{z1} = -90.956 k*ft	M_{z2} = -88.628 k*ft	M_{z3} = 74.635 k*ft

Moment Magnification from Aashto Lrfd 4.5.3.2.2b with RC-Pier Modifications

$M_c = \delta_b M_{2b} + \delta_s M_{2s}$ RC-Pier modifies this equation for unbraced frames by assuming
$M_c = \delta_s M_2$ that all moments are to be magnified by δ_s alone.

where $\delta_s = 1 / [1 - \Sigma P_u/(\phi_k * \Sigma P_e)]$

$\phi_k = 0.75$ Stiffness reduction factor for concrete
$P_e = \pi^2 * EI/(k*l_u)^2$ Euler buckling load
$EI = (E_c * I_g/2.5)/(1 + \beta_d)$ Flexural column stiffness
β_d is ratio of maximum factored dead load moment to maximum factored total moment, always positive

Calculate β_d = | Maximum Factored Dead Load Moment / Maximum Factored Total Load Moment |

Loads from RC-Pier

Unfactored Self-weight

F_{y1} = 40.10 k	F_{y2} = 44.88 k	F_{y3} = 40.10 k
M_{x1} = 0.00 k*ft	M_{x2} = 0.00 k*ft	M_{x3} = 0.00 k*ft
M_{z1} = -0.41 k*ft	M_{z2} = 0.00 k*ft	M_{z3} = 0.41 k*ft

Unfactored DC loads

F_{y1} = 305.22 k	F_{y2} = 282.22 k	F_{y3} = 305.22 k
M_{x1} = 0.00 k*ft	M_{x2} = 0.00 k*ft	M_{x3} = 0.00 k*ft
M_{z1} = 4.87 k*ft	M_{z2} = 0.00 k*ft	M_{z3} = -4.87 k*ft

Factored Self-weight (Load factor = 1.25)

F_{y1} = 50.125 k	F_{y2} = 56.10 k	F_{y3} = 50.125 k
M_{x1} = 0.00 k*ft	M_{x2} = 0.00 k*ft	M_{x3} = 0.00 k*ft
M_{z1} = -0.5125 k*ft	M_{z2} = 0.00 k*ft	M_{z3} = 0.5125 k*ft

Factored DC loads (Load factor = 1.25)

F_{y1} = 381.525 k	F_{y2} = 352.775 k	F_{y3} = 381.525 k
M_{x1} = 0.00 k*ft	M_{x2} = 0.00 k*ft	M_{x3} = 0.00 k*ft
M_{z1} = 6.0875 k*ft	M_{z2} = 0.00 k*ft	M_{z3} = -6.0875 k*ft

Factored Self-weight + DC loads

F_{y1} = 431.650 k	F_{y2} = 408.875 k	F_{y3} = 431.650 k
M_{x1} = 0.00 k*ft	M_{x2} = 0.00 k*ft	M_{x3} = 0.00 k*ft
M_{z1} = 5.575 k*ft	M_{z2} = 0.00 k*ft	M_{z3} = -5.575 k*ft

Check M_{min} due to minimum eccentricity (e_{min} = 0.125')

$M_{x\_min1} = M_{z\_min1}$ = (431.650 k)*(0.125') = 53.956 k*ft

$M_{x\_min2} = M_{z\_min2}$ = (408.875 k)*(0.125') = 51.109 k*ft

$M_{x\_min3} = M_{z\_min3}$ = (431.650 k)*(0.125') = 53.956 k*ft

Factored Loads considered for β_d

F_{y1} = 431.650 k	F_{y2} = 408.875 k	F_{y3} = 431.650 k
M_{x1} = 53.956 k*ft	M_{x2} = 51.109 k*ft	M_{x3} = 53.956 k*ft
M_{z1} = 53.956 k*ft	M_{z2} = 51.109 k*ft	M_{z3} = -53.956 k*ft

β_d Calculations

Column 1
β_{dx1} = | (53.956 k*ft) / (313.24 k*ft) | = 0.172252
β_{dz1} = | (53.956 k*ft) / (-90.956 k*ft) | = 0.593211

Column 2
β_{dx2} = | (51.109 k*ft) / (311.86 k*ft) | = 0.163886
β_{dz2} = | (51.109 k*ft) / (-88.628 k*ft) | = 0.576676

Column 3
β_{dx3} = | (53.956 k*ft) / (313.24 k*ft) | = 0.172252
β_{dz3} = | (53.956 k*ft) / (-74.635 k*ft) | = 0.722935

Calculate EI = $(E_c*I_g/2.5)/(1 + \beta_d)$

$E_c = (33)*(150 \text{ pcf})^{1.5}*(3500 \text{ psi})^{0.5}*[(144 \text{ in}^2/\text{ft}^2) / (1000 \text{ lb/k})]$ = 516,472.7 ksf

$I_g = 0.25*\pi*r^4 = 0.25*\pi*(0.5*2.5')^4 = 1.9175 \text{ ft}^4$

Column 1
$EI_{x1} = [(516{,}472.7 \text{ ksf})*(1.9175 \text{ ft}^4) / 2.5] / (1 + 0.172252) = 337{,}921.8 \text{ k*ft}^2$
$EI_{z1} = [(516{,}472.7 \text{ ksf})*(1.9175 \text{ ft}^4) / 2.5] / (1 + 0.593211) = 248{,}636.0 \text{ k*ft}^2$

Column 2
$EI_{x2} = [(516{,}472.7 \text{ ksf})*(1.9175 \text{ ft}^4) / 2.5] / (1 + 0.163886) = 340{,}350.9 \text{ k*ft}^2$
$EI_{z2} = [(516{,}472.7 \text{ ksf})*(1.9175 \text{ ft}^4) / 2.5] / (1 + 0.576676) = 251{,}243.4 \text{ k*ft}^2$

Column 3
$EI_{x3} = [(516{,}472.7 \text{ ksf})*(1.9175 \text{ ft}^4) / 2.5] / (1 + 0.172252) = 337{,}921.8 \text{ k*ft}^2$
$EI_{z3} = [(516{,}472.7 \text{ ksf})*(1.9175 \text{ ft}^4) / 2.5] / (1 + 0.722935) = 229{,}915.6 \text{ k*ft}^2$

Calculate $P_e = (\pi^2 * EI)/(k * l_u)^2$ $k_x = 2.1$, $k_z = 1.2$, $l_u = 20.5'$

Column 1 $P_{ex1} = [(\pi^2)*(337{,}921.8\ k*ft^2)] / [(2.1)*(20.5')]^2 = 1799.574\ k$

$P_{ez1} = [(\pi^2)*(248{,}636.0\ k*ft^2)] / [(1.2)*(20.5')]^2 = 4055.025\ k$

Column 2 $P_{ex2} = [(\pi^2)*(340{,}350.9\ k*ft^2)] / [(2.1)*(20.5')]^2 = 1812.51\ k$

$P_{ez2} = [(\pi^2)*(251{,}243.4\ k*ft^2)] / [(1.2)*(20.5')]^2 = 4097.55\ k$

Column 3 $P_{ex3} = [(\pi^2)*(337{,}921.8\ k*ft^2)] / [(2.1)*(20.5')]^2 = 1799.574\ k$

$P_{ez3} = [(\pi^2)*(229{,}915.6\ k*ft^2)] / [(1.2)*(20.5')]^2 = 3749.712\ k$

Calculate $\delta_s = 1 / [1 - \Sigma P_u/(\phi_k * \Sigma P_e)]$ for Column 1

Column 1 $\delta_{sx} = 1 / [1 - (727.65\ k + 709.02\ k + 597.08\ k) / [(0.75)*(1799.574\ k + 1812.51\ k + 1799.574\ k)]]$

$= 2.0043$

$\delta_{sz} = 1 / [1 - (727.65\ k + 709.02\ k + 597.08\ k) / [(0.75)*(4055.025\ k + 4097.55\ k + 3749.712\ k)]]$

$= 1.2950$

Factored Loads with Magnification for Column 1

$F_{y1} = 727.65\ k$

$M_{x1} = (313.24\ k*ft)*(2.0043) = 627.827\ k*ft$

$M_{z1} = (-90.956\ k*ft)*(1.2950) = -117.793\ k*ft$

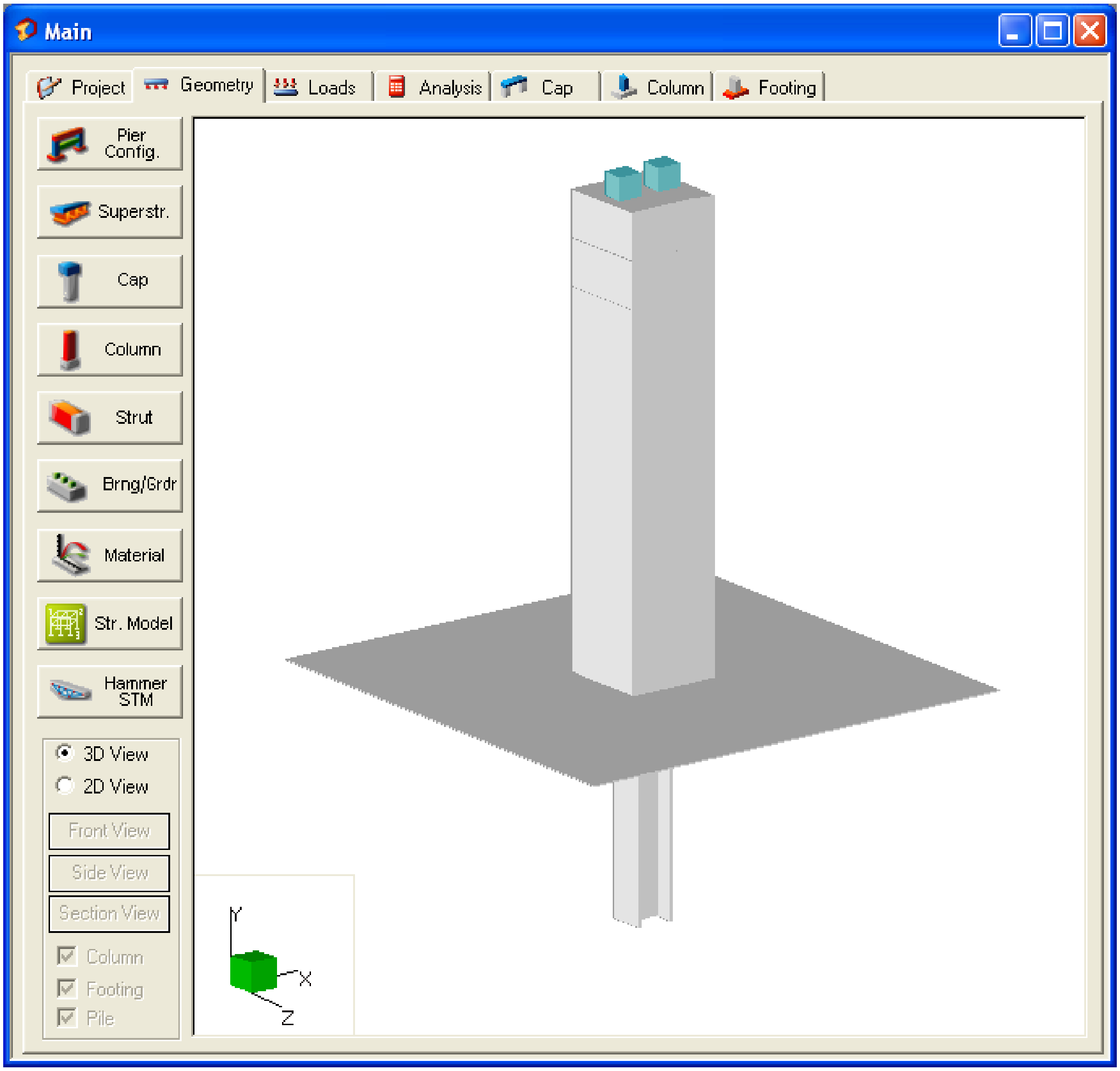
Appendix D

RC-Pier and Footing Surcharge

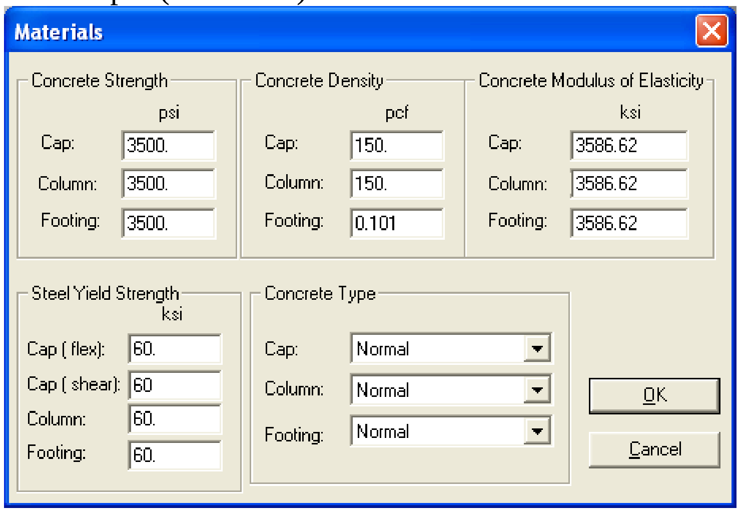
The user needs to be aware of how RC-Pier handles footing surcharge loads:

- Load factors are not applied to the footing surcharge if the EV load case is not specified on the Loads tab.

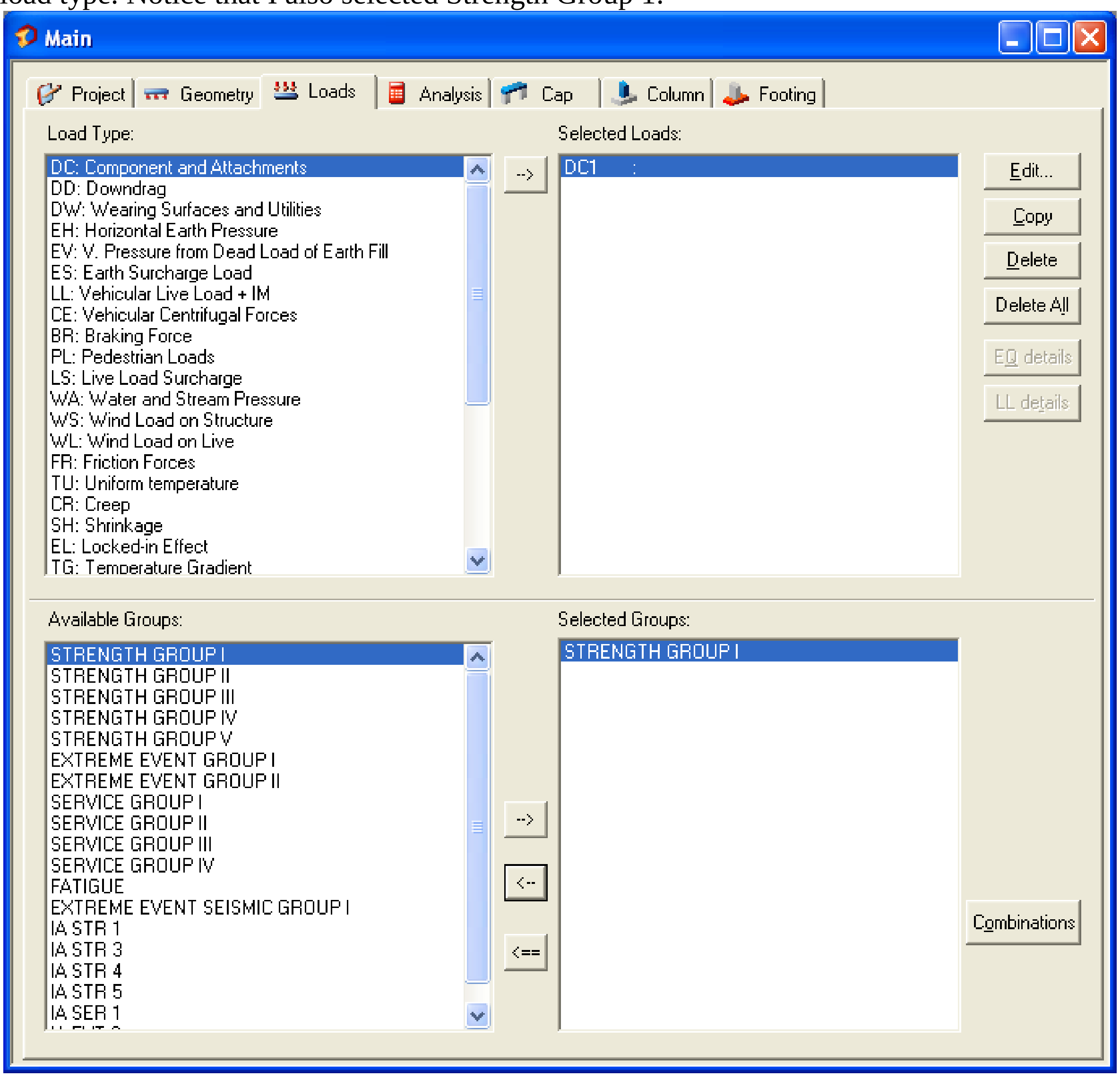
The problem will be illustrated using a simple example. Consider the unusual pier below. The cap is 2’ x 2’ x 2’. The column is 2’ x 2’ x 8’ tall. The footing is 10’ x 10’ x 0.5” thick. There is one pile in the center of the footing. Two bearings are centered over the column.



I modeled the pier like this to make it easier to see what the loads are. Essentially the footing weight is 0 kips because it is very thin and because I set the unit weight of the footing to the really small value of 0.101 pcf (see below).



On the Loads tab I selected only load type DC; however, I didn't enter any loads for the DC1 load type. Notice that I also selected Strength Group 1.



The only load on my pier footing at this point is the self-weight of the cap and column. Remember that the footing is "weightless".

Unfactored Cap + Column Weight = (2')*(2')*(2' + 8')*(0.150 kcf) = 6 kips
Max. Factored Cap + Column Weight = (1.25)*(6 kips) = 7.50 kips
Min. Factored Cap + Column Weight = (0.90)*(6 kips) = 5.40 kips

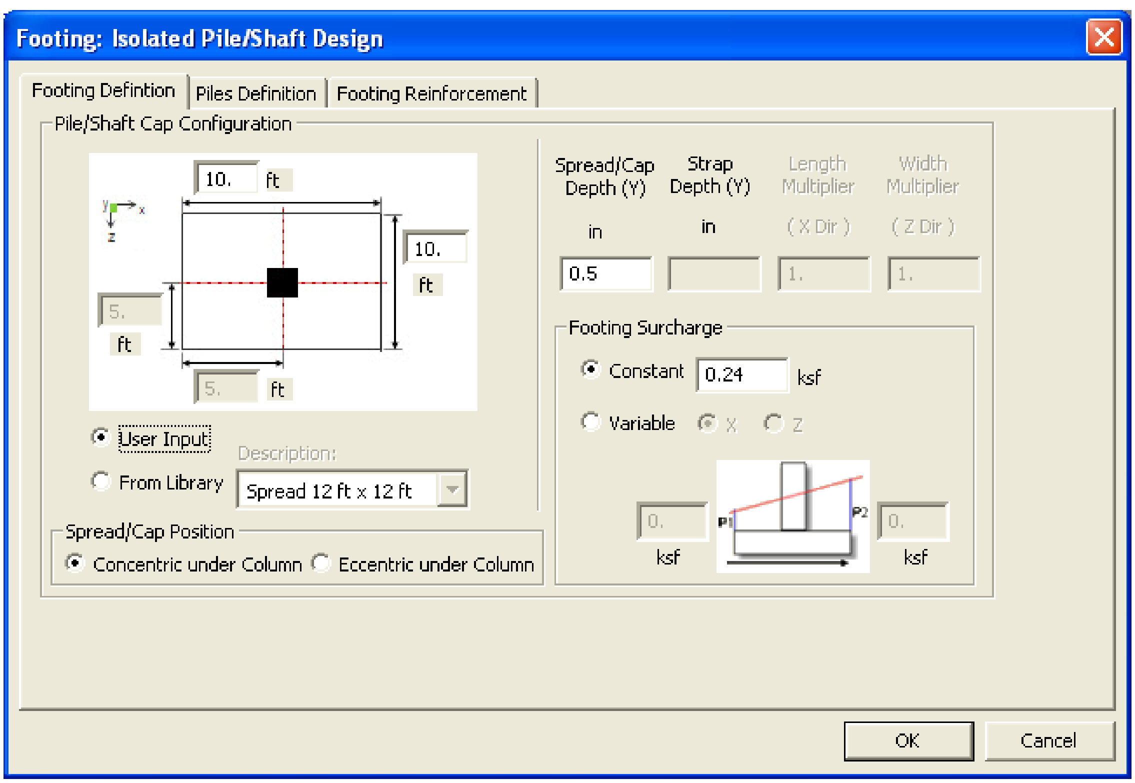
If I check the Design Status of my footing pile (since I only have one pile) in RC-Pier I can see that my calculations above concur with RC-Pier's results for the maximum and minimum factored pile reaction.

Pile Reactions, Factored

Pile	Loc(X) ft	Loc(Z) ft	X in	Z in	comb	Ovs	P kips	Mxx kft	Mzz kft	Pile Reac. kips
1	0.00	-5.00	60.0	0.0	1	—	-7.50	0.00	-0.00	7.50
					3	—	-5.40	0.00	-0.00	5.40

Now let's add in a footing surcharge load and see how RC-Pier handles that. We will assume we have 2' of fill on the footing and that the unit soil weight is 0.120 kcf.

Constant Footing Surcharge = (2')*(0.120 kcf) = 0.240 ksf



When we check the Design Status of our footing in RC-Pier we get the following results:

Pile Reactions, Factored

Pile	Loc(X) ft	Loc(Z) ft	X in	Z in	comb	Ovs	P kips	Mxx kft	Mzz kft	Pile Reac. kips
1	0.00	-5.00	60.0	0.0	1	—	-7.50	0.00	-0.00	31.50
					2	—	-5.40	0.00	-0.00	29.40

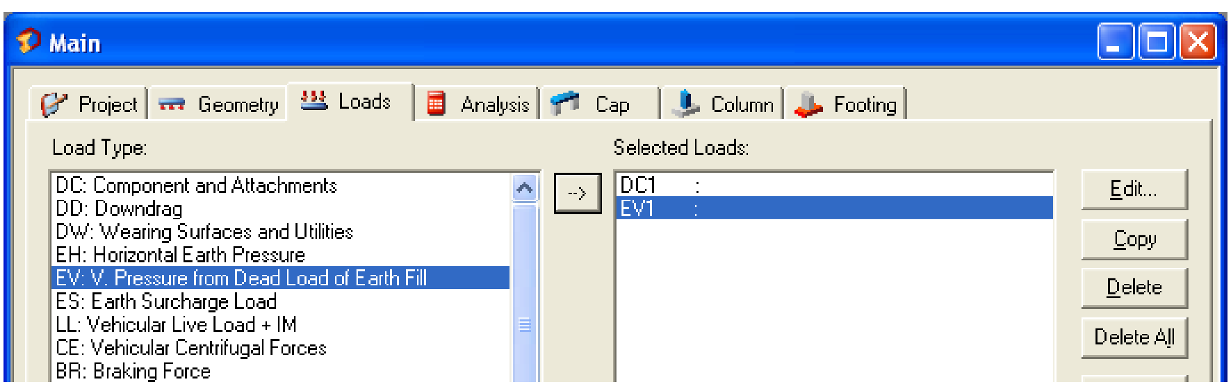
Footing Design : Notes
Only max. force in piles is considered for design.
Pile coordinates X and Z are from the most left edge of the footing.
Plong= Lateral load in longitudinal direction at the top of pile, Kips.
Php= Available resisting horizontal component due to batter= batter * Vertical pile reaction, Kips.
Plong-Php= Remaining lateral force required to resist by pile.

Max. Pile Reaction Used in Design: (without selfweight and surcharge)	
Factored pile reaction	7.50 kips

The maximum factored pile reaction is now 31.50 kips. We can calculate this as follows:

Unfactored Surcharge Load = (0.240 ksf)*(10')*(10') = 24.00 kips
Max. Pile Rxn = (Max. Factored Cap + Column Weight) + (Unfactored Surcharge Load)
Max. Pile Rxn = 7.50 kips + 24.00 kips = 31.50 kips

So we can see that the surcharge load is <u>not</u> being factored. Now let's see what happens when we add the EV load on the Loads tab screen as shown below. Note that we are not actually entering any load as an EV1 load or as a DC1 load.



This time we get the different results as shown below.

Pile Reactions, Factored										
Pile	Loc(X) ft	Loc(Z) ft	X in	Z in	comb	Ovs	P kips	Mxx kft	Mzz kft	Pile Reac. kips
1	0.00	-5.00	60.0	0.0	1	—	-7.50	0.00	-0.00	39.90
					4	—	-5.40	0.00	-0.00	27.00

Footing Design : Notes
Only max. force in piles is considered for design.
Pile coordinates X and Z are from the most left edge of the footing.
Plong= Lateral load in longitudinal direction at the top of pile, Kips.
Php= Available resisting horizontal component due to batter= batter * Vertical pile reaction, Kips.
Plong-Php= Remaining lateral force required to resist by pile.

Max. Pile Reaction Used in Design: (without selfweight and surcharge)	
Factored pile reaction	7.50 kips

The maximum factored pile reaction is now 39.90 kips. We can calculate this as follows:

Factored Surcharge Load = (1.35)*(24.00 kips) = 32.40 kips
Max. Pile Rxn = (Max. Factored Cap + Column Weight) + (Factored Surcharge Load)
Max. Pile Rxn = 7.50 kips + 32.40 kips = 39.90 kips

So we can see that the surcharge load is being factored when we add EV to the Loads tab screen. [Note that I also tried an ES load instead of an EV load. The ES load did not result in a load factor being applied to the Footing Surcharge load.] So, the Footing Surcharge is only factored when the EV load is specified on the Loads tab screen. Excluding the load factor for the fill loads on the footing can be fairly significant if you have a deep fill and relatively light superstructure loads.

So, if you typically enter the footing surcharge load on the Footing tab then you should still supply an EV load on the Loads tab even if you don't enter a load for it. Apparently RC-Pier hasn't always functioned in this manner. An office example I put together for 305 Wapello around 10/10/2006 (RC-Pier Version 4.1.0) shows some calculations that make it apparent that the load factor was being included in the footing surcharge load when it was entered on the Footing tab, but no EV load was specified on the Loads tab.

One recommended procedure might be to enter the footing fill load for each pier footing as an EV load near the bottom of each column on the Loads tab. [I recommend the load be placed just a fraction above the bottom of the column for the RC-Pier footing design runs since that ensures the Analysis Results on the Analysis tab reflect the load.] Doing it this way may affect whether or not you want to make use of RC-Pier to design your footing reinforcement since it will have some effect on those results.

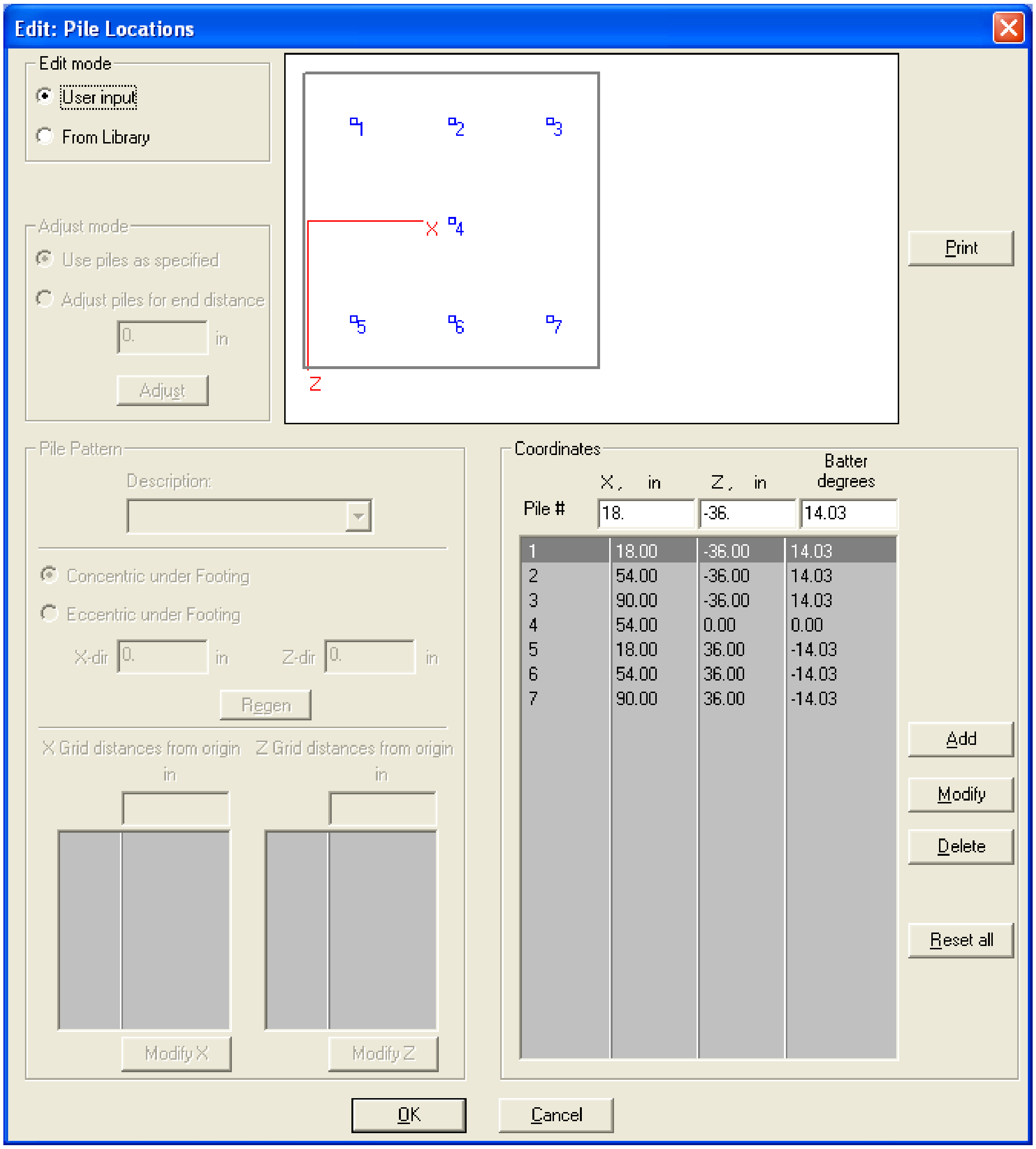
An interesting side note concerns the footing self-weight applied by RC-Pier. Not that you would ever do this, but… if you were ever to do a run of RC-Pier with no DC loads then you would find that the cap and column self-weight would not be included as a load on your footing. However, the footing self-weight would be applied to your footing, but it would not have a load factor applied.

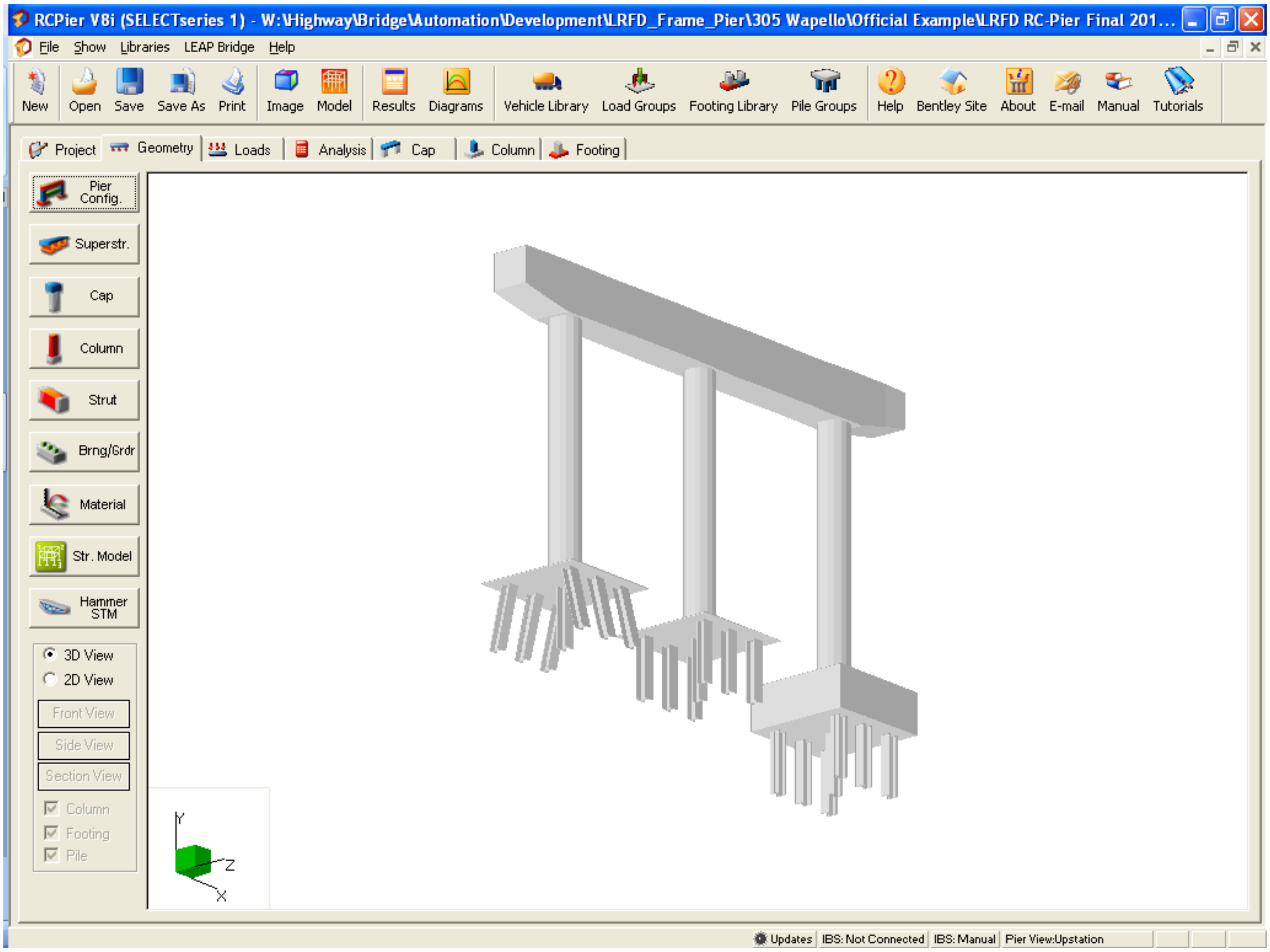
Finally it should be noted that the column area is not deducted from the footing area when the footing surcharge is actually computed. Normally this isn't a big deal since the column area is generally quite a bit smaller than the footing area, but it is something to keep in mind.

Appendix E

RC-Pier and Battered Piles

As you may have seen, RC-Pier allows the user to enter pile batter in the z-axis direction only. For instance, in the figure below I have entered a batter of 14.03 degrees which is approximately a 1:4 batter. When a pile batter is entered the program prints some additional output to the Pile Reactions table. Some of the calculations for this additional output are demonstrated on the following pages.

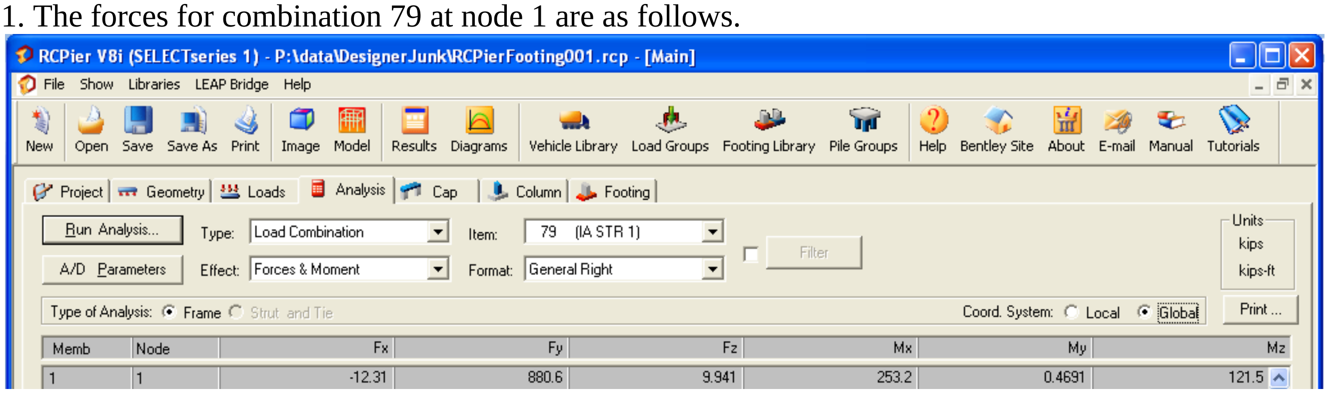




For these example calculations we are going to run only one combination (#79).

```
Comb #    79  (IA STR 1     ) = 1.00 (  1.25 DC1 + 1.50 DW1 + 1.35 EV1 + 1.75 LL1
                                      - 1.75 BR1 + 0.50 TU1 + 0.50 SH2 )
```

We are only going to look at the calculations for footing 1 which corresponds with node 1 of member 1. The forces for combination 79 at node 1 are as follows.



The pile reactions for this footing are as follows. The last three columns of output are printed because we have input a pile batter.

Pile Reactions, Factored

Pile	Loc(X) ft	Loc(Z) ft	X in	Z in	Batter degree	comb	Ovs	P kips	Mxx kft	Mzz kft	Pile Reac. kips	Php kips	Plong kips	Plong-Php kips
1	-3.00	-1.50	18.0	-36.0	14	79	—	-880.62	-253.16	-121.55	129.74	32.42	-1.42	31.00 #
						79	—	-880.62	-253.16	-121.55	129.74	32.42	-1.42	31.00 #
2	0.00	-1.50	54.0	-36.0	14	79	—	-880.62	-253.16	-121.55	139.87	34.95	-1.42	33.53 #
						79	—	-880.62	-253.16	-121.55	139.87	34.95	-1.42	33.53 #
3	3.00	-1.50	90.0	-36.0	14	79	—	-880.62	-253.16	-121.55	150.00*	37.48	-1.42	36.06 #
						79	—	-880.62	-253.16	-121.55	150.00*	37.48	-1.42	36.06 #
4	0.00	-4.50	54.0	0.0	0	79	—	-880.62	-253.16	-121.55	125.80	0.00	-1.42	-1.42
						79	—	-880.62	-253.16	-121.55	125.80	0.00	-1.42	-1.42
5	-3.00	-7.50	18.0	36.0	-14	79	—	-880.62	-253.16	-121.55	101.61	-25.39	-1.42	-26.81
						79	—	-880.62	-253.16	-121.55	101.61	-25.39	-1.42	-26.81
6	0.00	-7.50	54.0	36.0	-14	79	—	-880.62	-253.16	-121.55	111.74	-27.92	-1.42	-29.34
						79	—	-880.62	-253.16	-121.55	111.74	-27.92	-1.42	-29.34
7	3.00	-7.50	90.0	36.0	-14	79	—	-880.62	-253.16	-121.55	121.87	-30.45	-1.42	-31.87
						79	—	-880.62	-253.16	-121.55	121.87	-30.45	-1.42	-31.87

Footing Design : Notes
* Factored Force in pile is greater than factored pile capacity.
# = Pile needs to resist remaining lateral force.
Only max. force in piles is considered for design.
Pile coordinates X and Z are from the most left edge of the footing.
Plong= Lateral load in longitudinal direction at the top of pile, Kips.
Php= Available resisting horizontal component due to batter= batter * Vertical pile reaction, Kips.
Plong-Php= Remaining lateral force required to resist by pile.

The following calculations are developed for pile #1.
The section moduli for pile #1 in the X and Z directions with respect to the center of the footing are:

Sx = [(2 rows)*(3 piles)*(3')^2] / 3' = 18 pile*ft
Sz = [(2 rows)*(2 piles)*(3')^2] / 3' = 12 pile*ft

The pile reaction for pile #1 is:

Pile Rxn = [(880.62 k) / (7 piles)] + [(253.16 k*ft) / (18 pile*ft)] -
[(121.55 k*ft) / (12 pile*ft)] = 129.74 k

The horizontal component of the pile reaction due to pile batter is:

Php = (129.74 k) * (tan(14.03 deg)) = 32.42 k

The lateral forces on the pile are as follows. RC-Pier currently ignores Fx forces since they are perpendicular to the direction of batter.

Fx = (12.31 k) / (7 piles) = 1.76 k
Fz = (-9.941 k) / (7 piles) = -1.42 k

Plong = Fz = -1.42 k

The sign convention for this lateral force and the horizontal component of the pile reaction are opposed and thus RC-Pier assumes:

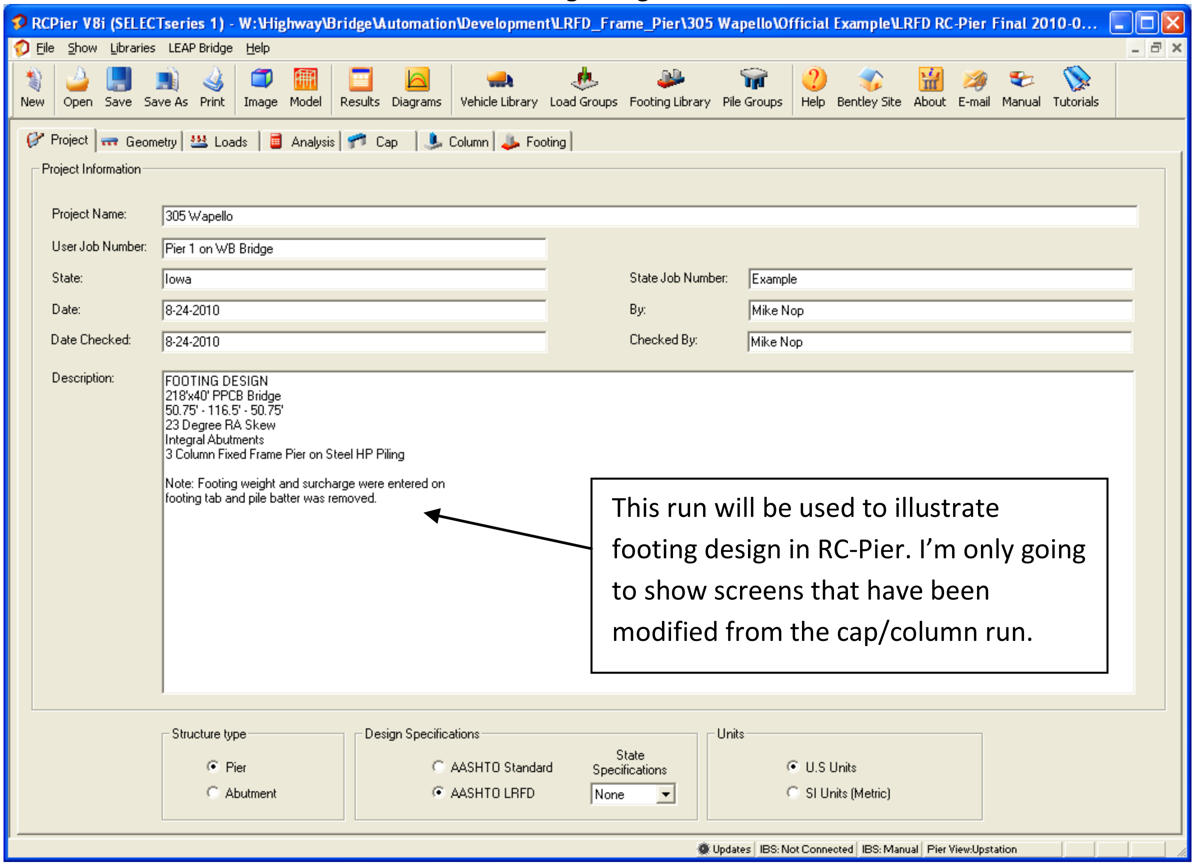
Plong-Php = 32.42 k - 1.42 k = 31.00 k

It appears (from additional testing) that RC-Pier flags any positive value for "Plong-Php" as a failure. The additional RC-Pier output for battered piles is somewhat confusing and, for the time being, you should simply refer to the Bridge Design Manual for guidance in dealing with lateral pile forces for vertical and battered piles.

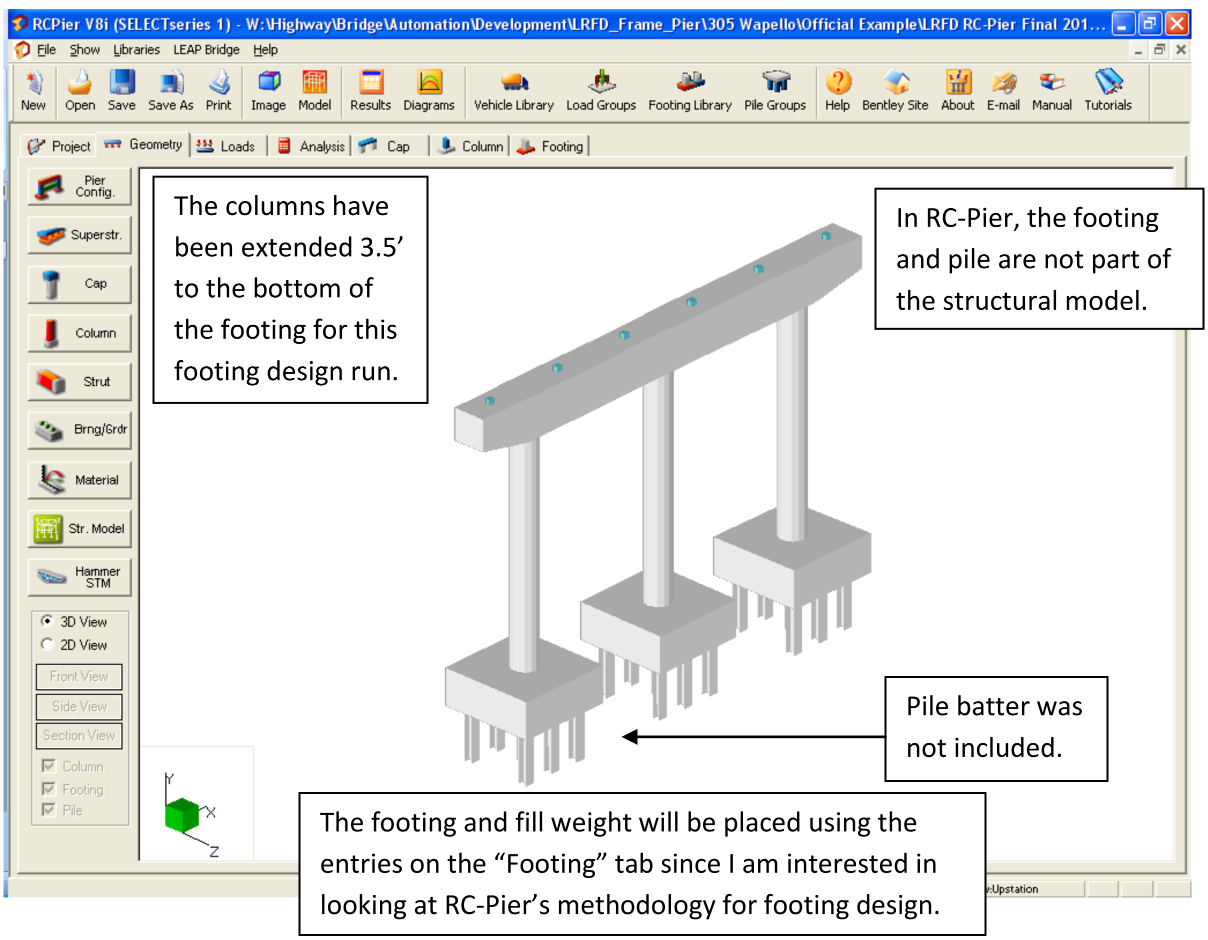
> BDM 6.6.4.1.3.1
> "The pile group supporting a pier footing shall be checked for lateral loading [OBS MM No. 9]. Each vertical pile may be assumed to have shear resistance, and each battered pile may be assumed to have shear resistance plus the horizontal component of the axial resistance. See the pile resistance guidelines for steel H-piles [BDM 6.2.6.1] and for timber piles [BDM 6.2.6.3]."

Appendix F

RC-Pier and Pile Footing Design: Flexure and Shear



This run will be used to illustrate footing design in RC-Pier. I'm only going to show screens that have been modified from the cap/column run.

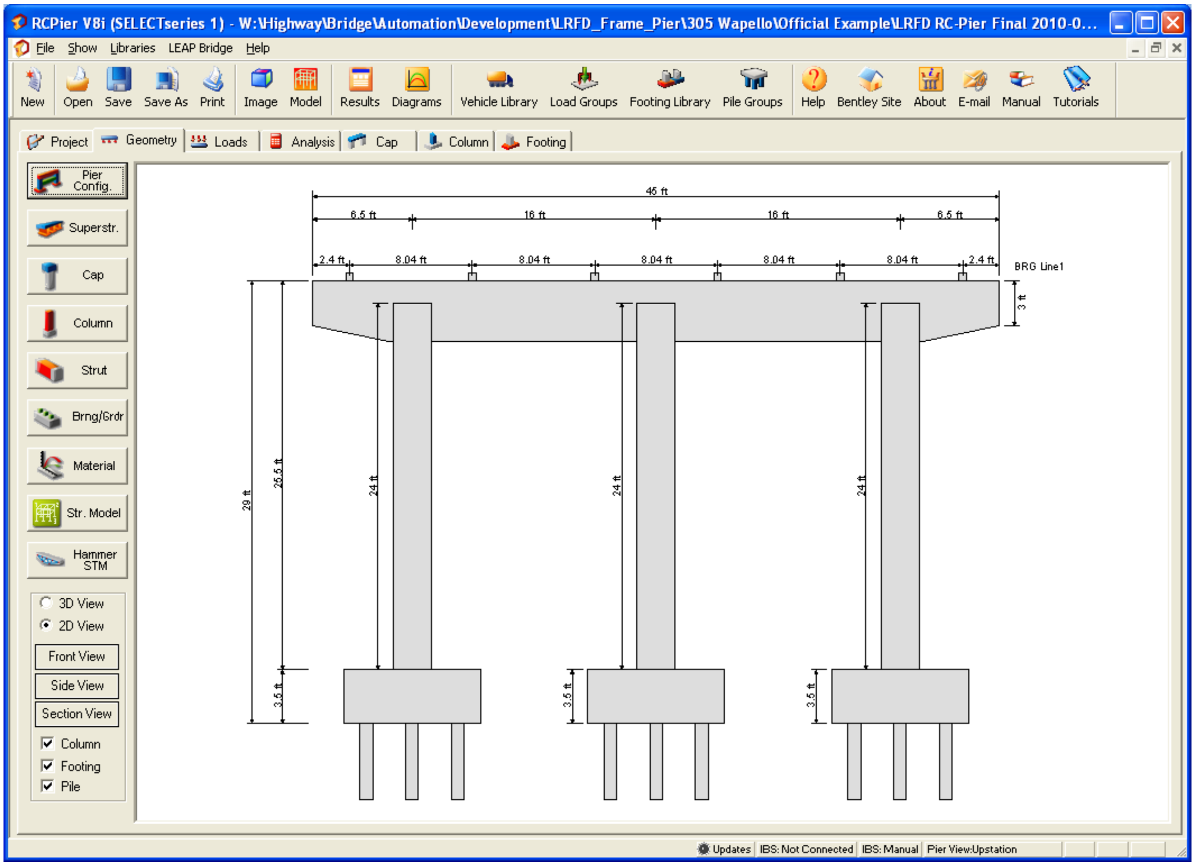


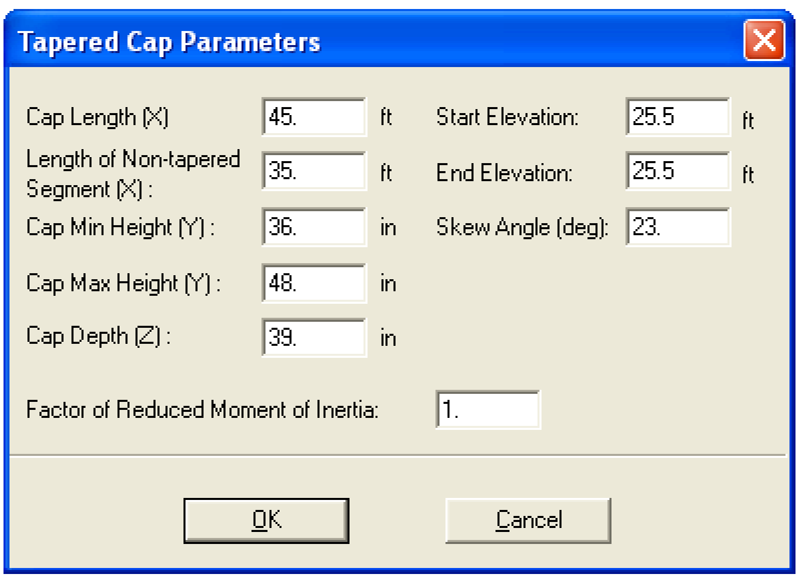
The columns have been extended 3.5' to the bottom of the footing for this footing design run.

In RC-Pier, the footing and pile are not part of the structural model.

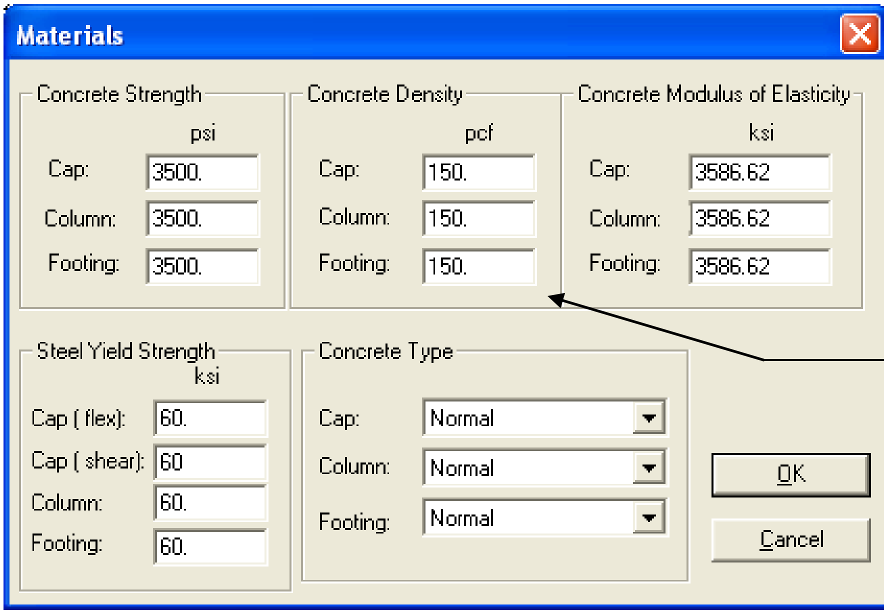
Pile batter was not included.

The footing and fill weight will be placed using the entries on the "Footing" tab since I am interested in looking at RC-Pier's methodology for footing design.

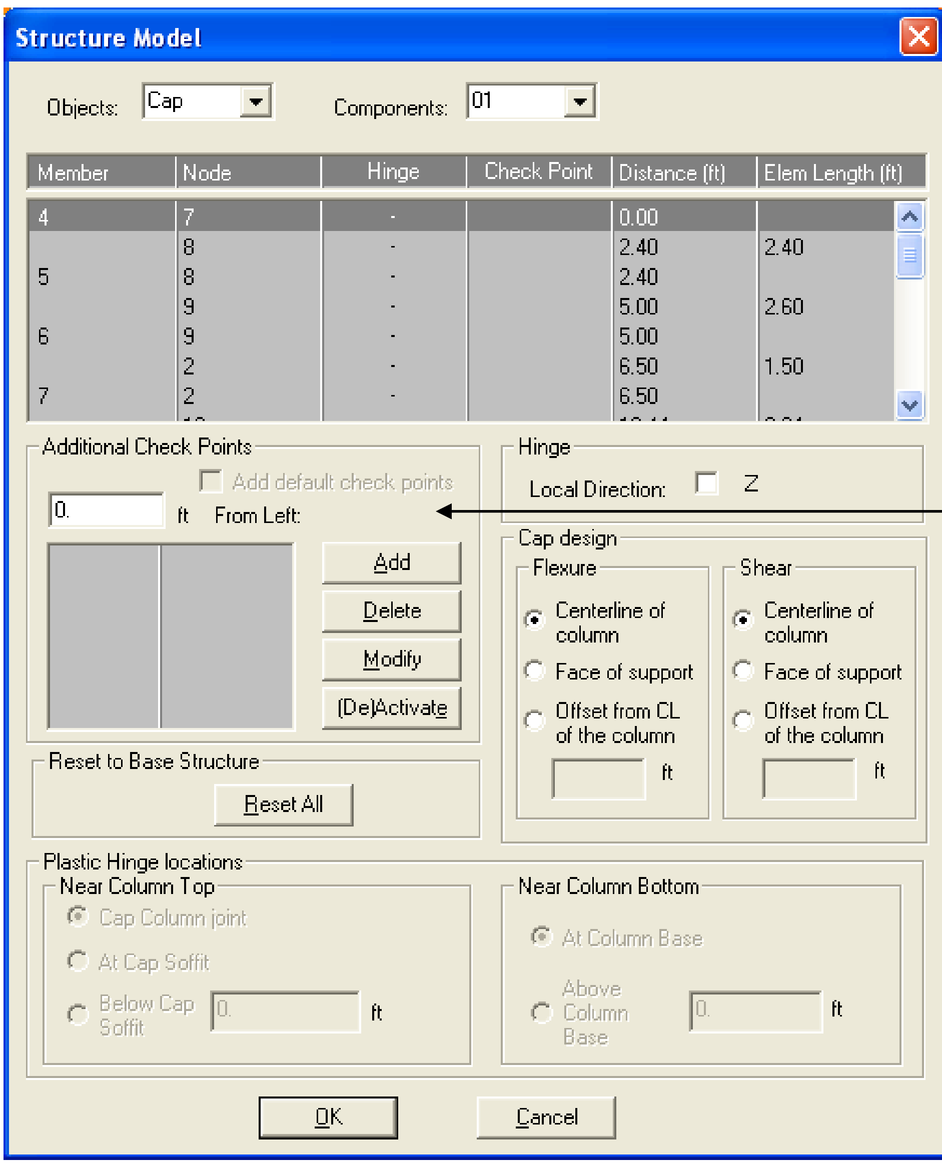




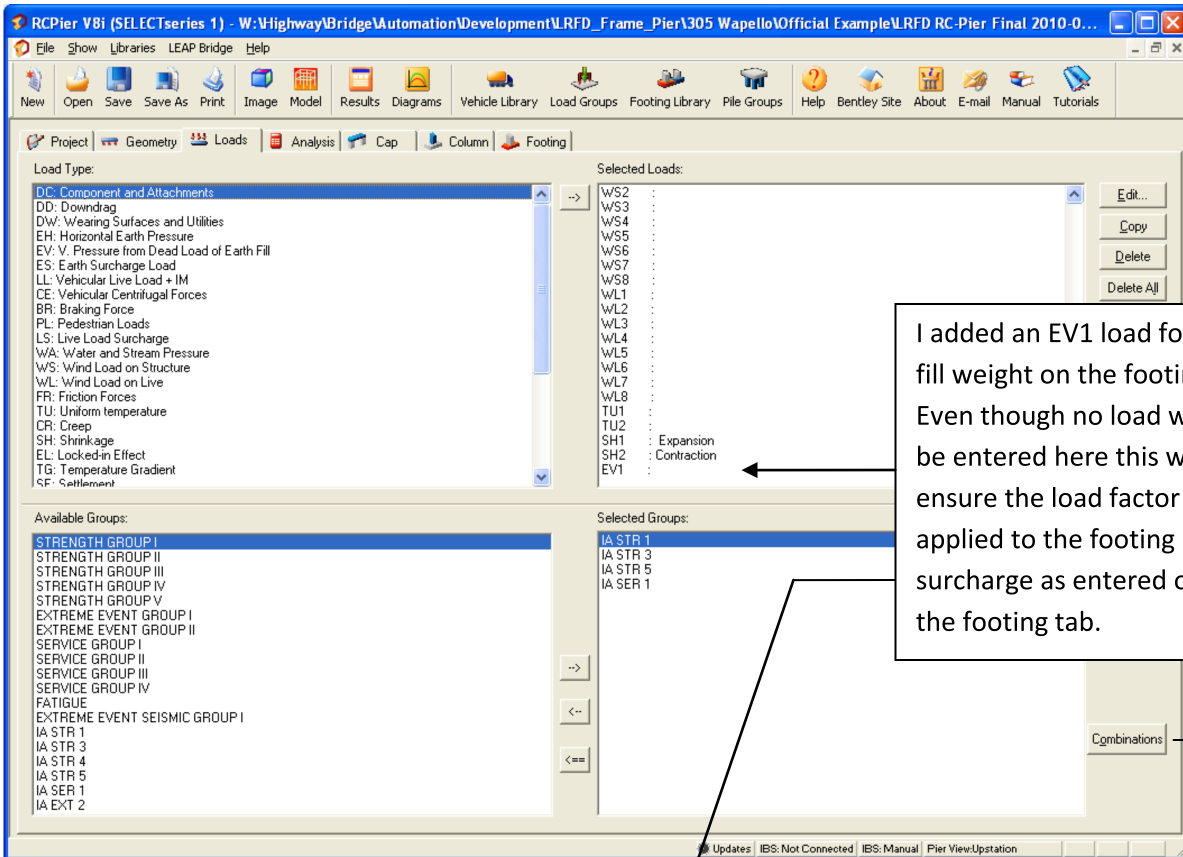
Notice that the column length has been increased by 3.5’ from 22’ to 25.5’.



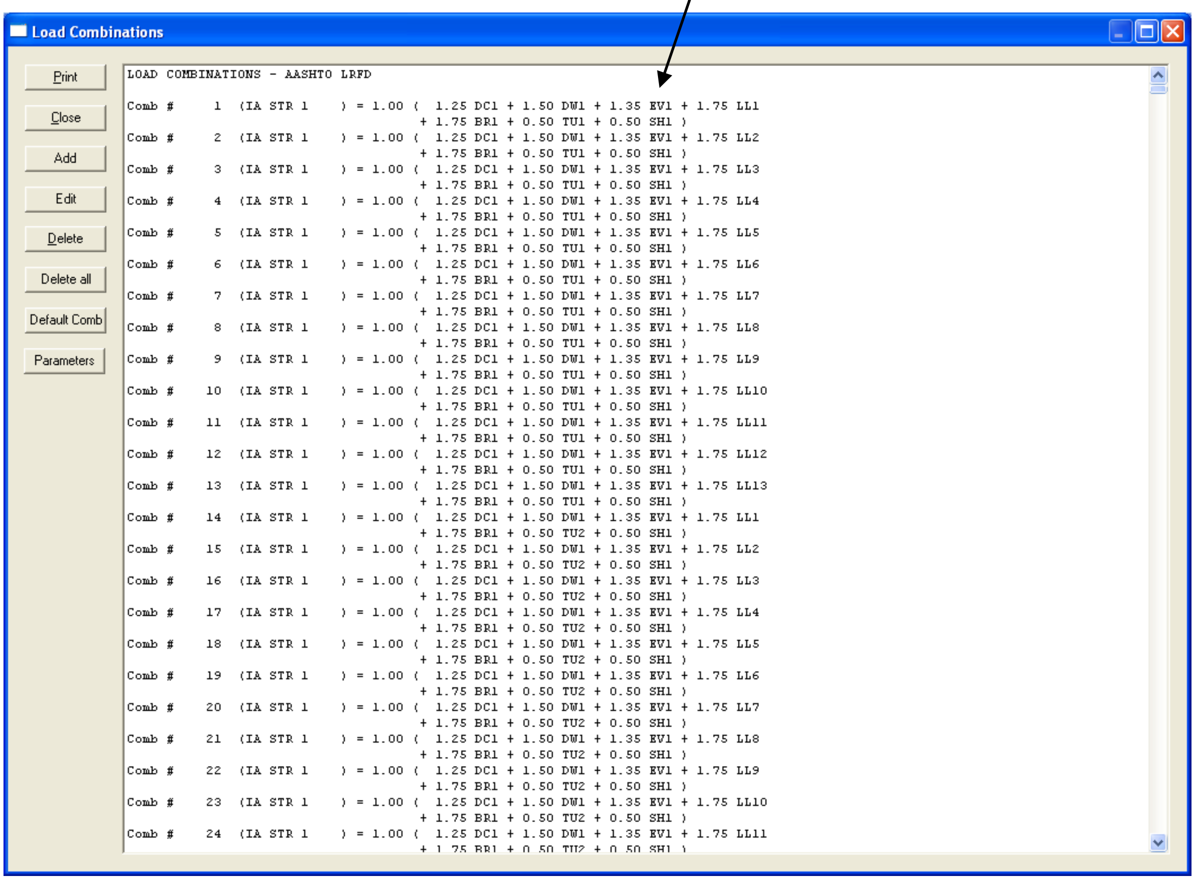
The footing concrete density was left as 150 pcf since the self-weight will be calculated by RC-Pier.



I removed all the additional pier cap check points.

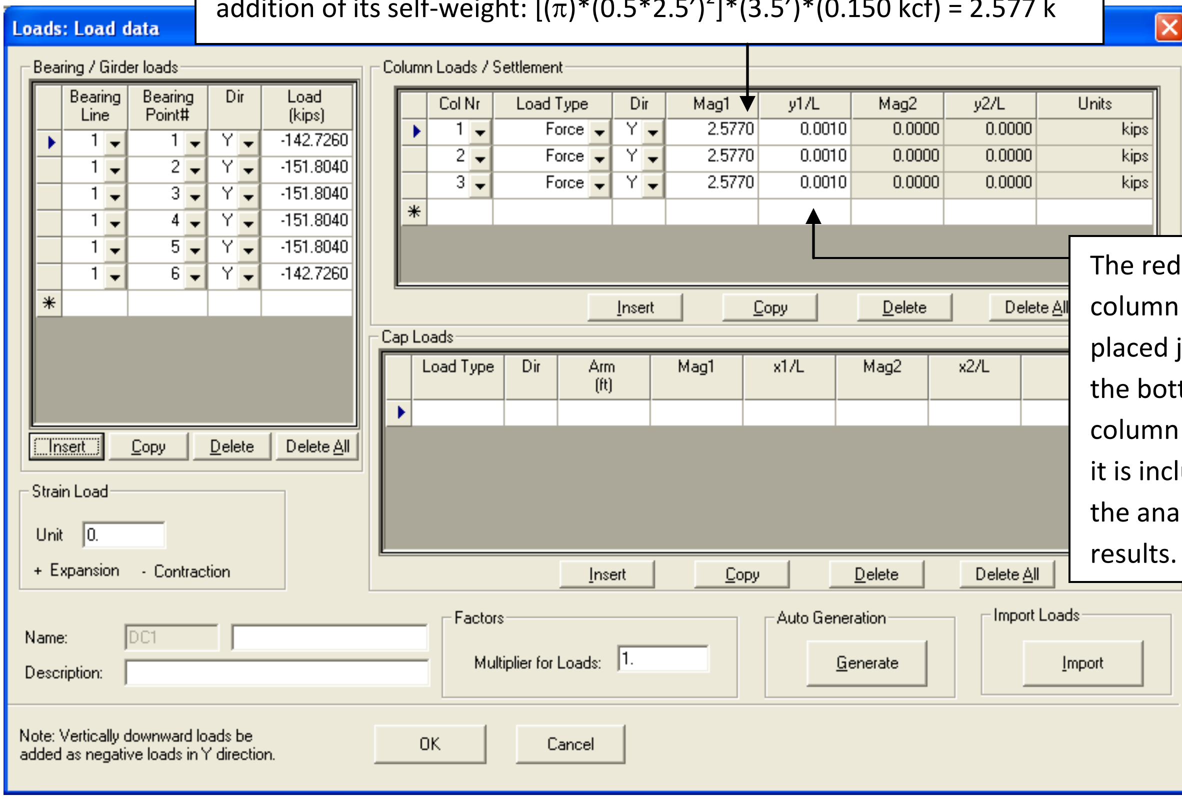


I added an EV1 load for the fill weight on the footing. Even though no load will be entered here this will ensure the load factor is applied to the footing surcharge as entered on the footing tab.



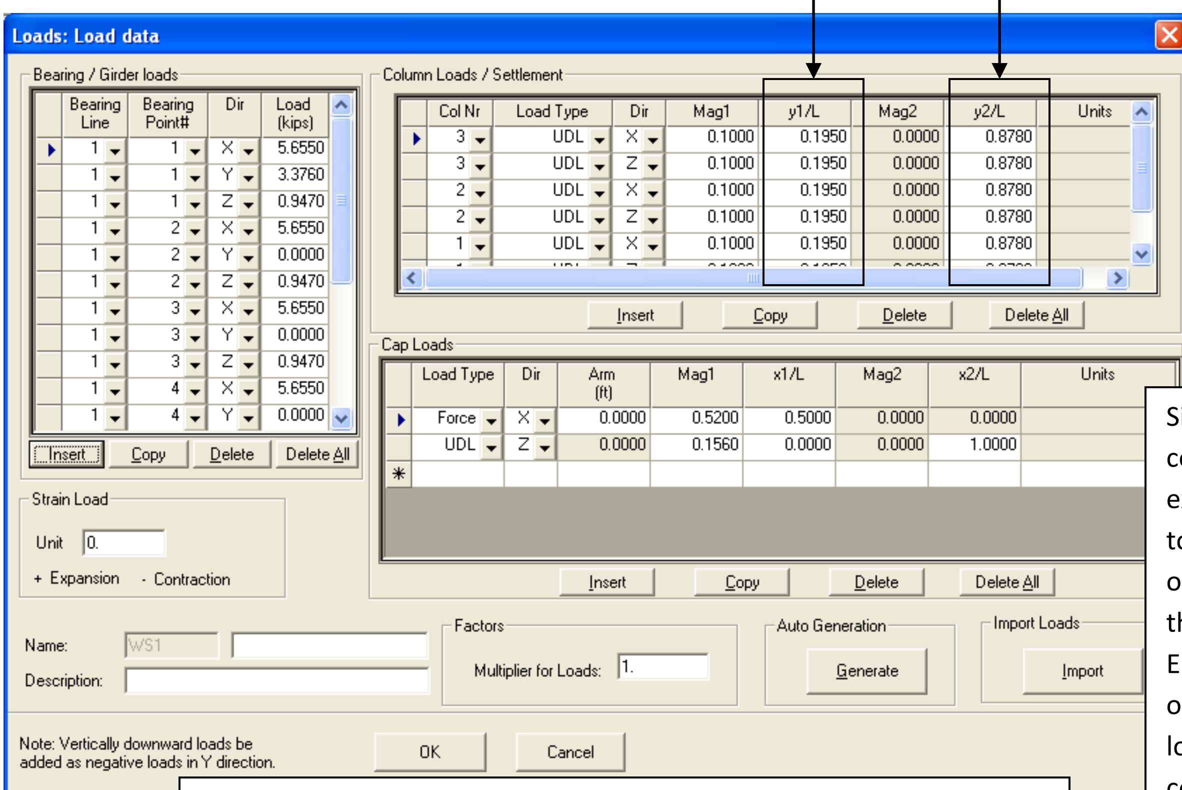
DC1

Removed the weight due to the 3.5' column extension to counteract the addition of its self-weight: $[(\pi)*(0.5*2.5')^2]*(3.5')*(0.150\ \text{kcf}) = 2.577$ k



The reduction in column weight is placed just above the bottom of the column to ensure it is included in the analysis results.

WS1



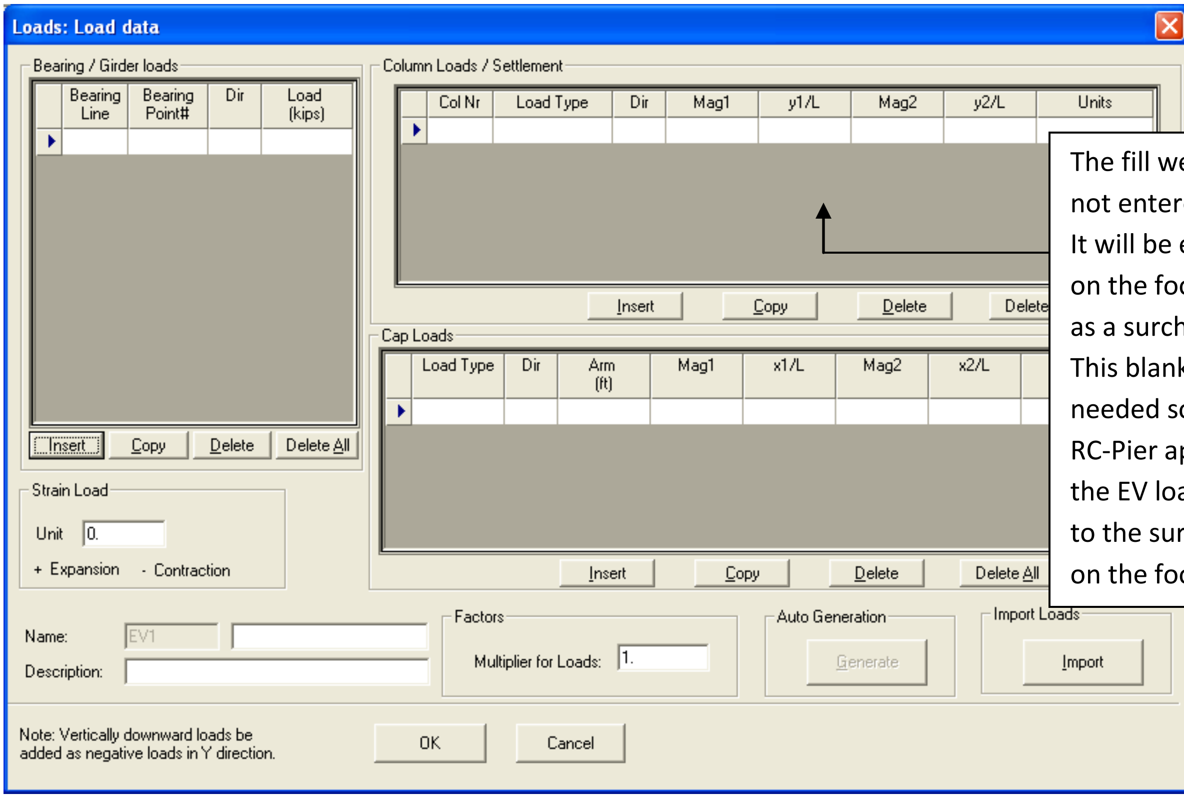
Since the columns were extended 3.5' to the bottom of the footing, the Start and End locations of the wind loads on the columns should be modified.

I didn't adjust the locations of the wind loads since the overall effect is not that significant. However, if I had the new values would be:

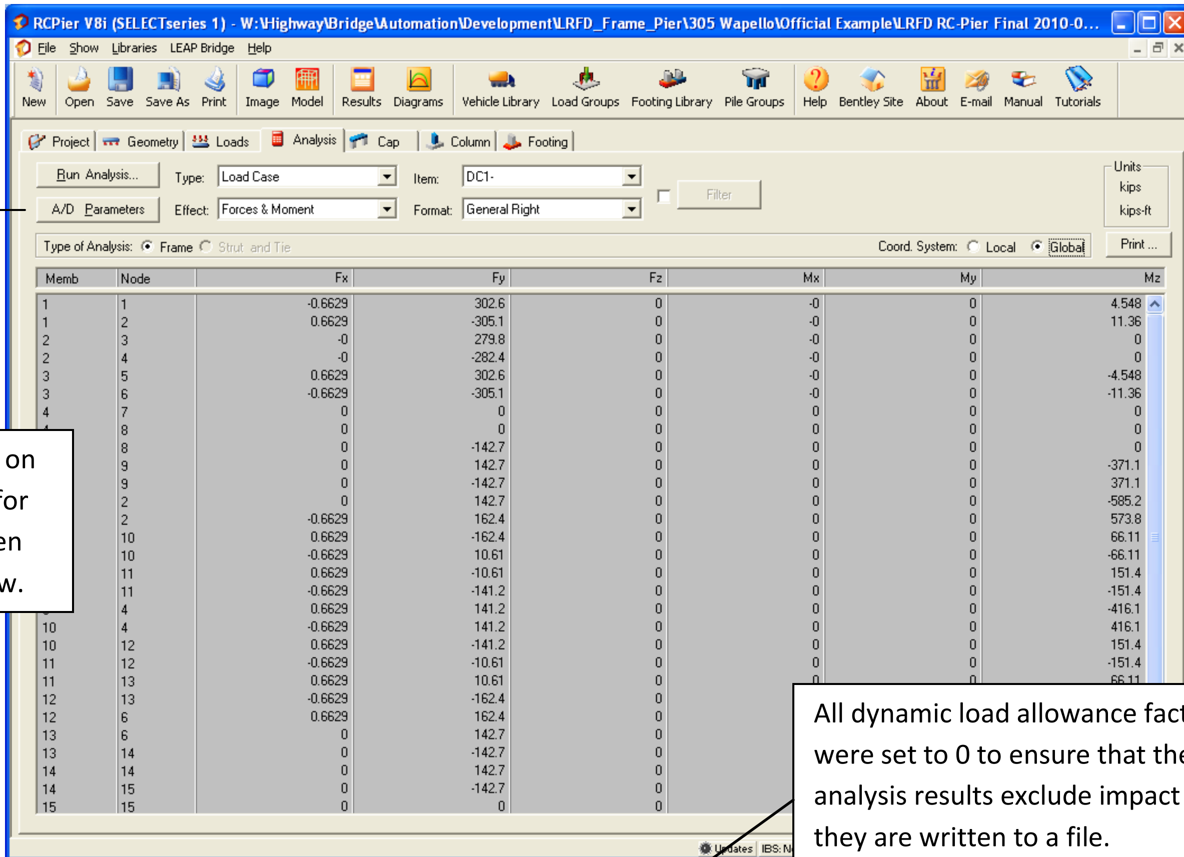
Start: $y1/L = 7.5'/24' = 0.313$

End: $y2/L = 21.5'/24' = 0.896$

EV1

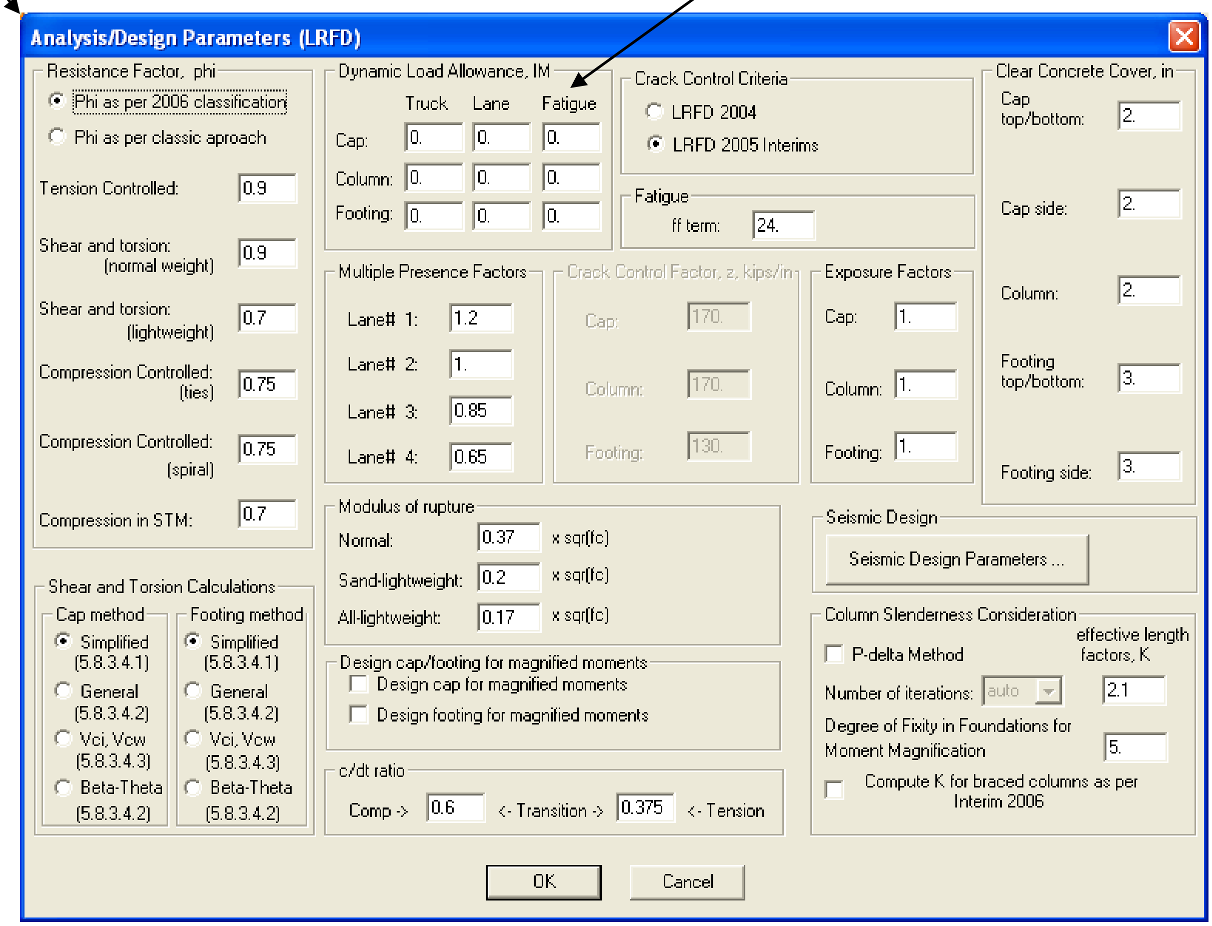


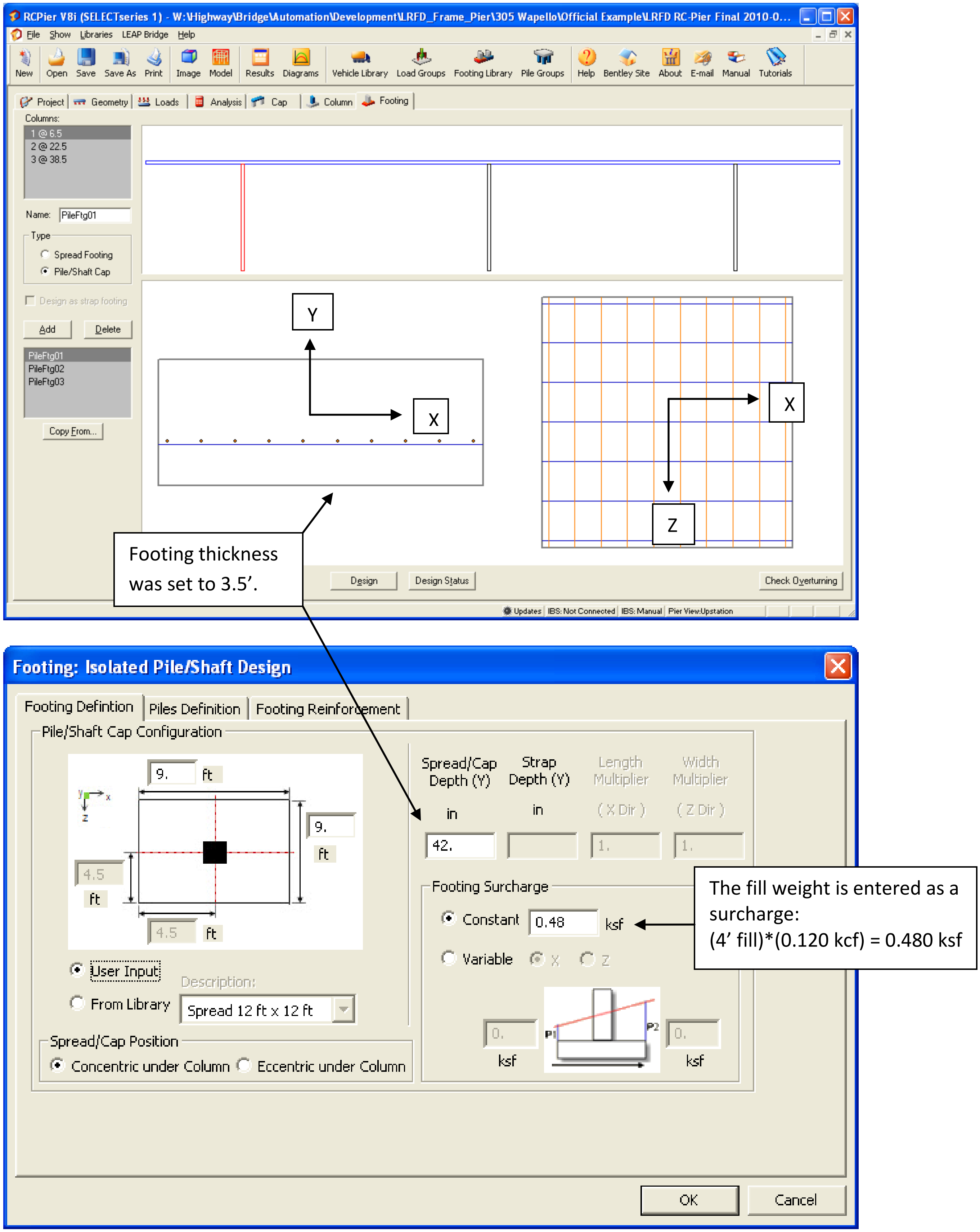
The fill weight is not entered here. It will be entered on the footing tab as a surcharge. This blank entry is needed so that RC-Pier applies the EV load factor to the surcharge on the footing tab.

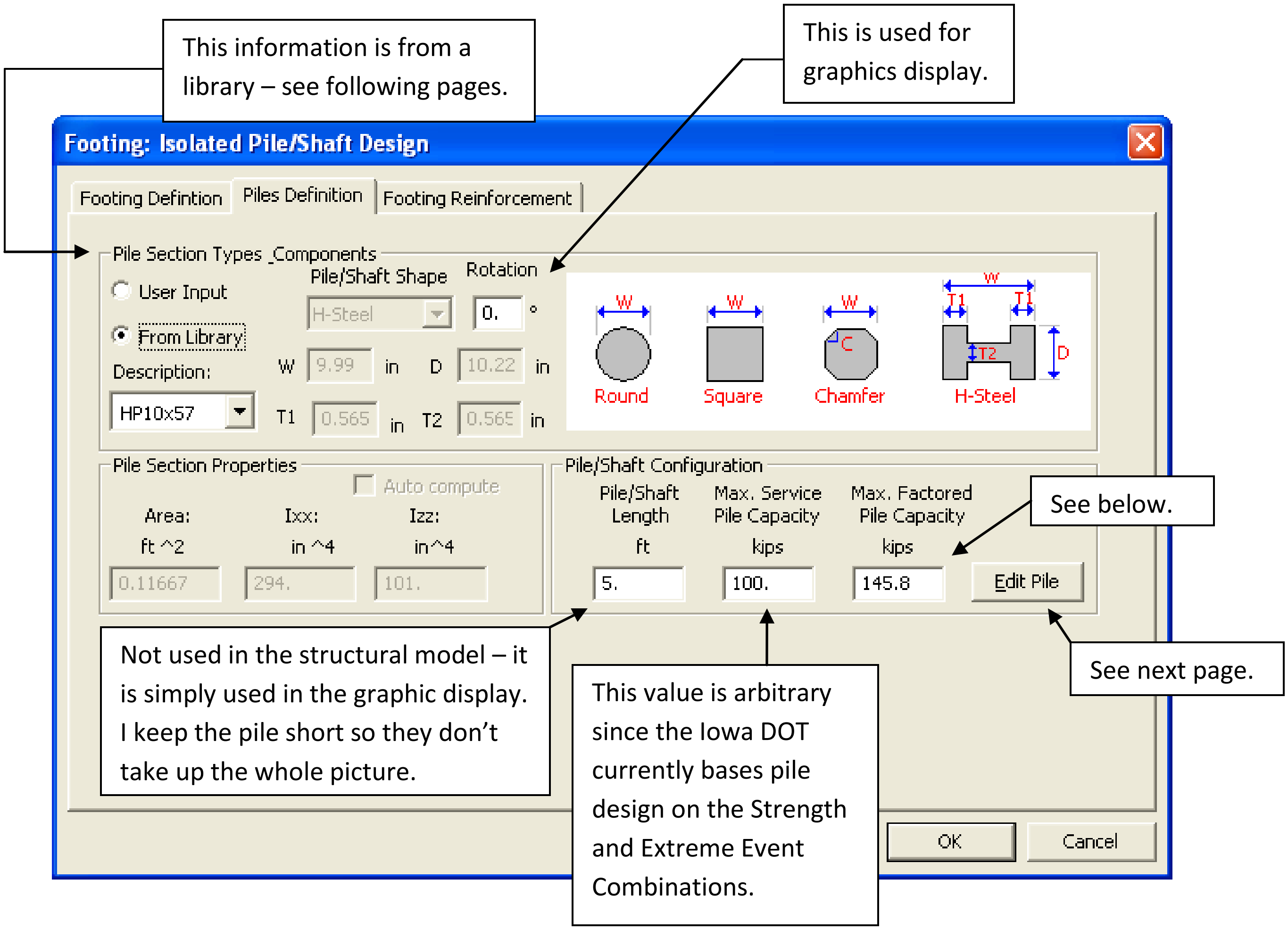


Click on this for screen below.

All dynamic load allowance factors were set to 0 to ensure that the analysis results exclude impact if they are written to a file.



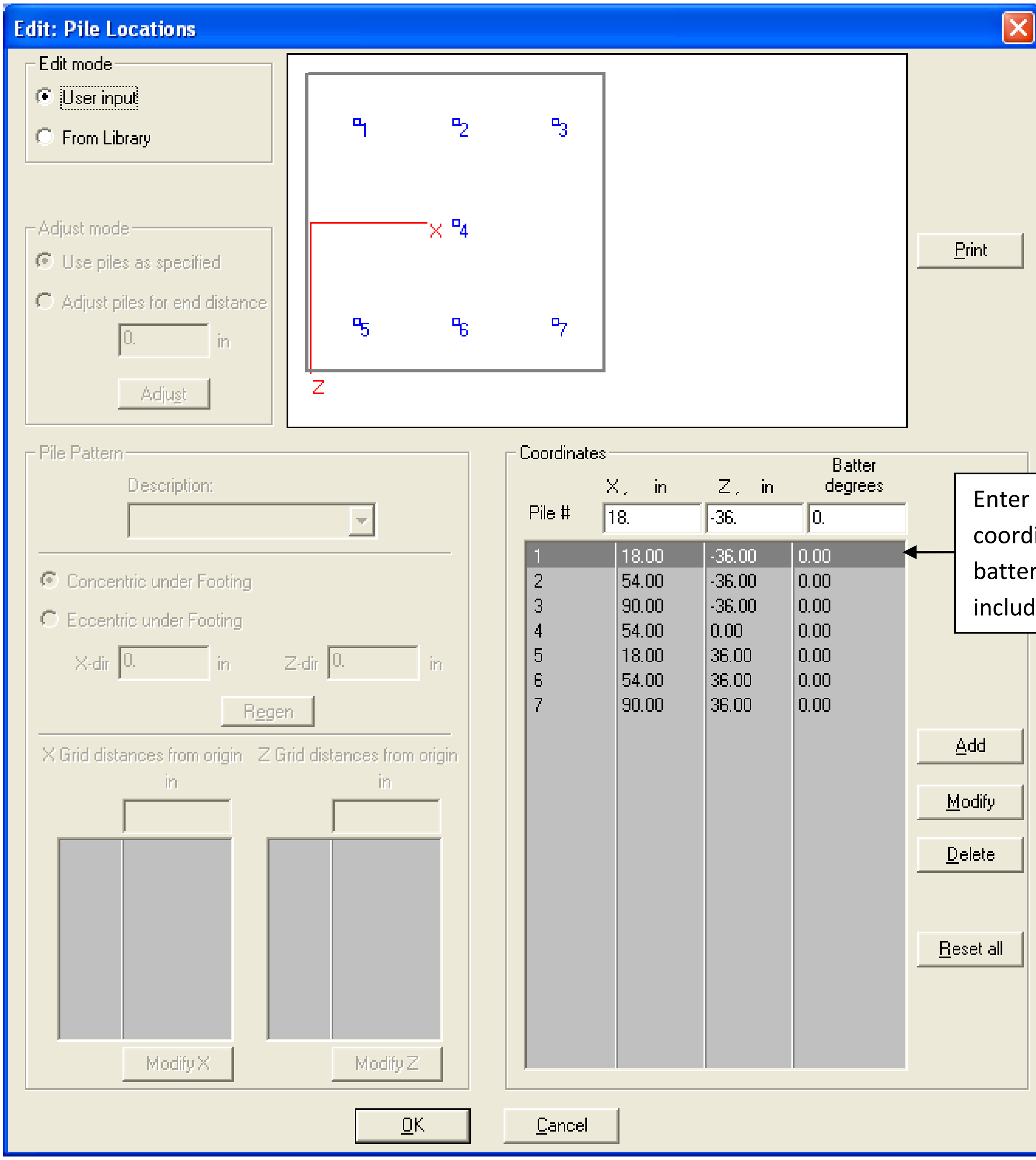

RCPier V8i (SELECTseries 1) - W:\Highway\Bridge\Automation\Development\LRFD_Frame_Pier\305 Wapello\Official Example\LRFD RC-Pier Final 2010-0...
File Show Libraries LEAP Bridge Help
New Open Save Save As Print Image Model Results Diagrams Vehicle Library Load Groups Footing Library Pile Groups Help Bentley Site About E-mail Manual Tutorials
Project Geometry Loads Analysis Cap Column Footing
Columns:
1 @ 6.5
2 @ 22.5
3 @ 38.5
Name: PileFtg01
Type
Spread Footing
Pile/Shaft Cap
Design as strap footing
Add Delete
PileFtg01
PileFtg02
PileFtg03
Copy From...
Y
X
X
Z
Design Design Status Check Overturning
Footing thickness was set to 3.5'.
Footing: Isolated Pile/Shaft Design
Footing Defintion Piles Definition Footing Reinforcement
Pile/Shaft Cap Configuration
9. ft
9. ft
4.5 ft
4.5 ft
User Input
From Library
Description:
Spread 12 ft x 12 ft
Spread/Cap Position
Concentric under Column Eccentric under Column
Spread/Cap Depth (Y) in
Strap Depth (Y) in
Length Multiplier (X Dir)
Width Multiplier (Z Dir)
42.
Footing Surcharge
Constant 0.48 ksf
Variable X Z
ksf ksf
The fill weight is entered as a surcharge:
(4' fill)*(0.120 kcf) = 0.480 ksf
OK Cancel



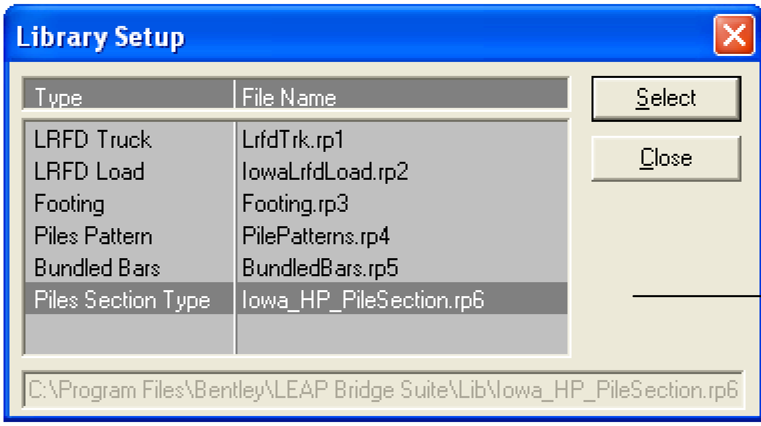
<u>HP10x57 Structural Resistance Level 1</u>

Factored Resistance = (6 ksi)*(0.1167 ft^2)*(144 in^2/ft^2)*(1.45) = 146.16 k

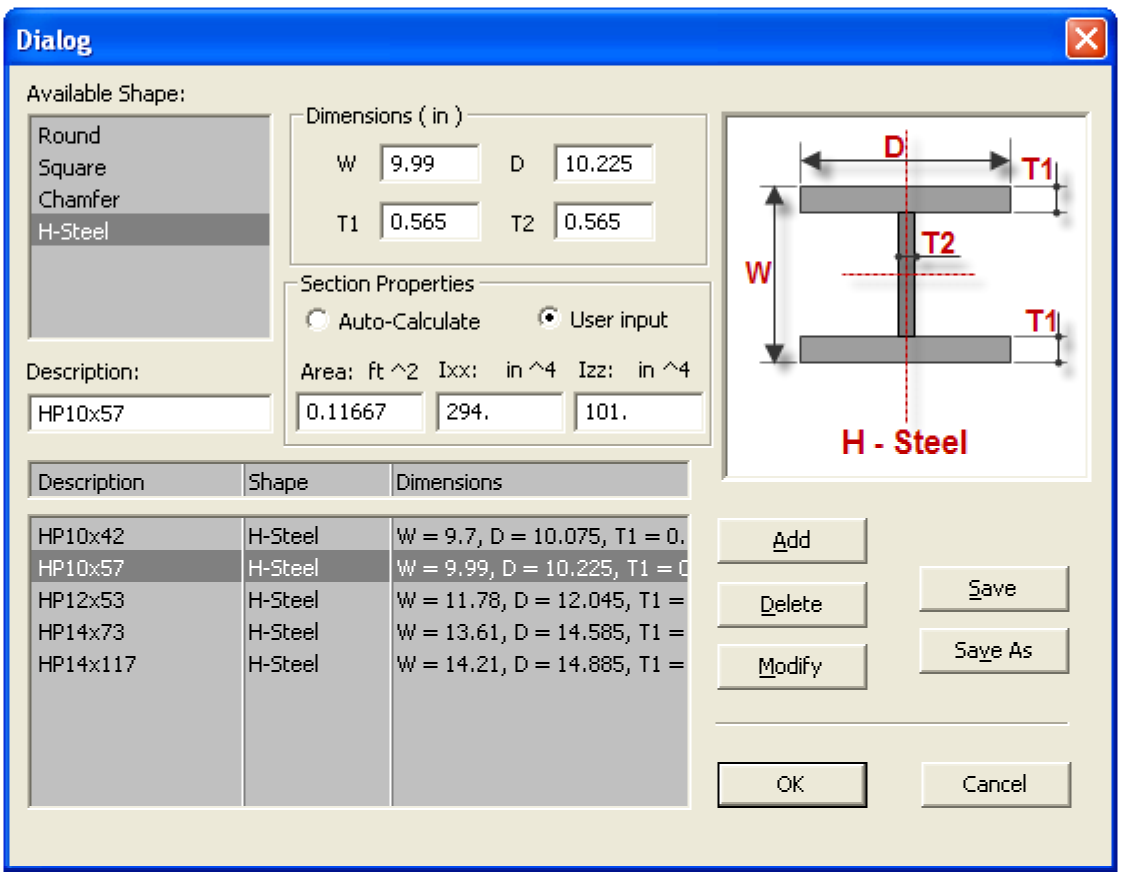
BDM Table 6.2.6.1-1 shows (0.6)*(243 k) = 145.8 k

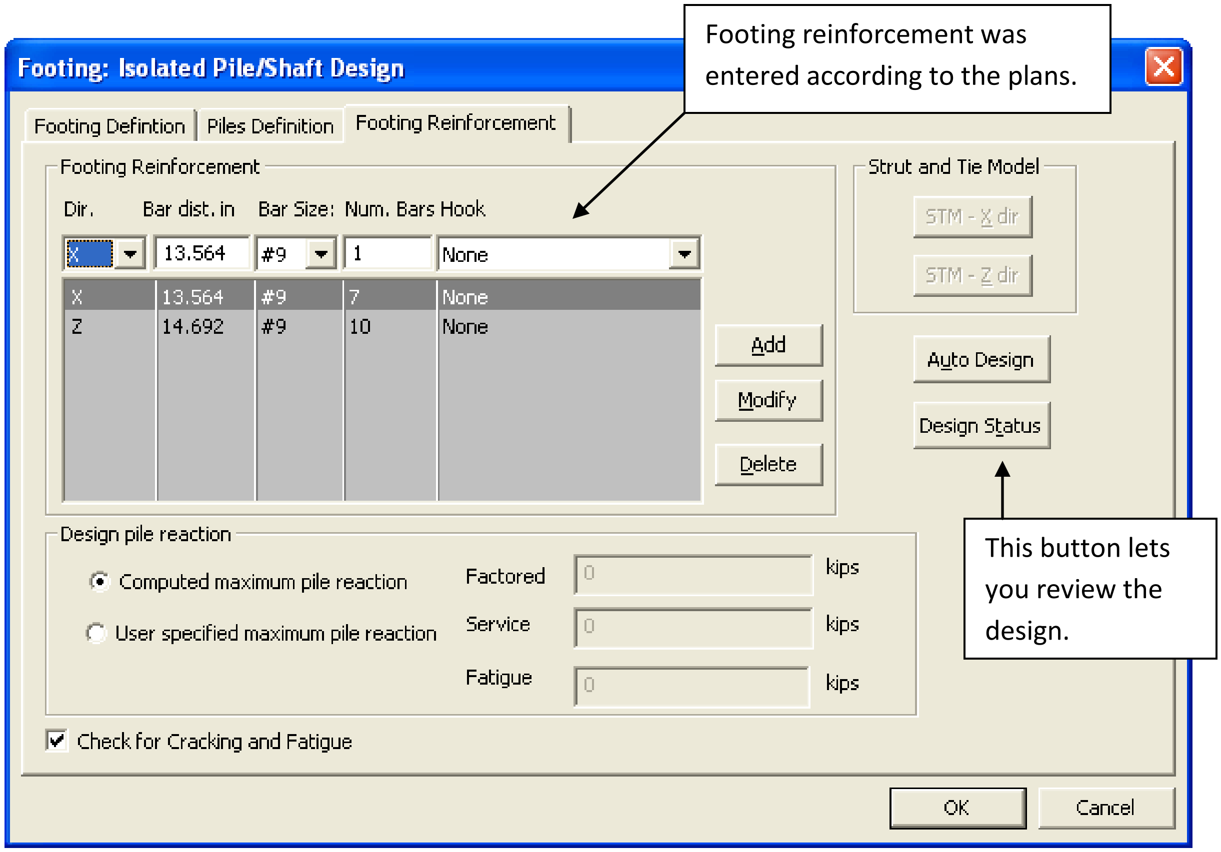


Enter pile coordinates. Pile batter was not included.



Pile Type Library




Footing reinforcement was entered according to the plans.
Footing: Isolated Pile/Shaft Design
Footing Defintion
Piles Definition
Footing Reinforcement
Footing Reinforcement
Dir.
Bar dist. in
Bar Size:
Num. Bars
Hook
X
13.564
#9
1
None
X 13.564 #9 7 None
Z 14.692 #9 10 None
Add
Modify
Delete
Strut and Tie Model
STM - X dir
STM - Z dir
Auto Design
Design Status
This button lets you review the design.
Design pile reaction
Computed maximum pile reaction
User specified maximum pile reaction
Factored
Service
Fatigue
0
kips
Check for Cracking and Fatigue
OK
Cancel

ISOLATED FOOTING DESIGN

I've included some portions of RC-Pier's output for the footing.

ISOLATED FOOTING DESIGN
Code: AASHTO LRFD 2007 (with Interims)
Units: US
Pier View: Upstation.

GEOMETRY
Name : PileFtg01
Shape : Rectangular, Type : Pile/Shaft Cap
Bf(X) = 9.00 ft, Hf(Z) = 9.00 ft, Thickness(Y) = 42.00 in
Ag = 81.00 ft^2, Ix = 54.00 ft^2, Iz = 36.00 ft^2
Footing concentric.
Columns located on the footing:
Column No. 1 at x = 0.00 ft, Round D = 30.00 in
Surcharge = 0.48 ksf
Piles: H-Steel Size: W = 9.99 in, D = 10.23 in, T1 = 0.56 in, T2 = 0.56 in
Service Capacity: 100.00 kips Factored Capacity: 145.80 kips
Piles Section Properties: Area = 0.12 ft^2 Ix = 294.00 in^4 Iz = 101.00 in^4

DESIGN PARAMETERS	
f'c = 3500.00 psi	fy = 60000.00 psi
phi tens = 0.90	
phi comp = 0.75	phi shear = 0.90
Tens below = 0.375	Comp Above = 0.600
Ec = 3586.6 ksi	Es = 29000.0 ksi
Crack check as per 2005 Interims	
Crack control Exposure = 1.00	
Concrete Type : Normal Weight.	

Not interested in the Service capacity of the piles at this time.

Pile Reactions, Service

Pile	Loc(X) ft	Loc(Z) ft	X in	Z in	comb	Ovs	P kips	Mxx kft	Mzz kft	Pile Reac. kips
1	-3.00	-1.50	18.00	-36.0	8308	1.000	-580.67	-109.97	159.98	114.02*
					8019	1.000	-332.59	109.97	-197.05	36.61
2	0.00	-1.50	54.00	-36.0	8204	1.000	-560.28	-365.26	-10.32	111.96*
					8125	1.000	-351.20	365.26	-15.23	41.51
3	3.00	-1.50	90.00	-36.0	8412	1.000	-551.99	-365.26	-105.22	119.55*
					7917	1.000	-359.48	365.26	79.66	36.05
4	0.00	-4.50	54.00	0.0	7879	1.000	-592.36	196.58	216.79	96.25
					8424	1.000	-319.12	-196.58	-242.34	57.22
5	-3.00	-7.50	18.00	36.0	7879	1.000	-592.36	196.58	216.79	125.24*
					8422	1.000	-320.90	-196.58	-253.85	25.40
6	0.00	-7.50	54.00	36.0	7866	1.000	-569.11	365.26	81.61	113.22*
					8411	1.000	-357.15	-365.26	-107.30	42.36
7	3.00	-7.50	90.00	36.0	8074	1.000	-560.82	365.26	-13.28	113.15*
					8203	1.000	-365.44	-365.26	-12.40	44.58

Maximum Service Reaction

Pile Reactions, Factored

Pile	Loc(X) ft	Loc(Z) ft	X in	Z in	comb	Ovs	P kips	Mxx kft	Mzz kft	Pile Reac. kips
1	-3.00	-1.50	18.0	-36.0	1652	—	-740.48	-236.79	104.78	142.76
					1078	—	-229.24	288.04	-241.31	7.10
2	0.00	-1.50	54.0	-36.0	57	—	-792.01	-253.16	-57.54	142.30
					1086	—	-239.43	415.69	-156.16	21.58
3	3.00	-1.50	90.0	-36.0	83	—	-787.87	-253.16	-104.99	150.46*
					1070	—	-243.58	415.69	-108.71	31.23
4	0.00	-4.50	54.0	0.0	18	—	-817.16	253.16	97.77	131.83
					1077	—	-224.24	111.98	-273.96	42.50
5	-3.00	-7.50	18.0	36.0	18	—	-817.16	253.16	97.77	154.04*
					7590	—	-273.86	-158.07	-205.23	23.71
6	0.00	-7.50	54.0	36.0	18	—	-817.16	253.16	97.77	145.89*
					7579	—	-318.10	-364.43	-28.70	35.66
7	3.00	-7.50	90.0	36.0	1418	—	-724.44	364.43	-30.66	141.38
					1064	—	-347.78	-415.69	137.49	25.60

This is greater than the factored resistance of 145.80 k. So, I should modify my pile arrangement or add more piling. I won't do that at this time.

Footing Design : Notes

* Service Force in pile is greater than service pile capacity.
* Factored Force in pile is greater than factored pile capacity.
Only max. force in piles is considered for design.
Pile coordinates X and Z are from the most left edge of the footing.
Plong= Lateral load in longitudinal direction at the top of pile, Kips.
Php= Available resisting horizontal component due to batter= batter * Vertical pile reaction, Kips.
Plong-Php= Remaining lateral force required to resist by pile.

Max. Pile Reaction Used in Design: (without selfweight and surcharge)

Factored pile reaction	138.95 kips
Service pile reaction	113.61 kips

Note that the maximum factored pile reaction is not 154.04 kips in this table. This is because the footing and surcharge (fill weight) have been deducted. The same is true for the service pile reaction.

Reinforcement Schedule

Dir	Quantity	Size	Bar dist. in	As total in^2	Spacing in	Hook
X	7	#9	13.56	7.00	16.81	None
Z	10	#9	14.69	10.00	11.21	None

Footing Self-weight = (0.150 kcf)*(9')*(9')*(3.5') / (7 piles) = 6.075 k/pile

Surcharge = (0.120 kcf)*(9')*(9')*(4' fill depth) / (7 piles) = 5.5543 k/pile

Factored Pile Reaction = 154.04 k – (1.25)*(6.075 k) – (1.35)*(5.5543 k) = 138.95 k

Service Pile Reaction = 125.24 k – (1.00)*(6.075 k) – (1.00)*(5.5543 k) = 113.61 k

Note that the column footprint in the fill is not deducted.

1.108' to critical face of column (based on equiv. square)

As = 0.0015*Ag/2 = (0.0015)*(9')*(12 in/ft)*(3.5')*(12 in/ft) / 2 = 3.402 in2

This appears to be based on the 2005 Aashto Lrfd Code Art. 5.10.8.2

Flexure

Dir	Loc ft	d in	Mmax kft	Comb	CL	Asb_req in^2	Asb_prv in^2	Asb_eff in^2	Ast_req in^2	Ast_prv in^2	Ast_eff in^2
X	-1.11	28.44	525.8	18	T	5.57	7.00	7.00	3.40	0.00 *	0.00 *
X	1.11	28.44	525.8	18	T	5.57	7.00	7.00	3.40	0.00 *	0.00 *
Z	-1.11	27.31	788.8	18	T	8.80	10.00	10.00	3.40	0.00 *	0.00 *
Z	1.11	27.31	788.8	18	T	8.80	10.00	10.00	3.40	0.00 *	0.00 *

See hand calculations for Asb required

Flexure Note

CL: Section classification as per LRFD 2006 interims for provided reinforcement.

C = Compression controlled, I = In-Transition, T = Tension controlled.

Required reinforcement is based on phi for tension controlled sections..

* The provided reinforcement is not adequate, either less than required or larger than maximum allowed.

Cracking check as per AASHTO LRFD 2007 with Interims (2005)

Cracking/Fatigue

Dir	Loc ft	d in	Cracking Mmax kft	Cracking Comb	Cracking fs ksi	Cracking Srq in	Cracking Spr in	Fatigue Mmax kft	Fatigue Comb	Fatigue fs ksi	Fatigue ratio fs
X	-1.11	28.44	429.9	7879	28.27	***	16.8*	0.0	0	0.00	0.00
X	1.11	28.44	429.9	7879	28.27	***	16.8*	0.0	0	0.00	0.00
Z	-1.11	27.31	644.9	7879	31.28	***	11.2*	0.0	0	0.00	0.00
Z	1.11	27.31	644.9	7879	31.28	***	11.2*	0.0	0	0.00	0.00

See hand calculations for cracking check

Cracking/Fatigue Note

* Provided rebar spacing is not adequate for crack control.

*** Spacing is negative.

One Way Shear (Simplified Method)

Col	Dir	Dist ft	Comb	dv in	Vu kips	phi*Vc kips
1	X	-3.63	18	30.24	0.0	347.8
	X	3.63	18	30.24	0.0	347.8
	Z	-3.63	18	30.24	0.0	347.8
	Z	3.63	18	30.24	0.0	347.8

See hand calculations for one-way shear

Two Way Shear

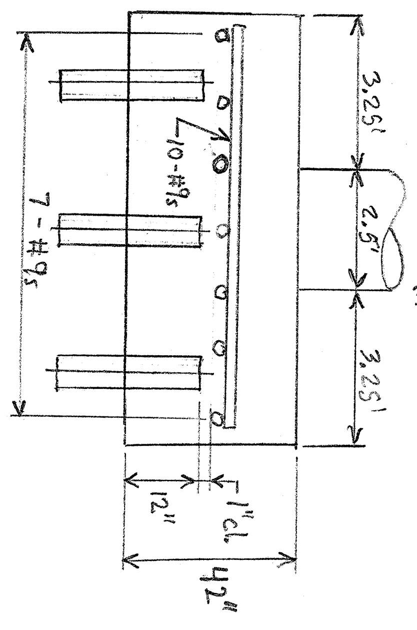
#	Bo ft	Ao ft^2	Comb	Avg. dv in	Vu kips	phi*Vc kips
Columns						
1	15.77	19.79	18	30.24	833.7	1214.1
Piles - max						
4	13.41	11.24	18	30.24	138.9	1032.4
Piles - min						
1	6.35	10.09	18	30.24	138.9	489.1

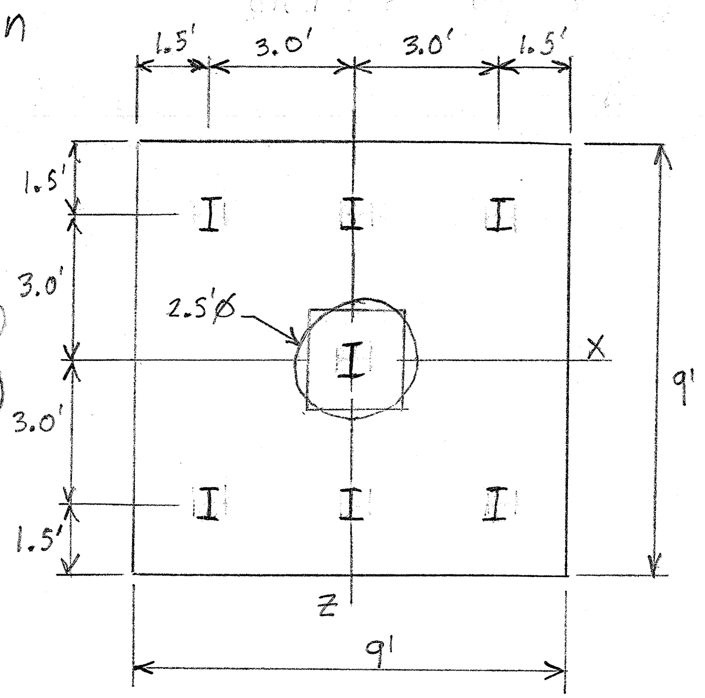
See hand calculations for two-way shear

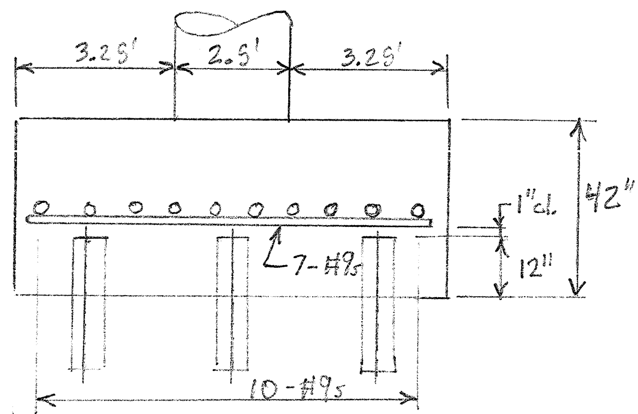
Two Way Shear Note

TWO WAY SHEAR IN FOOTING IS NOT DESIGNED AND STIRRUPS ARE NOT CONSIDERED.

RC-Pier Footing Design







Equivalent Square Column

$$w = \sqrt{\pi\left(\frac{2.5'}{2}\right)^2} = 2.216'$$

$$\frac{w}{2} = 1.108'$$

Flexure

X-Dir^n : 7-#9s

$$d_s = 42'' - 13'' - \frac{1.128''}{2} = 28.436''$$

Max Pile Load neglecting fill & footing weight

$$M_{max} = (138.95^{k}/\text{pile})(2\text{piles})(3' - 1.108') = 525.8^{k\text{-}1}$$

$$A_{s\,prov} = (7\text{bars})(1.00\text{in}^2) = 7\text{in}^2 \quad \leftarrow 7\text{-}\#9s$$

$$a = \frac{A_s f_y}{0.85 f'_c b} = \frac{(7\text{in}^2)(60\text{ksi})}{(0.85)(3.5\text{ksi})(9' \times 12''/_1)} = 1.307''$$

$$M_r = \phi A_s f_y \left(d_s - \frac{a}{2}\right) = (0.9)(7\text{in}^2)(60\text{ksi})\left(28.436'' - \frac{1.307''}{2}\right) = 10{,}501^{k\text{-}''}$$

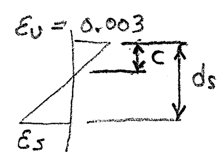
$$= 875.15^{k\text{-}1}$$

Check if Tension-Controlled? Yes

$$\beta_1 = 0.85$$

$$c = a/\beta_1 = \frac{1.307''}{0.85} = 1.538''$$

$$\varepsilon_s = \frac{(28.436'' - 1.538'')}{1.538''}(0.003) = 0.052 > 0.005$$



$$\varepsilon_s = \frac{(d_s - c)}{c}\varepsilon_u$$

Find $A_{s\,req'd}$

$$R_n = \frac{M_u}{\phi b d_s^2} = \frac{(525.8^{k-1})(12''/_1)}{(0.9)(9'\times 12''/_1)(28.436'')^2} = 0.08028 \text{ ksi}$$

$$\rho = \frac{0.85 f'_c}{f_y}\left(1-\sqrt{1-\frac{2R_n}{0.85 f'_c}}\right) = \frac{(0.85)(3.5\text{ ksi})}{60\text{ ksi}}\left(1-\sqrt{1-\frac{(2)(0.08028\text{ ksi})}{(0.85)(3.5\text{ ksi})}}\right)$$

$$= 0.0013565$$

$$A_{s\,req'd} = \rho b d_s = (0.0013565)(9'\times 12''/_1)(28.436'') = 4.166 \text{ in}^2$$

$$\frac{4}{3} A_{s\,req'd} = (4/3)(4.166 \text{ in}^2) = 5.555 \text{ in}^2$$ ← Matches RC-Pier

$$I_g = \frac{1}{12} bh^3 = \left(\frac{1}{12}\right)(9'\times 12'')(42'')^3 = 666,972 \text{ in}^4$$

$$f_r = 0.37\sqrt{f'_c} = (0.37)\sqrt{3.5\text{ksi}} = 0.6922 \text{ ksi}$$

$$M_{cr} = \frac{f_r I}{c} = \frac{(0.6922\text{ ksi})(666,927 \text{ in}^4)}{(42''/2)} = 21,979^{k-''} = 1831.6^{k-1}$$

$$1.2 M_{cr} = (1.2)(1831.6^{k-1}) = 2197.9^{k-1} > \frac{4}{3} M_u = \left(\frac{4}{3}\right)(525.8^{k-1}) = 701.1^{k-1}$$

So $A_{s\,req'd} = 5.555 \text{ in}^2 < A_{s\,prov} = 7 \text{ in}^2$

Cracking — Aashto Lrfd 5.7.3.4

$$s \le \frac{700\gamma_e}{\beta_s f_{ss}} - 2d_c$$

∴ Look at bars in x-dir^n

$\gamma_e = 1.00$

$$d_c = 12'' + 1'' + \frac{1.128''}{2} = 13.564''$$

$$\beta_s = 1 + \frac{d_c}{0.7(h-d_c)} = 1 + \frac{13.564''}{(0.7)(42''-13.564'')} = 1.6814$$

f_{ss} is tensile stress in the R/I at service limit state

In past calculations RC-Pier used ρn, but now it appears quite likely that it is using $2\rho n$ from Aashto Lrfd 5.7.1

← Max service pile reaction w/o footing & fill wgt

$$M_{max} = (113.61^{k}/\text{pile})(2\text{ piles})(3'-1.108') = 429.90^{k-1}$$

$$A_s = (7\text{ bars})(1.0 \text{ in}^2) = 7.0 \text{ in}^2$$

$$d_s = 42''-13''-\frac{1.128''}{2} = 28.436''$$

$$\rho = \frac{A_s}{bd_s} = \frac{7 \text{ in}^2}{(9'\times 12''/_1)(28.436'')} = 0.002279$$

$$E_c = (150)^{1.5}(33)\sqrt{3500\text{psi}}\,/\,1000^{lb}/_k = 3586.6 \text{ ksi}$$

$$E_s = 29,000 \text{ ksi}$$

$$n = \frac{E_s}{E_c} = 8.086 \rightarrow 8$$

$$2\rho n = 0.036469$$

$$k = \sqrt{(2\rho n)^2 + 4\rho n} - 2\rho n = 0.236053$$

$j = 1 - \frac{k}{3} = 1 - \frac{0.236053}{3} = 0.9213$

$f_{ss} = \frac{M}{A_s j d_s} = \frac{(429.90^{K\text{-}1})(12''/')}{(7.0 in^2)(0.9213)(28.436'')} = 28.130 ksi$ ∴ Close to RC-Pier

$S \leq \frac{(700)(1.00)}{(1.6814)(28.130 ksi)} - (2)(13.564'') = -12.328''$ ∴ Negative spacing

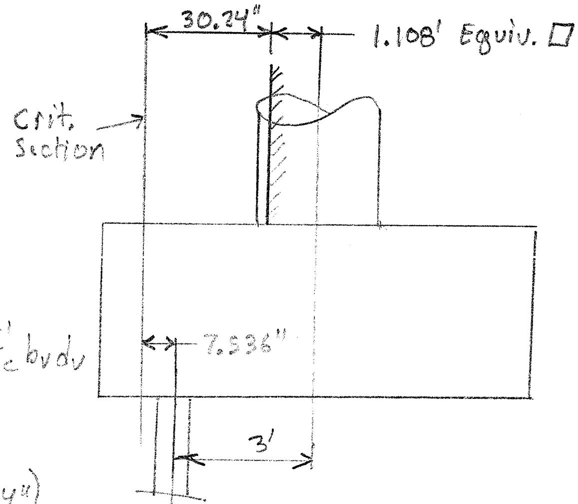
One Way Shear

Aoshto Lrfd 5.13.3.6 & 5.8.1.4 & 5.8.3.2

x - dir^n

$d_v =$ max of
$$\begin{cases} 0.72h = (0.72)(42'') = 30.24'' & \leftarrow \text{controls} \\ 0.9 d_s = (0.90)(28.436'') = 25.5924'' \\ d_s - a/2 = 25.5924'' - \frac{1.307''}{2} = 24.939'' \end{cases}$$

Critical section $= 1.108' + \frac{30.24''}{12''/'}$
$= 3.628'$



∴ All piles are inside critical section. shear design is not required.

$V_c = 0.0316 \beta \sqrt{f'_c}\, b_v d_v \leq 0.25 f'_c b_v d_v$

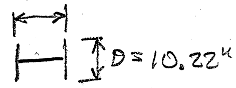
Let $\beta = 2.0$

$V_c = (0.0316)(2.0)(\sqrt{3.5 ksi})(9' \times 12''/')(30.24'')$

$= 386.15^k < (0.25)(3.5 ksi)(9' \times 12''/')(30.24'') = 2857.68^k$

$\phi V_c = (0.9)(386.15^k) = 347.54^k$ ← Matches RC-Pier

∴ The piles in the z - dir^n will also be inside the critical section

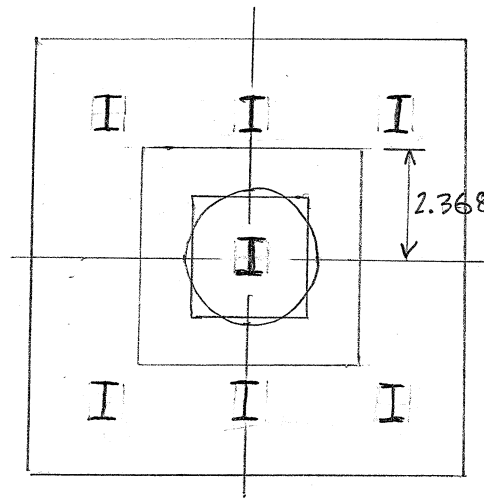


Two Way Shear   Aashto Lrfd 5.13.3.6

$d_v = 30.24''$ (based on 0.72h)

critical section $= 1.108' + \frac{30.24''}{(2)(12''/')}$

$= 2.368'$



(6 piles)(138.95 k/pile) = 833.7^k

$V_n = \left(0.063 + \frac{0.126}{\beta_c}\right)\sqrt{f'_c}\, b_o d_v \le 0.126\sqrt{f'_c}\, b_o d_v$

$\beta_c = \frac{(2)(2.368')}{(2)(2.368')} = 1$ square

$b_o = (8)(2.368') = 18.944' = 227.33''$

$V_n = \left(0.063 + \frac{0.126}{1}\right)\left(\sqrt{3.5 ksi}\right)(227.33'')(30.24'') = 2430.7^k >$ $(0.126)(\sqrt{3.5ksi})(227.33'')(30.24'') = 1620.5^k$ ← controls

$\emptyset V_n = \emptyset V_c = (0.9)(1620.5^k) = 1458.4^k$

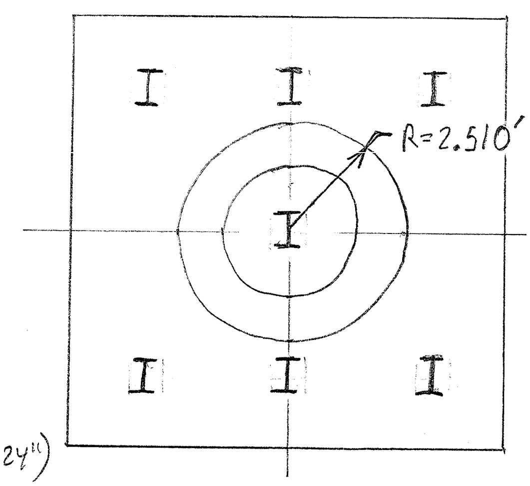
Not Used by RC-Pier →

Column ← RC-Pier's method

$d_v = 30.24''$

critical section $= \frac{2.5'}{2} + \frac{30.24''}{(2)(12''/')} = 2.51'$

(6 piles)(138.95 k/pile) = 833.7^k



$\beta_c = 1$ circular

$b_o = 2\pi R = (2)(\pi)(2.510') = 15.771'$

$= 189.25''$

$V_n = \left(0.063 + \frac{0.126}{1}\right)\left(\sqrt{3.5ksi}\right)(189.25'')(30.24'')$

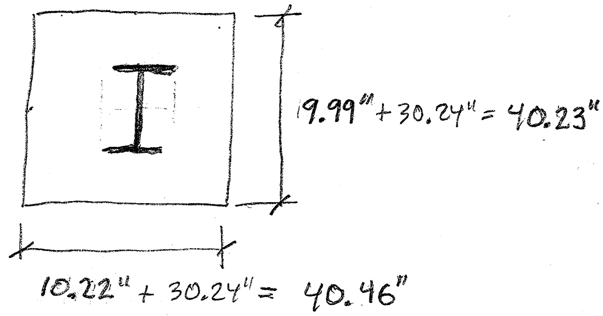
$= 2023.5^k > (0.126)(\sqrt{3.5ksi})(189.25'')(30.24'') = 1349.03^k$

$\emptyset V_n = \emptyset V_c = (0.9)(1349.03^k) = 1214.1^k > 833.7^k \therefore OK$

Interior Pile

$d_v = 30.24''$

$b_o = (2)(40.23'' + 40.46'')$
$= 161.38''$
$= 13.448'$



$\beta_c = \dfrac{40.46''}{40.23''} = 1.006$

$V_n = \left(0.063 + \dfrac{0.126}{1.006}\right)(\sqrt{3.5\,ksi})(161.38'')(30.24'')$

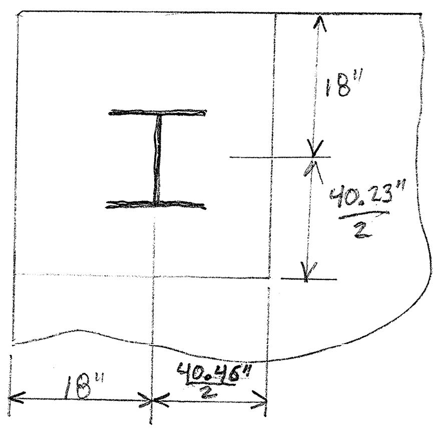
$= 1719.01^k$ $\quad (0.126)(\sqrt{3.5\,ksi})(161.38'')(30.24'') = 1150.37^k$

$\phi V_n = \phi V_c = (0.9)(1150.37^k) = 1035.33^k$ ← Close to RC-Pier. RC-Pier may be using 10" for both sides of the pile

Corner Pile

$d_v = 30.24''$

$b_o = (2)(18'') + \dfrac{40.46''}{2} + \dfrac{40.23''}{2}$
$= 76.345'' = 6.362'$



$V_c = 0.126\sqrt{f'_c}\, b_o d_v$
$= (0.126)(\sqrt{3.5\,ksi})(76.345'')(30.24'')$
$= 544.21^k$

$\phi V_c = (0.9)(544.21^k) = 489.8^k$ ← Close to RC-Pier

Appendix H

Hand Calculations for

Pile Footing Design Spreadsheet

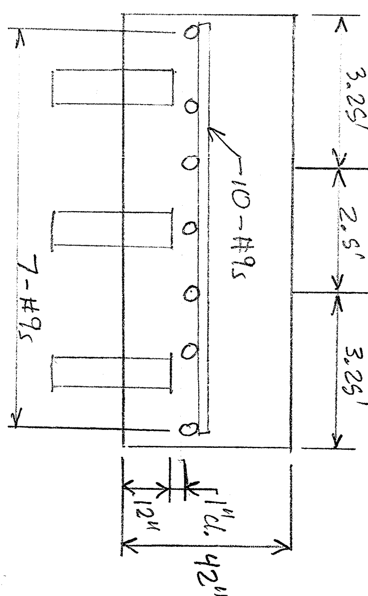
$R_r = \phi R_n = 145.8^k$ ∴ Factored Pile Resistance used to design for one-way beam shear.

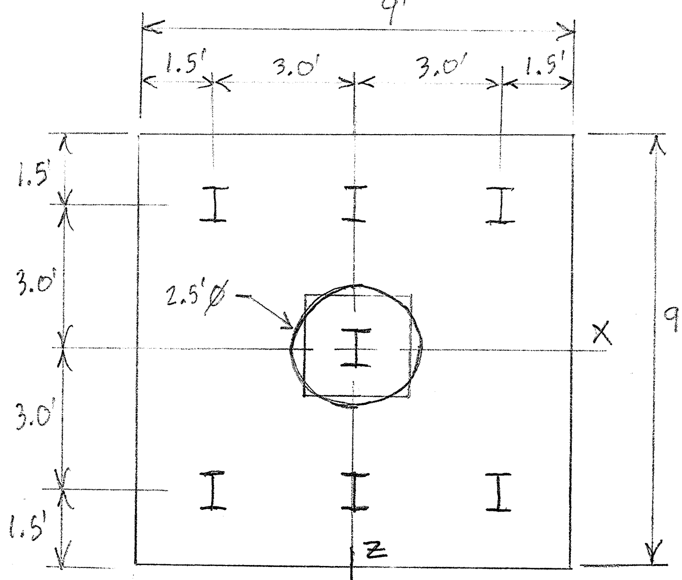
$P_{um} = 153.986^k$ ∴ Maximum factored pile load used to design flexure R/I.

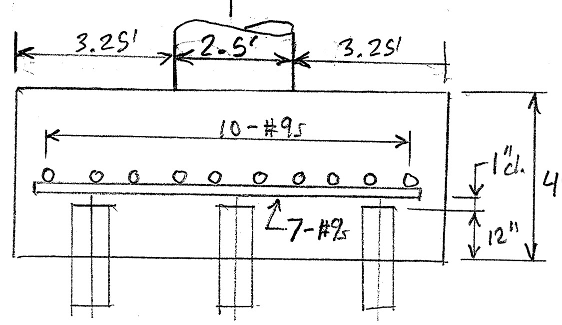
$P_{ua} = 131.374^k$ ∴ Maximum factored average pile load used to design for two-way punching shear.

Note: Normally P_{um} should be less than R_r. However, the point of these calculations is to simply demonstrate the procedure.

The footing weight will not be deducted for the design of the flexural reinforcement and shear capacity of the footing.







Equiv. Square Column

$W = \sqrt{\pi \left(\frac{2.5'}{2}\right)^2} = 2.216'$

$\frac{W}{2} = 1.108'$

Flexure

X - Dir^n

$d_s = 42'' - 13'' - \frac{1.128''}{2} = 28.436''$

$A_s = (7)(1.00 in^2) = 7.0\ in^2$ ← 7-#9s

$M_{u_z} = (153.586^K)(2\,piles)(3' - 1.108') = 581.2^{k\text{-}'}$

$a = \frac{A_s f_y}{0.85 f'_c b} = \frac{(7in^2)(60ksi)}{(0.85)(3.5ksi)(9' \times 12''/')} = 1.307''$

$M_r = \phi A_s f_y (d_s - \frac{a}{2}) = (0.9)(7in^2)(60ksi)(28.436'' - \frac{1.307''}{2}) = 10{,}501.8^{k\cdot in}$
$= 875.1^{k\cdot ft}$

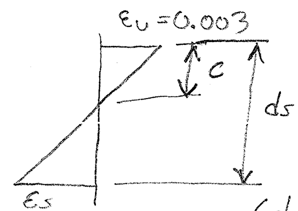
check if tension-controlled

$\beta_1 = 0.85$

$c = a/\beta_1 = 1.307''/0.85 = 1.538''$

$\varepsilon_s = \frac{(28.436'' - 1.538'')}{1.538''}(0.003)$

$= 0.0525 > 0.005$ ∴ It is tension-controlled



$\varepsilon_s = \frac{(d_s - c)}{c}\varepsilon_u$

Check minimum reinforcement

Well assume we can use $h = d_s + 2'' = 28.436'' + 2'' = 30.436''$

$f_r = 0.37\sqrt{f'_c} = (0.37)\sqrt{3.5ksi} = 0.692\ ksi$

$I_g = \frac{1}{12}bh^3 = (\frac{1}{12})(9' \times 12''/')(30.436'')^3 = 253{,}749.5\ in^4$

1.2 Mcr

$M_{cr} = \frac{f_r I}{c} = \frac{(0.6922ksi)(253{,}749.5 in^4)}{(30.436''/2)} = 11{,}542.06^{k\text{-}''} = 961.8^{k\text{-}'}$

$1.2 M_{cr} = 1154.2^{k\text{-}'} > M_r$

Note: $1.2 M_{cr} > \frac{4}{3} M_u$
$M_r > \frac{4}{3} M_u$

4/3 As reqd

$R_n = \frac{M_u}{\phi b d_s^2} = \frac{(581.2^{k\text{-}'})(12''/')}{(0.9)(9' \times 12''/')(28.436'')^2} = 0.08874\ ksi$

$\rho = \frac{0.85 f'_c}{f_y}\left(1 - \sqrt{1 - \frac{2R_n}{0.85 f'_c}}\right) = \frac{(0.85)(3.5ksi)}{60ksi}\left(1 - \sqrt{1 - \frac{(2)(0.08874ksi)}{(0.85)(3.5ksi)}}\right)$

$= 0.00150169$

$A_{s\,reqd} = \rho b d = (0.00150169)(9' \times 12''/')(28.436'') = 4.612\ in^2$

$\frac{4}{3} A_{s\,reqd} = (\frac{4}{3})(4.612 in^2) = 6.149\ in^2 > A_{s\,prov} = 7 in^2$

Cracking

$$s \le \frac{700\,\gamma_e}{\beta_s f_{ss}} - 2d_c$$

$\therefore$ Look at bars in x-dir^n

$\gamma_e = 1.00$

Assume $d_c = 2''$ and let $h = d_s + 2'' = 28.436'' + 2'' = 30.436''$

$$\beta_s = 1 + \frac{d_c}{(0.7)(h-d_c)} = 1 + \frac{2''}{(0.7)(30.436'' - 2'')} = 1.1005$$

f_{ss} is tensile stress in the R/F at service limit state

$M_{max} = (124.9^{K}/\text{pile})(2\,\text{piles})(3' - 1.108') = 472.6^{k\text{-}1}$

$A_s = 7\,in^2$

$d_s = 28.436''$

$$\rho = \frac{A_s}{bd} = \frac{7\,in^2}{(9' \times 12''/')(28.436'')} = 0.002279$$

$\rho n = 0.0182346$

$$K = \sqrt{(\rho n)^2 + 2\rho n} - \rho n = 0.1736$$

$$j = 1 - \frac{K}{3} = 1 - \frac{0.1736}{3} = 0.9421$$

$$f_{ss} = \frac{M}{A_s j d_s} = \frac{(472.6^{k\text{-}1})(12''/')}{(7.0\,in^2)(0.9421)(28.436'')} = 30.24\,ksi$$

$$s \le \frac{(700)(1.00)}{(1.1005)(30.24\,ksi)} - (2)(2'') = 17.034''$$

$E_c = (150)^{1.5}(33)\sqrt{3500\,psi}\,/\,1000\frac{lb}{k}$

$= 3586.6\,ksi$

$E_s = 29{,}000\,ksi$

$n = \frac{E_s}{E_c} = 8.086 \rightarrow 8$

Use Min. d_s for both axes

d_s = min of d_{sx} and d_{sz}

$d_s = 42" - 12" - 1" - 1.128" - \frac{1.128"}{2} = 27.308"$

$a = 1.867"$

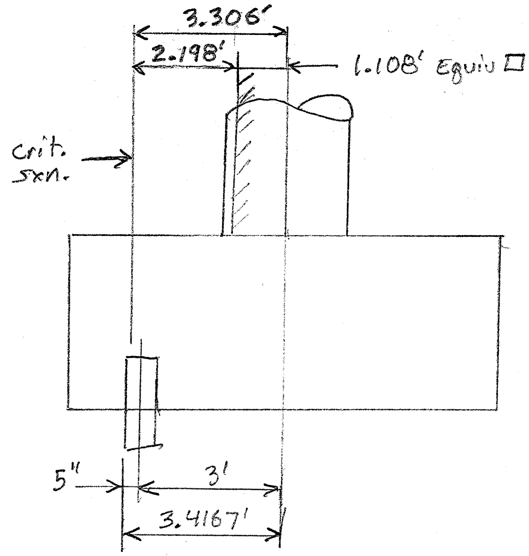
One Way Shear

x-dir^n

d_v = max of
$$\begin{cases} 0.72h = (0.72)(42") = 30.24" & \leftarrow \text{we are excluding this from consideration} \\ 0.9d_s = (0.9)(27.308") = 24.577" \\ d_s - a/2 = 27.308" - \frac{1.867"}{2} = 26.374" & \leftarrow \text{Controls} \end{cases}$$

Critical section $= 1.108' + \frac{26.374"}{12"/'}$

$= 3.306'$



∴ The 2 piles have a small portion outside the critical section. We may linearly interpolate to determine the shear load.

$$\frac{(3.4167' - 3.306')(12"/')}{10" \text{ pile}} = 0.133$$

$= 13.3\%$

$V_u = (145.8^k)(2 \text{ piles})(0.133) = 38.78^k$

$V_c = 0.0316\,\beta\sqrt{f'_c}\,b_v d_v < 0.25 f'_c b_v d_v$

$= (0.0316)(2.0)(\sqrt{3.5 ksi})(9' \times 12"/')(26.374") = 336.8^k <$

$(0.25)(3.5ksi)(9' \times 12"/')(26.374")$

$= 2492.3^k$

$\phi V_c = (0.9)(336.8^k) = 303.1^k > V_u$ ∴ OK

∴ To use $\beta = 2$ the point of 0 shear to the Equiv. Column Face must be less than $3d_v$

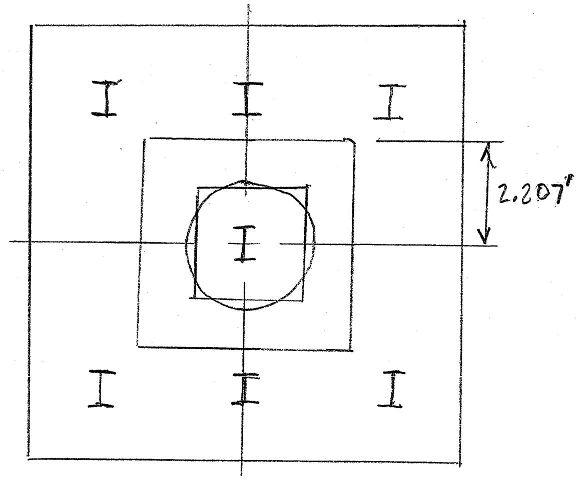
$3.4167' - \frac{2.216'}{2} = 2.309' < 3d_v = (3)\left(\frac{26.374"}{12"/'}\right) = 6.594'$

∴ OK

Two Way Shear

$d_v = 26.374''$

$$\text{Critical Section} = 1.108' + \frac{26.374''}{(2)(12''/1)}$$
$$= 2.207'$$



$(6\text{piles})(131.374^k) = 788.2^k$

$$V_c = \left(0.063 + \frac{0.126}{\beta_c}\right)\sqrt{f'_c}\, b_o d_v \leq 0.126\sqrt{f'_c}\, b_o d_v$$

$$\beta_c = \frac{(2)(2.207')}{(2)(2.207')} = 1$$

$b_o = (8)(2.207') = 17.656' = 211.872''$

$$V_c = \left(0.063 + \frac{0.126}{1}\right)\sqrt{3.5\text{ksi}}\,(211.872'')(26.374'') = 1975.8^k >$$

$$(0.126)(\sqrt{3.5\text{ksi}})(211.872'')(26.374'') = 1317.21^k$$

2 controls

$\phi V_c = (0.9)(1317.2^k) = 1185.5^k > V_u$

Appendix I

Pier Loads - CE

CE – Vehicular Centrifugal Force

- CE is applied 6.0 feet above the deck surface to piers with horizontally curved roadways.
- Design speed for the appropriate highway classification shall be taken from the Office of Design's *Design Manual*.
- Number of lanes loaded for CE shall be consistent with number of lanes loaded for vertical LL. Multiple presence factors apply to CE.
- Each pier shall resist the total CE force individually – it is not distributed among the bents.

Pier Loads – CE

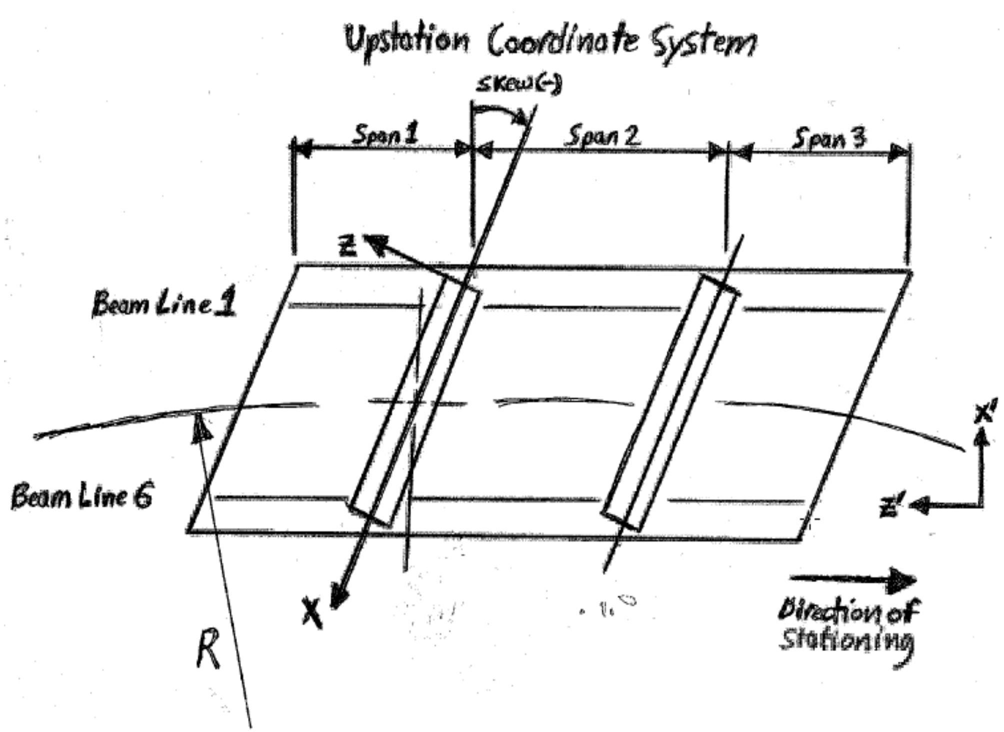
CE – Vehicular Centrifugal Force (continued)

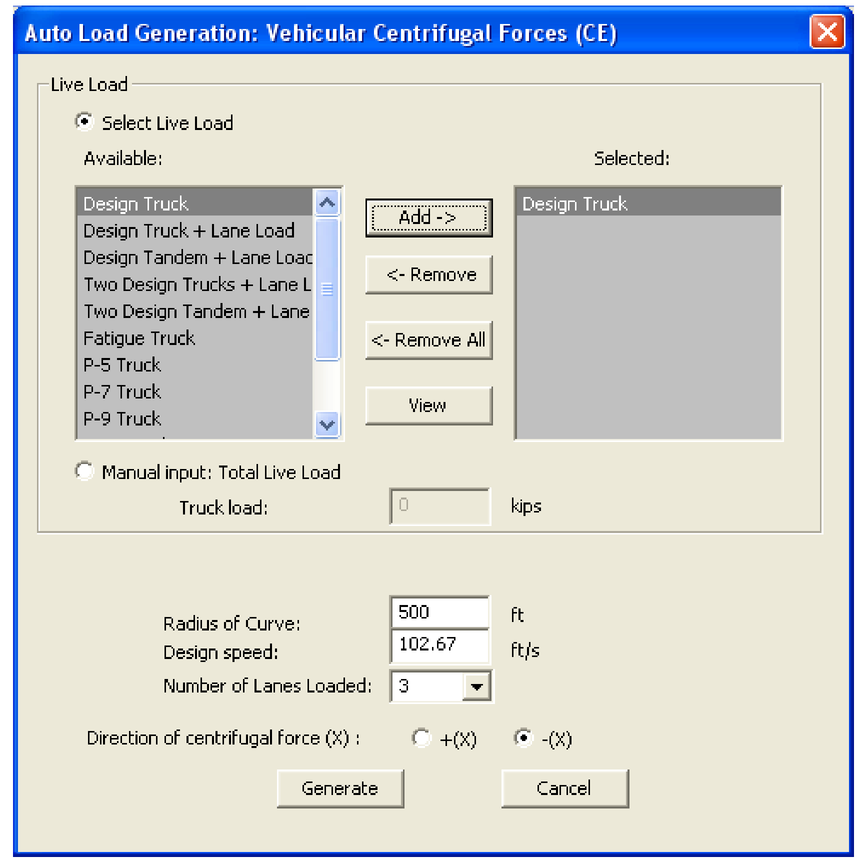
- The commentary of AASHTO LRFD 3.6.3 speaks of including and excluding CE in order to determine the worst case scenario for pier design. Our manual says CE should always be included when LL is included.
- CE is based on a percentage of total truck (72 kips) or tandem (50 kips) axle weight, not a LL pier reaction of said weight. [The Iowa DOT does not consider 90% of two design trucks.]

$CE = C * LL_{\text{truck or tandem}}$ $$C = f\frac{v^2}{gR}$$ where $f = 4/3$

Pier Loads – CE

Consider: 3 span PPC bridge (70.75'-91.5'-60.75') -- This is not 305 Wapello
32 degree LA skew.
6 beam lines at 7.401' (8.727' skewed spacing).
Upstation Coordinate System.





Pier Loads – CE

Height of CE Above Cap = 6' + [8" Slab Thk + 54" Beam Hgt] / (12 in/ft) = 11.167'

$C = f * v^2 / (g * R) = (4/3) * (102.67 \text{ ft/s})^2 / [(32.2 \text{ ft/s}^2) * (500')] = 0.8730$

Design Truck Axle Weight = 32 k + 32 k + 8 k = 72 k

CE = Fx' = (72 k) * (0.8730) * (3 lanes) * (0.85) = 160.283 k [MPF = 0.85]

Fx = -(160.283 k)*(cos(32 deg)) = -135.928 k

Fz = (160.283 k)*(sin(32 deg)) = 84.937 k

Fx per beam = (-135.928 k) / (6 beams) = -22.655 k

Fz per beam = (84.937 k) / (6 beams) = 14.156 k

Overturning Mom., Mz = (135.928 k)*(11.167') = 1517.908 k*ft

Fy for beam 1 = -(1517.908 k*ft) / [(5 beam spa)*(8.727' skewed)] = -34.786 k

Fy for beam 6 = (1517.908 k*ft) / [(5 beam spa)*(8.727' skewed)] = 34.786 k

Overturning Mom., Mx = (84.937 k)*(11.167') = 948.491 k*ft

Office policy is to delete Mx since we assume the connection between the pier and slab cannot transmit a moment in that direction.

Iowa Department of Transportation
Office of Bridges & Structures

Pier Loads – CE