RELEASED FOR CONSTRUCTION

PACKAGE DESCRIPTION: NDC 007, Silver Creek Box Culvert

DATE: February 26, 2021

The Design Task Manager and Design Manager certify that quality control activities have been conducted throughout the design process in compliance with the Design Quality Management Plan and all contractual requirements. The Design Task Manager and Design Manager certify that the deliverable is complete to the appropriate stage of design, is checked, and is ready to be released for construction. (For those drawings and documents included in the submittal that are prepared by a manufacturer or supplier or other persons not under his or her direct supervision, the Responsible Engineer shall affix a stamp that indicates the design shown on the sheet or document conforms to the overall design and contract requirements.)

COMMENTS:

SIGNED: Moshe L. Cohen — Digitally signed by Moshe L. Cohen, DN: cn=Moshe L. Cohen, c=US, o=Kaskaskia Engineering Group, email=mcohen@kaskaskiaeng.com, Date: 2021.03.01 07:47:40 -06'00' DATE: _____

DESIGN TASK MANAGER (LEAD)

SIGNED: _____ 2021.02.26 15:53:21-06'00' DATE: _____

DESIGN MANAGER

The Design Quality Manager certifies that the following reviews have been completed and that all comments have been resolved:

☒ Design Detail Checking ☐ Design Coordination Reviews ☐ Independent Technical Review ☐ Constructability Review

The Design Quality Manager certifies that the released for construction package has been audited for conformance with the Quality Management Plan, meets the requirements of the Quality Manual, checking and review processes have been followed, all audit findings have been resolved the Responsible Engineer has signed all drawings prepared under his or her direction, and by signing this release, the Design Quality Manager approves the audit process and procedures conducted in support of this release.

COMMENTS:

SIGNED: Jason Kleist — Digitally signed by Jason Kleist, DN: CN=Jason Kleist, Date: 2021.03.01 07:23:29-06'00' DATE: _____

DESIGN QUALITY MANAGER

The Project Manager has verified that:

☐ Design has undergone constructability review and is constructible as represented.

☐ The Released for Construction Package and working drawings for the portion of the Project to be constructed are complete and approved.

COMMENTS:

SIGNED: Bill Hines — Digitally signed by Bill Hines, Date: 2021.02.26 22:12:24 -06'00' DATE: _____

PROJECT MANAGER - Contractor

The MnDOT Project Manager has accepted the design for construction.

COMMENTS:

SIGNED: _____ DATE: _____

MnDOT PROJECT MANAGER

NOTICE OF DESIGN CHANGE

TO:	Bill Hines
FROM:	Scott Hasburgh
DATE:	February 26, 2021
NDC NO.:	007
DESIGN PACKAGE:	Silver Creek

REASON FOR THE CHANGE:

This NDC will update and provide a slightly shifted location of the Silver Creek box culvert. The depth of water and quantity of flow in the culvert make construction on existing alignment extremely difficult. Directing flow into a single cell of the existing box culvert will require installing sheet pile. The sheet pile and existing box location will leave insufficient space to remove and install the new adjacent cell of the proposed precast box culvert.

Shifting the box culvert allows better accommodation of the depth and quantity of flow away from the work zone. When the western cell is completed under I-94 WB, a temporary drainage accommodation will be installed to route drainage into the existing box under I-94 EB. The existing box culvert will then be removed under WB and the eastern cell installed under EB.

DESCRIPTION OF CHANGE:

The box culvert will be shifted approximately 2' to the west to provide the staging necessary to accommodate the existing drainage and water level. This will allow drainage to be maintained.

DRAWINGS AND/OR SPECIFICATIONS TO BE REVISED:

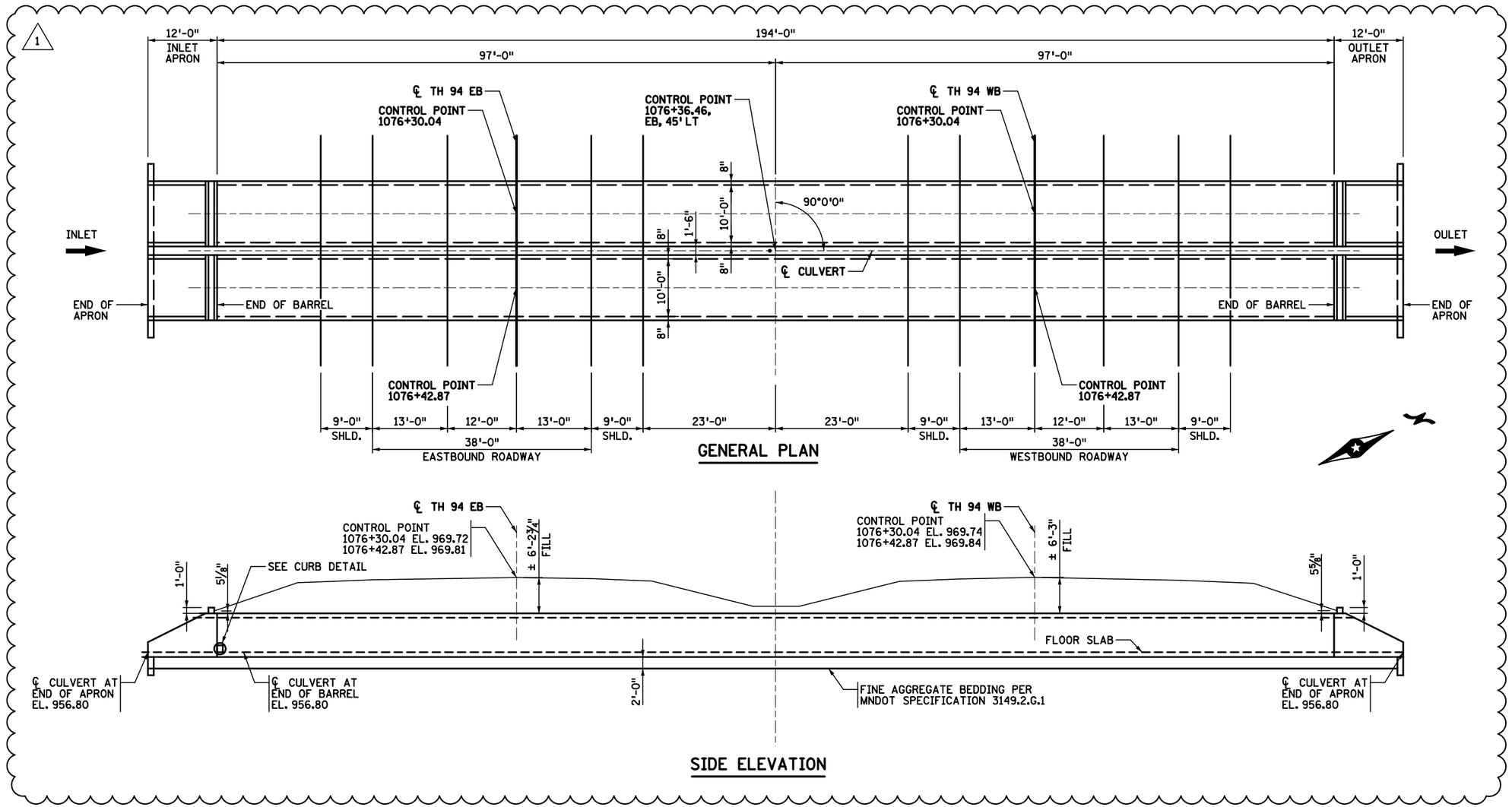
Sheet	Description
SC-1 to SC-7	Moved box culvert 2' west

DATE REVISED DRAWINGS AND/OR SPECS WILL BE AVAILABLE: February 26, 2021

RECEIVED BY CONTRACTOR: Bill Hines — Digitally signed by Bill Hines Date: 2021.02.26 22:11:31 -06'00'

PROJECT MANAGER — DATE

cc: MnDOT



GENERAL PLAN

SIDE ELEVATION

CONSTRUCTION NOTES

THE 2018 EDITION OF THE MINNESOTA DEPARTMENT OF TRANSPORTATION "STANDARD SPECIFICATIONS FOR CONSTRUCTION" SHALL GOVERN.

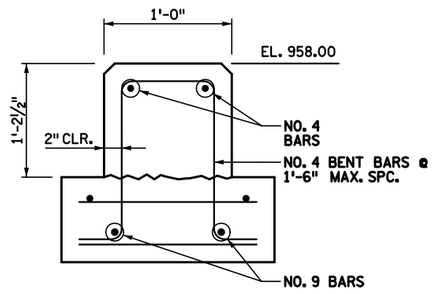
ALL EXPOSED CONCRETE EDGES SHALL BE FORMED WITH A 1/2" OR 3/4" CHAMFER UNLESS OTHERWISE NOTED.

CONSTRUCTION SHALL BE IN ACCORDANCE WITH SPEC. 2411, EXCEPT AS NOTED.

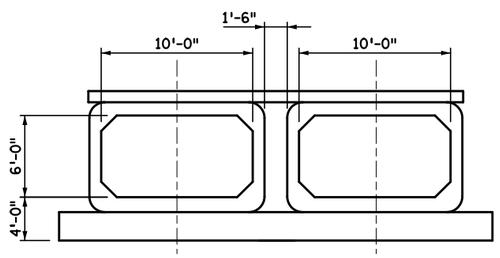
FOR STRUCTURE EXCAVATION AND BACKFILL SEE SPEC. 2451.

THE BAR SIZES SHOWN IN THIS PLAN ARE IN U.S. CUSTOMARY DESIGNATIONS.

THE SUBSURFACE UTILITY INFORMATION IN THIS PLAN IS UTILITY QUALITY LEVEL D. THIS UTILITY QUALITY LEVEL WAS DETERMINED ACCORDING TO THE GUIDELINES OF CI/ASCE 38-02, ENTITLED "STANDARD GUIDELINE FOR THE COLLECTION AND DEPICTION OF EXISTING SUBSURFACE UTILITY DATA".



CURB DETAIL



END ELEVATION

DESIGN DATA

DESIGNED IN ACCORDANCE WITH 2017 AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS AND MnDOT BRIDGE DESIGN MANUAL.
LOAD RESISTANCE FACTOR DESIGN METHOD

HL-93 LIVE LOAD

BARREL SPAN = 10'-0"
BARREL RISE = 6'-0"
BARREL LENGTH = 204'-0"
HEIGHT OF WINGWALL AT END = 1'-9"
DEPTH OF DROPWALL = 3'-2"
DESIGN FILL DEPTH MIN. = 2'-0"
DESIGN FILL DEPTH MAX. = 7'-0"
SKEW ANGLE = 0°

MATERIAL DESIGN STRESSES:
PRECAST CONCRETE:
f'c = 5 KSI CONCRETE
fy = 60 KSI REINFORCEMENT BARS
fy = 65 KSI FOR WELDED WIRE FABRIC

HL 93 LRFR
BRIDGE OPERATING RATING FACTOR = 1.3

LIST OF SHEETS

I-94
BRIDGES DESIGN BUILD PROJECT

I HEREBY CERTIFY THAT THIS PLAN WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.

SIGNED _____ DATE 05/22/2020
NAME BENJAMIN BOVEE LICENSE 52794

MINNESOTA
DEPARTMENT OF TRANSPORTATION

BRIDGE NO. 86X12
GENERAL PLAN AND ELEVATION

T.H. 94 OVER SILVER CREEK
0.9 MILES EAST OF JCT. C.S.A.H. 8
STA. 1076+36.46

IDENTIFICATION NO.

SEC. 21 T 122 N R 26 W

SILVER CREEK TOWNSHIP WRIGHT COUNTY

APPROVED _____
STATE BRIDGE ENGINEER
DATE _____

NO	DATE	BY	CKD	APPR	REVISION
1	02/25/21	NP	JW	JW	NDC 007 - SILVER CREEK CULVERT - 2' SHIFT

MNDOT ACCEPTANCE
SIGNATURE
DATE

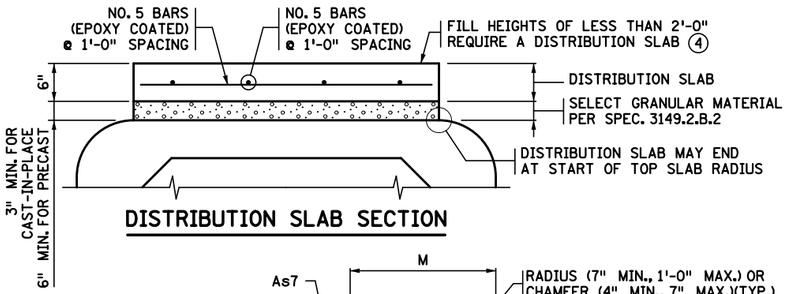
HcPCi, LLC Mead&Hunt
Kaskaskia Engineering Group, LLC

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION, OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.
LIC. NO. _____ DATE _____

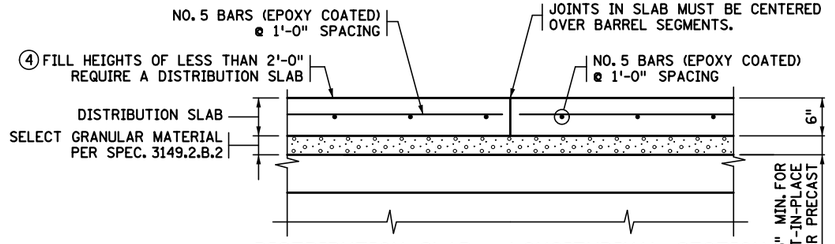
DESIGNED KLS
DRAWN RJO
CHECKED BB

I-94 DESIGN BUILD S.P. 8680-173
T.H. 94 - MONTICELLO TO CLEARWATER
BRIDGE NO. 86X12
GENERAL PLAN AND ELEVATION

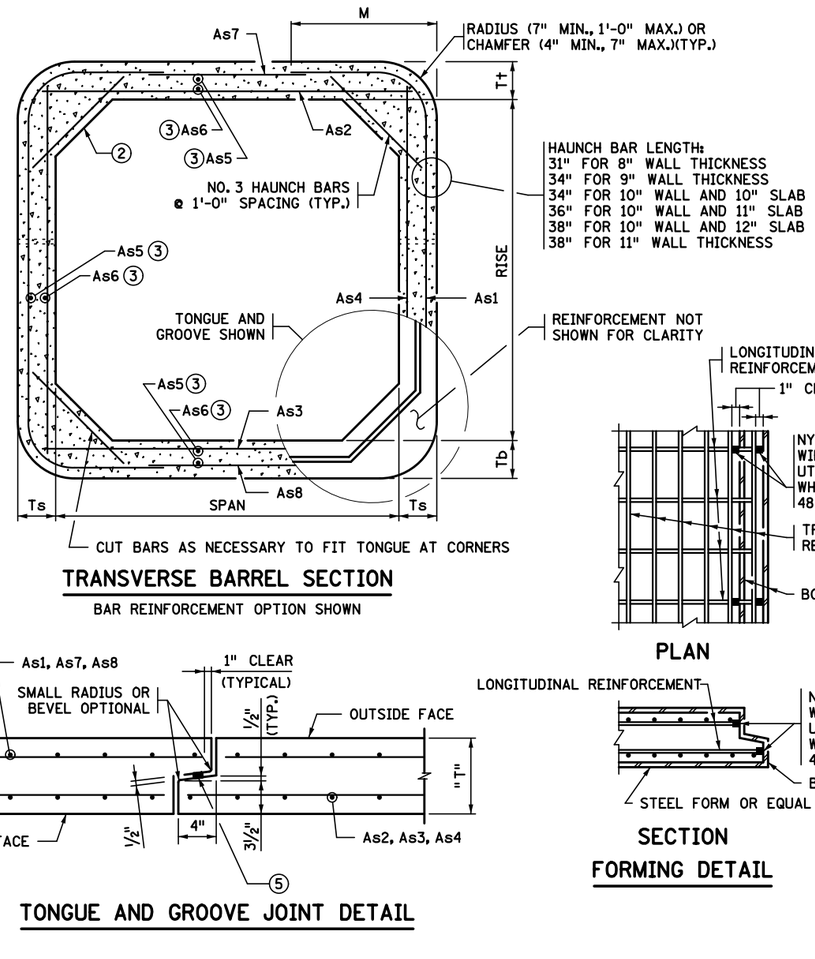
SHEET SC-1 OF 7



DISTRIBUTION SLAB SECTION

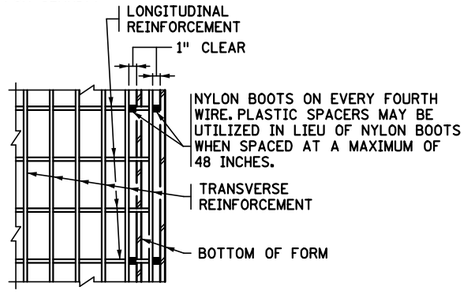


DISTRIBUTION SLAB - LONGITUDINAL SECTION



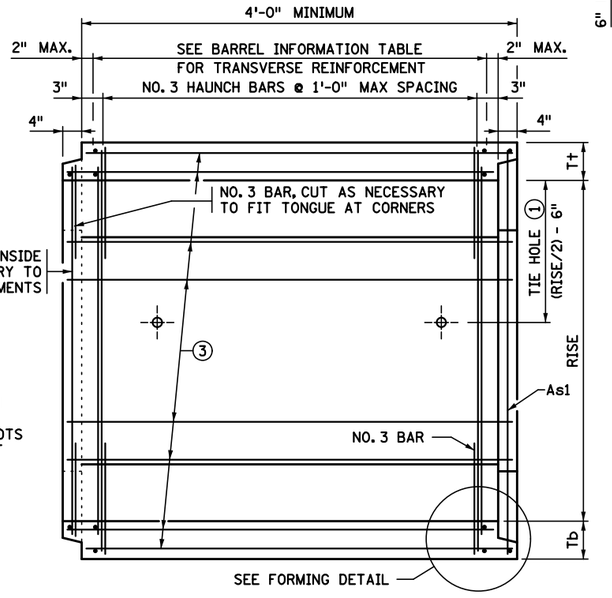
TRANSVERSE BARREL SECTION

BAR REINFORCEMENT OPTION SHOWN



PLAN

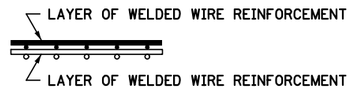
SECTION FORMING DETAIL



LONGITUDINAL BARREL SECTION

BAR REINFORCEMENT OPTION SHOWN

TONGUE AND GROOVE JOINT DETAIL



REINFORCEMENT LAYER DETAIL

WHEN MORE THAN ONE LAYER OF WELDED WIRE REINFORCEMENT IS USED TO OBTAIN THE REQUIRED REINFORCEMENT AREAS, PLACE THE WIRES OF THE WELDED WIRE REINFORCEMENT AS SHOWN

CONSTRUCTION NOTES

CONSTRUCT CULVERTS PER SPEC. 2412 EXCEPT AS NOTED.

REFER TO THE GENERAL PLAN AND ELEVATION SHEET FOR THE DISTANCE BETWEEN BARRELS OF ADJACENT BOXES AND TO STANDARD FIGURE 5-395.115 FOR MATERIAL REQUIREMENTS FOR FILL BETWEEN ADJACENT BOXES.

PROVIDE WELDED WIRE REINFORCEMENT, SHEAR REINFORCEMENT AND REINFORCEMENT BARS PER THE APPLICABLE REQUIREMENTS OF AASHTO M259.

1½" MIN. AND 2" MAX. CONCRETE COVER ON ALL REINFORCEMENT, INCLUDING SHEAR REINFORCEMENT, EXCEPT FOR TONGUE AND GROOVE DETAIL.

ANY OF THE FOLLOWING COMBINATIONS OF STEEL REINFORCEMENT MAY BE USED:
- (a) 1 OR 2 LAYERS OF WELDED WIRE REINFORCEMENT OR
- (b) 1 LAYER OF WELDED WIRE REINFORCEMENT AND 1 LAYER OF REINFORCEMENT BARS OR
- (c) 1 LAYER OF REINFORCEMENT BARS.

DEVELOP REINFORCEMENT IN ACCORDANCE WITH AASHTO "LRFD BRIDGE DESIGN SPECIFICATIONS". IF BAR REINFORCEMENT IS SUBSTITUTED FOR WELDED WIRE REINFORCEMENT, INCREASE THE AREA OF REINFORCEMENT BY 8%, AND SUBMIT DESIGN CALCULATIONS VERIFYING COMPLIANCE WITH AASHTO 5.7.3.4. "CONTROL OF CRACKING BY DISTRIBUTION OF REINFORCEMENT".

MAXIMUM SIZE OF REINFORCEMENT BARS IS NO. 6. THE MAXIMUM WELDED WIRE REINFORCEMENT SIZE IS W23 PER LAYER (MAXIMUM OF 2 LAYERS).

SPACE CENTER TO CENTER OF TRANSVERSE WIRES NOT LESS THAN 2" NOR MORE THAN 4". SPACE CENTER TO CENTER OF LONGITUDINAL WIRES NOT MORE THAN 8".

WHEN USING As1, As7, AND As8 REINFORCEMENT AS ONE CONTINUOUS CAGE WITH SPLICES OCCURRING IN THE CENTER OF THE TOP AND BOTTOM OF THE BOX SECTION, THE MIN. LAP LENGTH FOR THE As7 AND As8 IS 15".

WELDING IS NOT PERMITTED ON REINFORCEMENT BARS OR WELDED WIRE REINFORCEMENT, EXCEPT THAT THE ORIGINAL WELDING REQUIRED TO MANUFACTURE WIRE REINFORCEMENT IS ACCEPTABLE.

WHEN REINFORCEMENT IS CUT, PLACE ADDITIONAL REINFORCEMENT ON BOTH SIDES OF THE CUT MEMBER TO REPLACE OR EXCEED THE CUT STEEL.

USE CONCRETE MIX NO. 3W82 WITH NO CALCIUM CHLORIDE ALLOWED.

SHOP DRAWING APPROVAL PER SPEC. 3238.2.A IS NOT REQUIRED UNLESS OPENINGS OR ATTACHMENTS ARE PLACED ON A BARREL SEGMENT.

COMPACT THE FIRST 1.5' (LOOSE) OF FILL ABOVE THE BOX WITH LIGHT COMPACTION EQUIPMENT SUCH AS PLATE COMPACTORS OR WALK BEHIND ROLLERS.

TRANSVERSE REINFORCEMENT IS PARALLEL TO THE CULVERT SPAN. LONGITUDINAL REINFORCEMENT IS PERPENDICULAR TO THE CULVERT SPAN.

(1) USE 1" DIAMETER CULVERT TIES. SEE STANDARD PLATE NO. 3145 FOR DETAILS.

(2) USE 12" VERTICAL, 12" HORIZONTAL HAUNCHES ON ALL BOX SIZES.

(3) PLACE LONGITUDINAL REINFORCEMENT DENOTED AS As5 AND As6 IN ALL SLABS AND WALLS WITH A MINIMUM OF 0.06 SQ. IN./FT.

(4) ROADWAY OR SHOULDER FILL HEIGHTS OF LESS THAN 2'-0" REQUIRE A 6" THICK DISTRIBUTION SLAB WITH CONCRETE MIX 3S52.

PLACE CAST-IN-PLACE DISTRIBUTION SLABS WITH 3" MIN. SELECT GRANULAR MATERIAL PER SPEC. 3149.2.B.2 BETWEEN BARREL AND DISTRIBUTION SLAB.

PRECAST DISTRIBUTION SLABS MAY BE USED FOR FILL HEIGHTS OVER 1'-0". PROVIDE 6" MINIMUM SELECT GRANULAR MATERIAL PER SPEC. 3149.2.B.2 BETWEEN BARREL AND SLAB.

EXTEND THE WIDTH OF THE DISTRIBUTION SLAB TO THE OUTSIDE EDGES OF THE ROADWAY SHOULDERS UNLESS DIRECTED BY THE ENGINEER.

REDESIGN THE DISTRIBUTION SLAB PER THE MnDOT PAVEMENT DESIGN MANUAL IF IT IS USED AS PAVEMENT SURFACE.

PAYMENT FOR THE DISTRIBUTION SLAB AND SELECT GRANULAR MATERIAL BENEATH THE SLAB IS CONSIDERED INCIDENTAL.

(5) REFER TO SPEC. 2412 FOR SEALANT REQUIREMENTS.

BARREL INFORMATION TABLE ***

LOCATION	SIZE	CLASS	f'c (P.S.I.)	FILL HEIGHT RANGE (FT.)	DISTRIBUTION SLAB REQUIRED *	RECESSED TIE RODS REQUIRED **	DIMENSIONS					WEIGHT (LBS./FT.)	WELDED WIRE REINFORCEMENT											
													As1			As2		As3		As4		As7		As8	
							SPAN (FT.)	RISE (FT.)	T+ (IN.)	Tb (IN.)	Ts (IN.)		AREA (IN.²/FT.)	LENGTH (FT.)	M (FT.)	AREA (IN.²/FT.)	LENGTH (FT.)	AREA (IN.²/FT.)	LENGTH (FT.)	AREA (IN.²/FT.)	LENGTH (FT.)	AREA (IN.²/FT.)	LENGTH (FT.)	AREA (IN.²/FT.)	LENGTH (FT.)
1076+36.46	10X6	2	5000	3-7	NO	NO	10	6	9	10	8	4200	0.45	12'-8"	2'-10"	0.56	10'-6"	0.59	10'-6"	0.20	6'-6"	0.24	8'-3"	0.24	8'-3"

* ALL CLASS 1 CULVERTS WITH FILL HEIGHTS OF LESS THAN 2'-0" REQUIRE A DISTRIBUTION SLAB. IF A DISTRIBUTION SLAB IS NOT REQUIRED, INDICATE "NO" IN THIS BOX.

** FOR PEDESTRIAN CULVERT APPLICATIONS HIDE-AWAY OR RECESSED TIE CONNECTIONS ARE REQUIRED, SEE STANDARD PLATE 3145. IF REQUIRED, INDICATE "YES" IN THIS BOX.

*** BOX CULVERTS WITH SPANS FROM 6 TO 14 FT. ARE DESIGNED FOR HL-93 LIVE LOADS (AASHTO LRFD 3.6.2.1) NOT INCLUDING THE DESIGN LANE LOAD. BOXES WITH SPANS OF 16 FT. ARE DESIGNED FOR HL-93 LIVE LOADS INCLUDING THE DESIGN LANE LOAD.

REVISION: FEBRUARY 22, 2018

APPROVED: MARCH 24, 2011
Nancy Daubenberger
STATE BRIDGE ENGINEER

STATE PROJ. NO 8680-173 (T.H. 94) STA. 1076+36.46

FIG. 5-395.101(A)

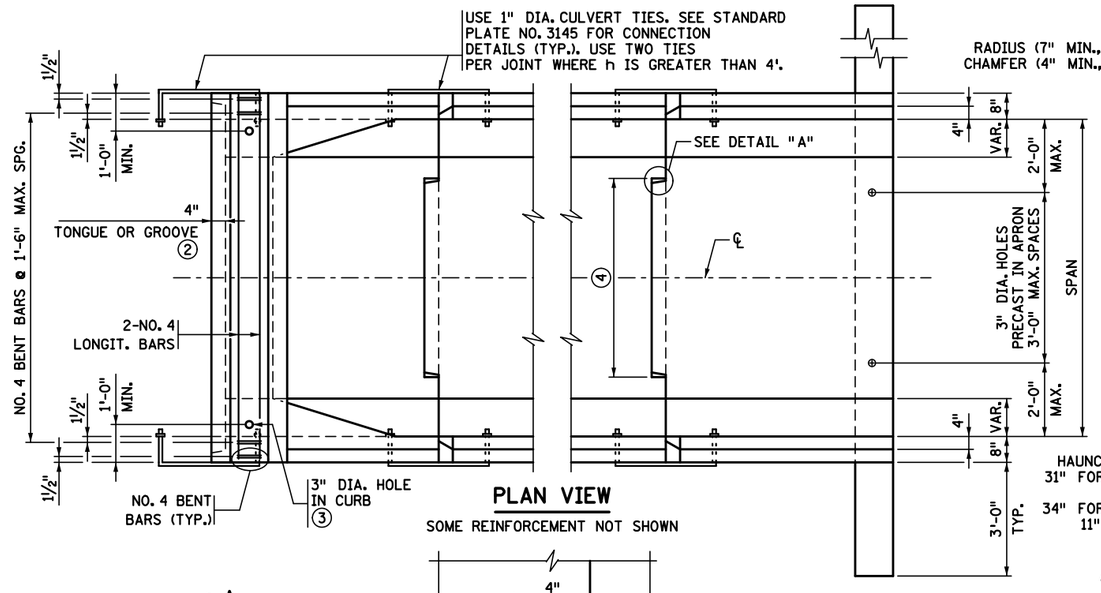
CERTIFIED BY _____ 05/22/2020
LICENSED PROFESSIONAL ENGINEER — DATE
NAME: BENJAMIN BOVEE LIC. NO. 52794

TITLE: PRECAST CONCRETE BARREL DETAILS

DES: KLS	DR: RJO	APPROVED:
CHK: BB	CHK: BB	

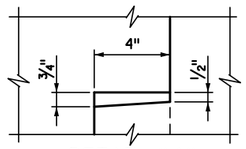
SHEET NO. 2 OF 7 SHEETS

BRIDGE NO. 86X12

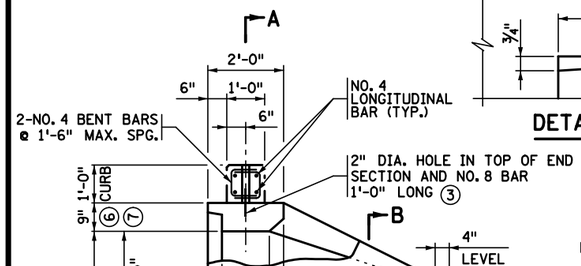


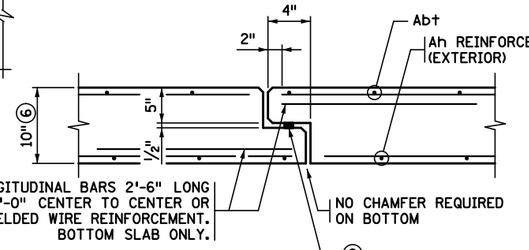
PLAN VIEW

SOME REINFORCEMENT NOT SHOWN



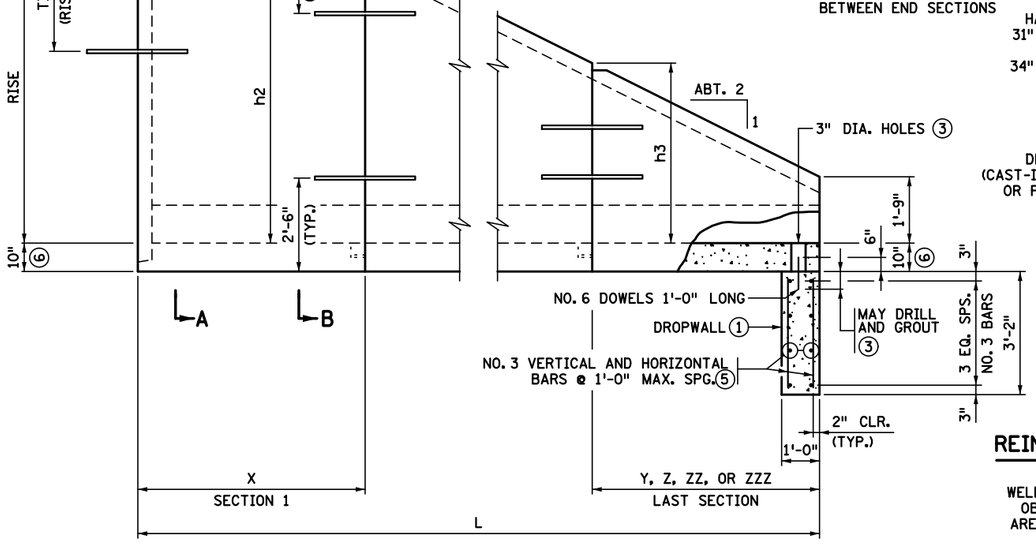
DETAIL "A"



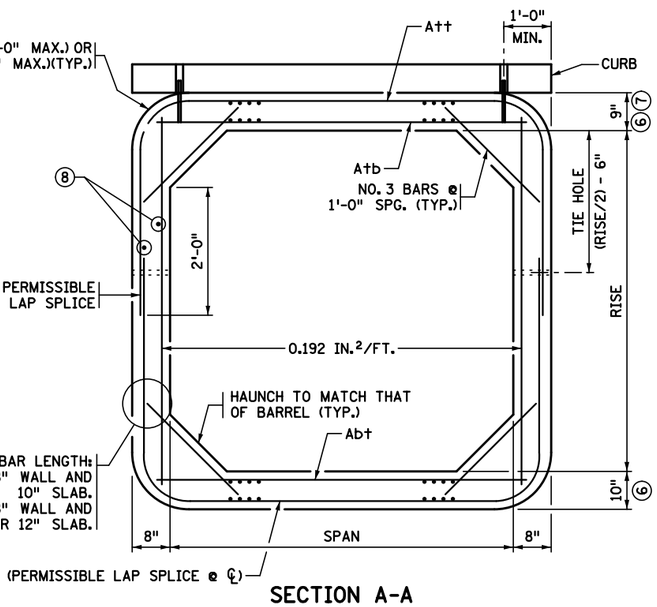


TONGUE AND GROOVE JOINT DETAIL

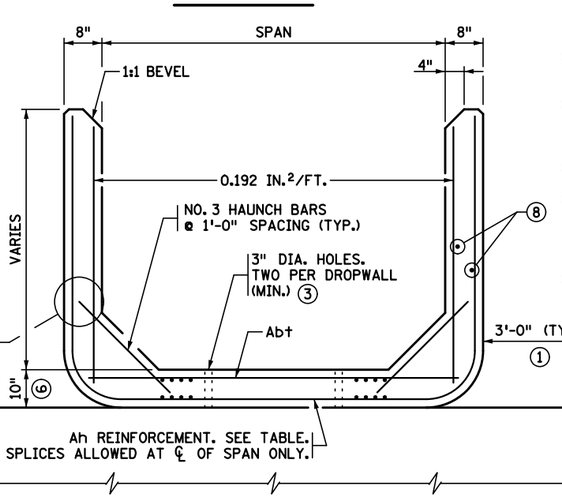
BETWEEN END SECTIONS



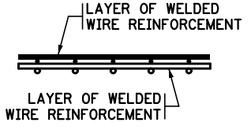
SIDE ELEVATION



SECTION A-A



SECTION B-B



REINFORCEMENT LAYER DETAIL

WHEN MORE THAN ONE LAYER OF WELDED WIRE REINFORCEMENT IS USED TO OBTAIN THE REQUIRED REINFORCEMENT AREAS, PLACE THE WIRES OF THE WELDED WIRE REINFORCEMENT AS SHOWN.

CONSTRUCTION NOTES

SEE STANDARD FIG. 5-395.101(A) AND FIG. 5-395.101(B) FOR ADDITIONAL DIMENSIONS AND CONSTRUCTION NOTES.

USE CONCRETE MIX NO. 3W82 WITH NO CALCIUM CHLORIDE ALLOWED.

ALL END SECTIONS REQUIRE CURB ON LINTEL BEAM.

ON ALL END SECTIONS FOR WATERWAYS, USE DROPWALLS ON INLET AND OUTLET ENDS.

SEE STANDARD FIG. 5-395.115 FOR EMBANKMENT PROTECTION.

FINISH ALL EXPOSED EDGES OF CONCRETE WITH ½" OR ¾" CHAMFER OR RADIUS UNLESS OTHERWISE NOTED.

MAXIMUM SIZE OF REINFORCEMENT BARS IS NO. 6, EXCEPT NO. 7 OR 8 BARS MAY BE USED FOR A†b ON SPANS GREATER THAN 14'. THE MAXIMUM WELDED WIRE REINFORCEMENT SIZE IS W23 PER LAYER (MAXIMUM OF 2 LAYERS).

① WITH DOUBLE BOXES LOCATE DROPWALL JOINTS BETWEEN END SECTIONS. SEE STANDARD FIG. 5-395.111 FOR ALTERNATE DROPWALLS. LIMITS OF EXCAVATION FOR DROPWALL ARE APPROXIMATELY THE SAME AS DROPWALL DIMENSIONS. DROPWALL CONCRETE MIX IS 3S52, OR 3Y82 IF PRECAST. FURNISHING AND INSTALLATION OF DROPWALL TO BE INCLUDED IN PRICE BID FOR END SECTIONS. DROPWALL NOT REQUIRED FOR NON-WATERWAY USE.

② CHECK LOCATION TO DETERMINE WHETHER A TONGUE OR A GROOVE IS USED.

③ FILL HOLE WITH GROUT. GROUT CONSISTS OF 1 PART CEMENT AND 2 PARTS SAND. USE TYPE 1A AIR ENTRAINED PORTLAND CEMENT. GROUT MIX MAXIMUM SLUMP IS 4".

④ 3'-6" MIN. TONGUE AND 3'-7" MIN. GROOVE FOR CULVERTS WITH 6'-0" SPANS. 5'-0" MIN. TONGUE AND 5'-1" MIN. GROOVE FOR CULVERTS WITH SPANS GREATER THAN 6'-0". CENTER TONGUE AND GROOVE ON ℄ OF EACH APRON JOINT. TONGUE AND GROOVE JOINT ON ALL THREE SIDES OF APRON IS PERMISSIBLE.

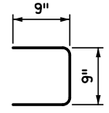
⑤ WELDED WIRE REINFORCEMENT OF EQUAL AREA MAY BE SUBSTITUTED FOR REBAR.

⑥ APRON TOP AND BOTTOM SLAB THICKNESS MAY BE 8" FOR CULVERTS WITH 6' SPANS ONLY. BOTTOM SLAB THICKNESS MAY BE INCREASED UP TO 2" MAX. PROVIDED CONCRETE COVER IS 1½" MIN., 2" MAX.

⑦ 10" MINIMUM TOP SLAB FOR 14' AND 16' SPANS.

⑧ PLACE LONGITUDINAL REINFORCEMENT PERPENDICULAR TO THE CULVERT SPAN WITH A MINIMUM OF 0.06 SQUARE INCHES PER PERIPHERAL FOOT ON ALL FACES OF THE BARREL.

⑨ REFER TO SPEC. 2412 FOR SEALANT REQUIREMENTS.



NO. 4 BENT BAR

A††, A†b REINFORCEMENT

SPAN (FT.)	A†† (IN²/FT.)	A†b (IN²/FT.)
6	0.27	0.44
8	0.47	0.60
10	0.62	0.74
12	0.88	1.06
14	1.20	1.58
16	1.52	2.09

A†b REINFORCEMENT

SPAN (FT.)	A†b (IN²/FT.)
6-10	0.20
12	0.30
14	0.39
16	0.39

APRON DIMENSIONS & Ah REINFORCEMENT

RISE FT.	L FT.	SECTION 1 X	SECTION 1 Ah	h2	SECTION 2 Y	SECTION 2 Ah	h3	SECTION 3 Z	SECTION 3 Ah	h4	SECTION 4 ZZ	SECTION 4 Ah	h5	SECTION 5 ZZZ	SECTION 5 Ah	h6
4	8	8'(4')	0.192	1'-9"(3'-9")	(4')	(0.192)	(1'-9")									
5	10	6'	0.192	3'-9"	4'	0.192	1'-9"									
6	12	6'	0.192	4'-9"	6'	0.192	1'-9"									
7	14	6'	0.192	5'-9"	8'(4')	0.192	1'-9"(3'-9")	(4')	(0.192)	(1'-9")						
8	16	6'	0.20	6'-9"	6'	0.192	3'-9"	4'	0.192	1'-9"						
9	18	6'	0.29	7'-9"	6'	0.20	4'-9"	6'	0.192	1'-9"						
10	20	6'	0.42	8'-9"	6'	0.29	5'-9"	8'(4')	0.192	1'-9"(3'-9")	(4')	(0.192)	(1'-9")			
11	22	6'	0.60	9'-9"	6'	0.42	6'-9"	6'	0.192	3'-9"	4'	0.192	1'-9"			
12	24	6'	0.78	10'-9"	6'	0.60	7'-9"	6'	0.20	4'-9"	6'	0.192	1'-9"			
13	26	6'	1.03	11'-9"	6'	0.78	8'-9"	6'	0.28	5'-9"	8'(4')	0.192	1'-9"(3'-9")	(4')	(0.192)	(1'-9")
14	28	6'	1.38	12'-9"	6'	1.03	9'-9"	6'	0.40	6'-9"	6'	0.192	3'-9"	4'	0.192	1'-9"

NOTE: Ah IS AREA OF REINFORCEMENT PER FOOT OF LENGTH (IN²/FT.)
VALUES IN ( ) MAY BE USED FOR END SECTIONS WITH SPANS OF 14' AND 16' ONLY.

REVISION: FEBRUARY 22, 2018

APPROVED: MARCH 24, 2011
Nancy J. Daubenberger
STATE BRIDGE ENGINEER

STATE PROJ. NO 8680-173 (T.H. 94) STA. 1076+36.46

FIG. 5-395.102

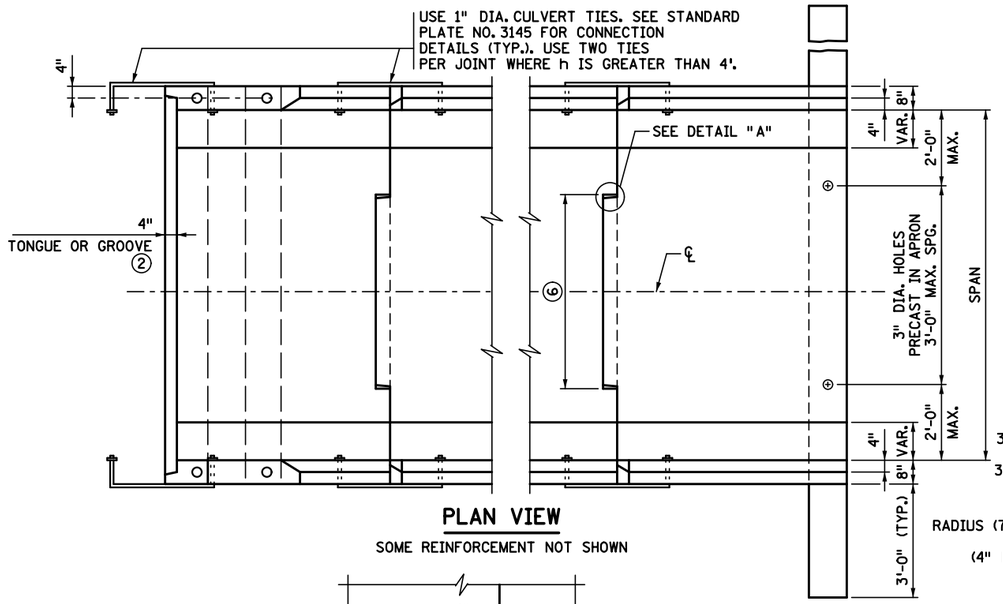
CERTIFIED BY _____ 05/22/2020
LICENSED PROFESSIONAL ENGINEER — DATE
NAME: BENJAMIN BOVEE LIC. NO. 52794

TITLE: PRECAST CONCRETE END SECTION TYPE I - SINGLE OR DOUBLE BARREL FOR SKEWS UP TO 7½°

DES: KLS DR: RJO APPROVED:
CHK: BB CHK: BB

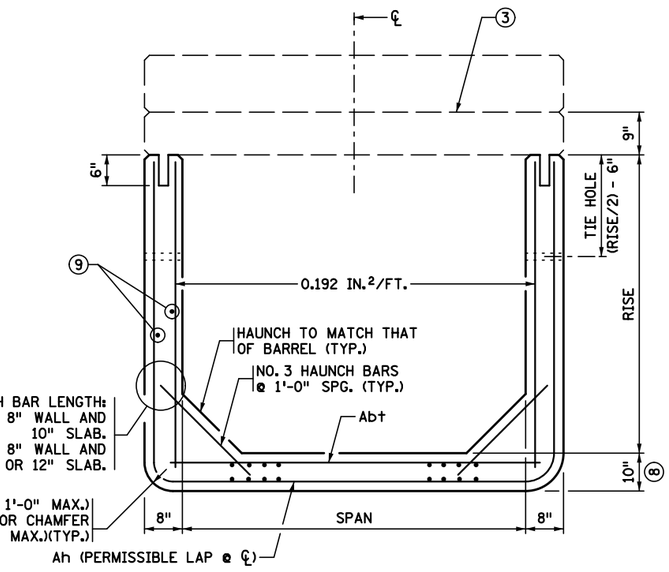
SHEET NO. 3 OF 7 SHEETS

BRIDGE NO. 86X12

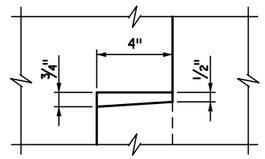


PLAN VIEW

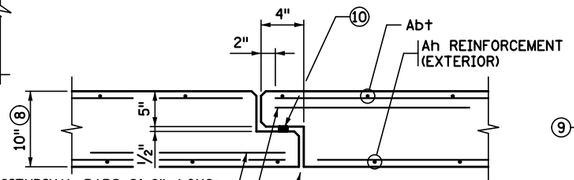
SOME REINFORCEMENT NOT SHOWN



SECTION A-A

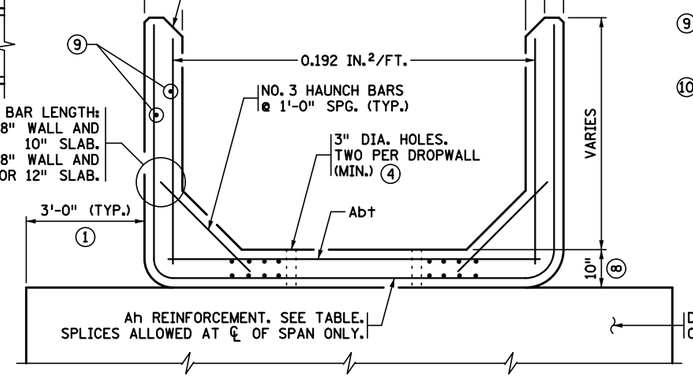


DETAIL "A"

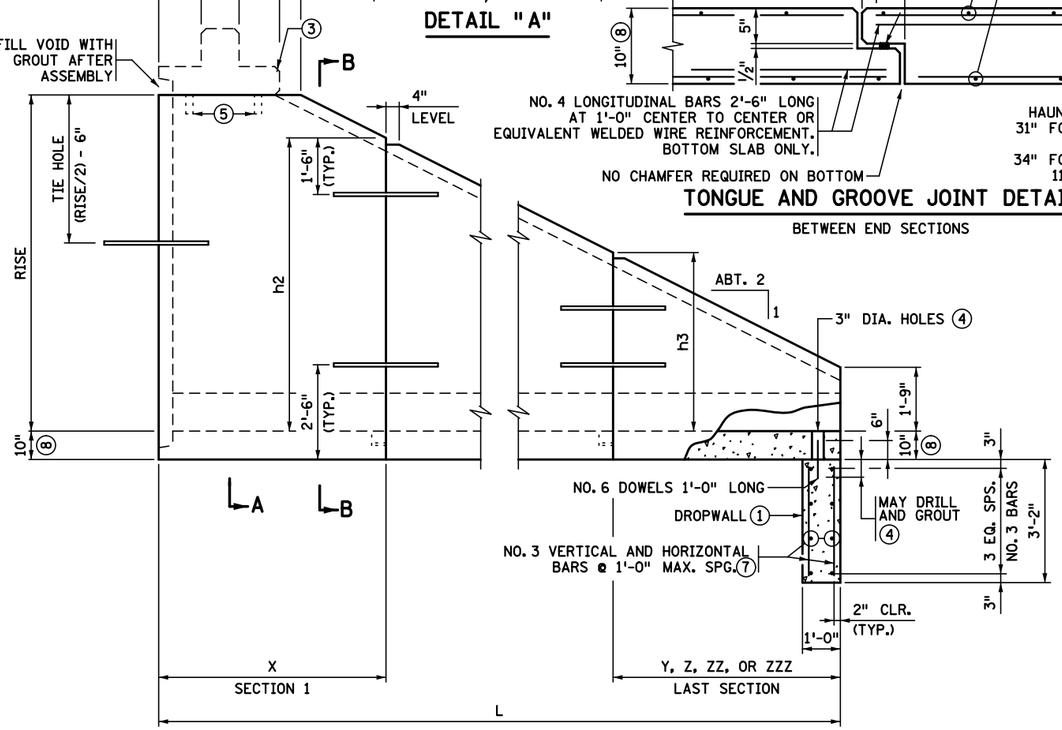


TONGUE AND GROOVE JOINT DETAIL

BETWEEN END SECTIONS



SECTION B-B



SIDE ELEVATION

Abt REINFORCEMENT	
SPAN (FT.)	Abt (IN²/FT.)
6-10	0.20
12	0.30
14	0.39
16	0.39

APRON DIMENSIONS & Ah REINFORCEMENT

RISE FT.	L FT.	SECTION 1 X	SECTION 1 Ah	h2	SECTION 2 Y	SECTION 2 Ah	h3	SECTION 3 Z	SECTION 3 Ah	h4	SECTION 4 ZZ	SECTION 4 Ah	h5	SECTION 5 ZZZ	SECTION 5 Ah	h6
4	8	8' (4')	0.192	1'-9" (3'-9")	(4')	(0.192)	(1'-9")									
5	10	6'	0.192	3'-9"	4'	0.192	1'-9"									
6	12	6'	0.192	4'-9"	6'	0.192	1'-9"									
7	14	6'	0.192	5'-9"	8' (4')	0.192	1'-9" (3'-9")	(4')	(0.192)	(1'-9")						
8	16	6'	0.20	6'-9"	6'	0.192	3'-9"	4'	0.192	1'-9"						
9	18	6'	0.29	7'-9"	6'	0.20	4'-9"	6'	0.192	1'-9"						
10	20	6'	0.42	8'-9"	6'	0.29	5'-9"	8' (4')	0.192	1'-9" (3'-9")	(4')	(0.192)	(1'-9")			
11	22	6'	0.60	9'-9"	6'	0.42	6'-9"	6'	0.192	3'-9"	4'	0.192	1'-9"			
12	24	6'	0.78	10'-9"	6'	0.60	7'-9"	6'	0.20	4'-9"	6'	0.192	1'-9"			
13	26	6'	1.03	11'-9"	6'	0.78	8'-9"	6'	0.28	5'-9"	8' (4')	0.192	1'-9" (3'-9")	(4')	(0.192)	(1'-9")
14	28	6'	1.38	12'-9"	6'	1.03	9'-9"	6'	0.40	6'-9"	6'	0.192	3'-9"	4'	0.192	1'-9"

NOTE: Ah IS AREA OF REINFORCEMENT PER FOOT OF LENGTH (IN²/FT.)
VALUES IN ( ) MAY BE USED FOR END SECTIONS WITH SPANS OF 14' AND 16' ONLY.

CONSTRUCTION NOTES

SEE STANDARD FIG. 5-395.101(A) AND FIG. 5-395.101(B) FOR ADDITIONAL DIMENSIONS AND CONSTRUCTION NOTES.

USE CONCRETE MIX NO. 3W82 WITH NO CALCIUM CHLORIDE ALLOWED.

ON ALL END SECTIONS FOR WATERWAYS, USE DROPWALLS ON INLET AND OUTLET ENDS.

SEE STANDARD FIG. 5-395.115 FOR EMBANKMENT PROTECTION.

FINISH ALL EXPOSED EDGES OF CONCRETE WITH 1/2" OR 3/4" CHAMFER OR RADIUS UNLESS OTHERWISE NOTED.

① WITH DOUBLE BOXES LOCATE DROPWALL JOINTS BETWEEN END SECTIONS. SEE STANDARD FIG. 5-395.111 FOR ALTERNATE DROPWALLS. LIMITS OF EXCAVATION FOR DROPWALL ARE APPROXIMATELY THE SAME AS DROPWALL DIMENSIONS. DROPWALL CONCRETE MIX IS 3S52, OR 3Y82 IF PRECAST. FURNISHING AND INSTALLATION OF DROPWALL TO BE INCLUDED IN PRICE BID FOR END SECTIONS. DROPWALL NOT REQUIRED FOR NON-WATERWAY USE.

② CHECK LOCATION TO DETERMINE WHETHER A TONGUE OR A GROOVE IS USED.

③ SEE STANDARD FIG. 5-395.104(B) FOR LINTEL BEAM DETAILS.

④ FILL HOLE WITH GROUT. GROUT CONSISTS OF 1 PART CEMENT AND 2 PARTS SAND. USE TYPE 1A AIR ENTRAINED PORTLAND CEMENT. GROUT MIX MAXIMUM SLUMP IS 4".

⑤ 2" DIAMETER HOLE, 6" DEEP IN TOP OF THE SECTION WALL.

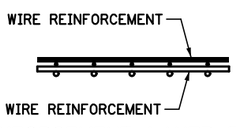
⑥ 3'-6" MIN. TONGUE AND 3'-7" MIN. GROOVE FOR CULVERTS WITH 6'-0" SPANS. 5'-0" MIN. TONGUE AND 5'-1" MIN. GROOVE FOR CULVERTS WITH SPANS GREATER THAN 6'-0". CENTER TONGUE AND GROOVE ON ℄ OF EACH APRON JOINT. TONGUE AND GROOVE JOINT ON ALL THREE SIDES OF APRON IS PERMISSIBLE.

⑦ WELDED WIRE REINFORCEMENT OF EQUAL AREA MAY BE SUBSTITUTED FOR REBAR.

⑧ APRON TOP AND BOTTOM SLAB THICKNESS MAY BE 8" FOR CULVERTS WITH 6' SPANS ONLY. BOTTOM SLAB THICKNESS MAY BE INCREASED UP TO 2" MAX. PROVIDED CONCRETE COVER IS 1 1/2" MIN., 2" MAX.

⑨ PLACE LONGITUDINAL REINFORCEMENT PERPENDICULAR TO THE CULVERT SPAN WITH A MINIMUM OF 0.06 SQUARE INCHES PER PERIPHERAL FOOT ON ALL FACES OF THE BARREL.

⑩ REFER TO SPEC. 2412 FOR SEALANT REQUIREMENTS.



REINFORCEMENT LAYER DETAIL

WHEN MORE THAN ONE LAYER OF WELDED WIRE REINFORCEMENT IS USED TO OBTAIN THE REQUIRED REINFORCEMENT AREAS, PLACE THE WIRES OF THE WELDED WIRE REINFORCEMENT AS SHOWN.

REVISION: FEBRUARY 22, 2018

APPROVED: MARCH 24, 2011
Nancy Dorbenberger
STATE BRIDGE ENGINEER

STATE PROJ. NO 8680-173 (T.H. 94) STA. 1076+36.46

FIG. 5-395.104(A)

CERTIFIED BY _____ 05/22/2020
LICENSED PROFESSIONAL ENGINEER — DATE

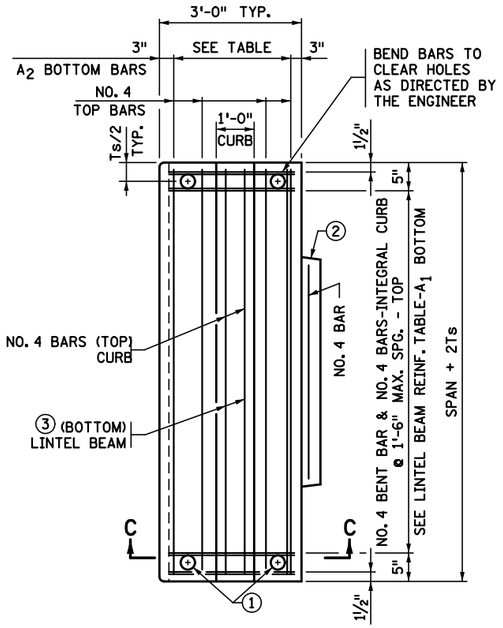
NAME: BENJAMIN BOVEE LIC. NO. 52794

TITLE: PRECAST CONCRETE END SECTION TYPE III - SINGLE OR DOUBLE BARREL FOR SKEWS UP TO 7 1/2°

DES: KLS	DR: RJO	APPROVED:
CHK: BB	CHK: BB	

SHEET NO. 4 OF 7 SHEETS

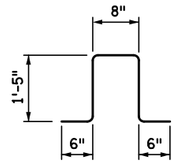
BRIDGE NO. 86X12



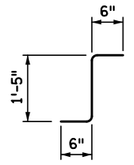
PLAN VIEW OF SQUARE LINTEL BEAM

LINTEL BEAM BOTTOM REINFORCEMENT		
SPAN (FT.)	A_1	A_2
6	NO. 4 @ 1'-2"	NO. 4 @ 9½"
8	NO. 4 @ 8"	NO. 5 @ 8"
10	NO. 5 @ 8"	NO. 6 @ 7½"
12	NO. 5 @ 6"	NO. 6 @ 6"
14	NO. 6 @ 6"	NO. 7 @ 6"
16	NO. 6 @ 6"	NO. 7 @ 6"

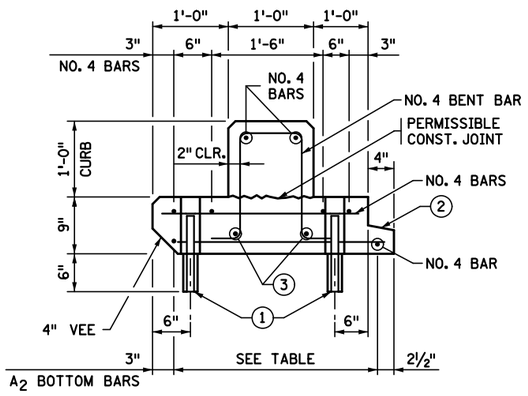
NOTE: MAXIMUM BAR SPACING GIVEN, REDUCE AS NECESSARY



NO. 4 BENT BAR



NO. 4 BENT BAR
ALTERNATE
④
2 REQUIRED



SECTION C-C

INTEGRAL CURB WITH TONGUE.
ADDITIONAL REINFORCEMENT IN TONGUE NOT SHOWN.

CONSTRUCTION NOTES

SEE STANDARD FIG. 5-395.101(A) AND FIG. 5-395.101(B) FOR ADDITIONAL DIMENSIONS AND CONSTRUCTION NOTES.

ALL END SECTIONS REQUIRE CURB ON LINTEL BEAM.

GROUT CONSISTS OF 1 PART CEMENT AND 2 PARTS SAND. USE TYPE 1A AIR ENTRAINED PORTLAND CEMENT. GROUT MIX MAXIMUM SLUMP IS 4".

① 3" DIA. HOLE THROUGH LINTEL BEAM AND 2" DIA. HOLE IN TOP OF WALL SECTION. PLACE NO. 8 DOWEL, 1'-0" LONG, IN HOLE AND FILL HOLE WITH GROUT.

② CHECK THE LOCATION TO DETERMINE WHETHER A TONGUE OR A GROOVE IS USED. TONGUE AND GROOVE TO TERMINATE AT HAUNCH.

③ FOR SPANS UNDER 10'-0" USE NO. 8 BARS. FOR SPANS OF 10'-0" TO 12'-0" USE NO. 9 BARS. FOR 14'-0" AND 16'-0" SPAN, USE NO. 10 BARS.

④ ALTERNATE BAR BEND MAY BE USED FOR NO. 4 BENT BAR.

REVISION: 10-09-2015

APPROVED: MARCH 24, 2011
Nancy Daubenberger
STATE BRIDGE ENGINEER

STATE PROJ. NO 8680-173 (T.H. 94) STA. 1076+36.46

FIG. 5-395.104(B)

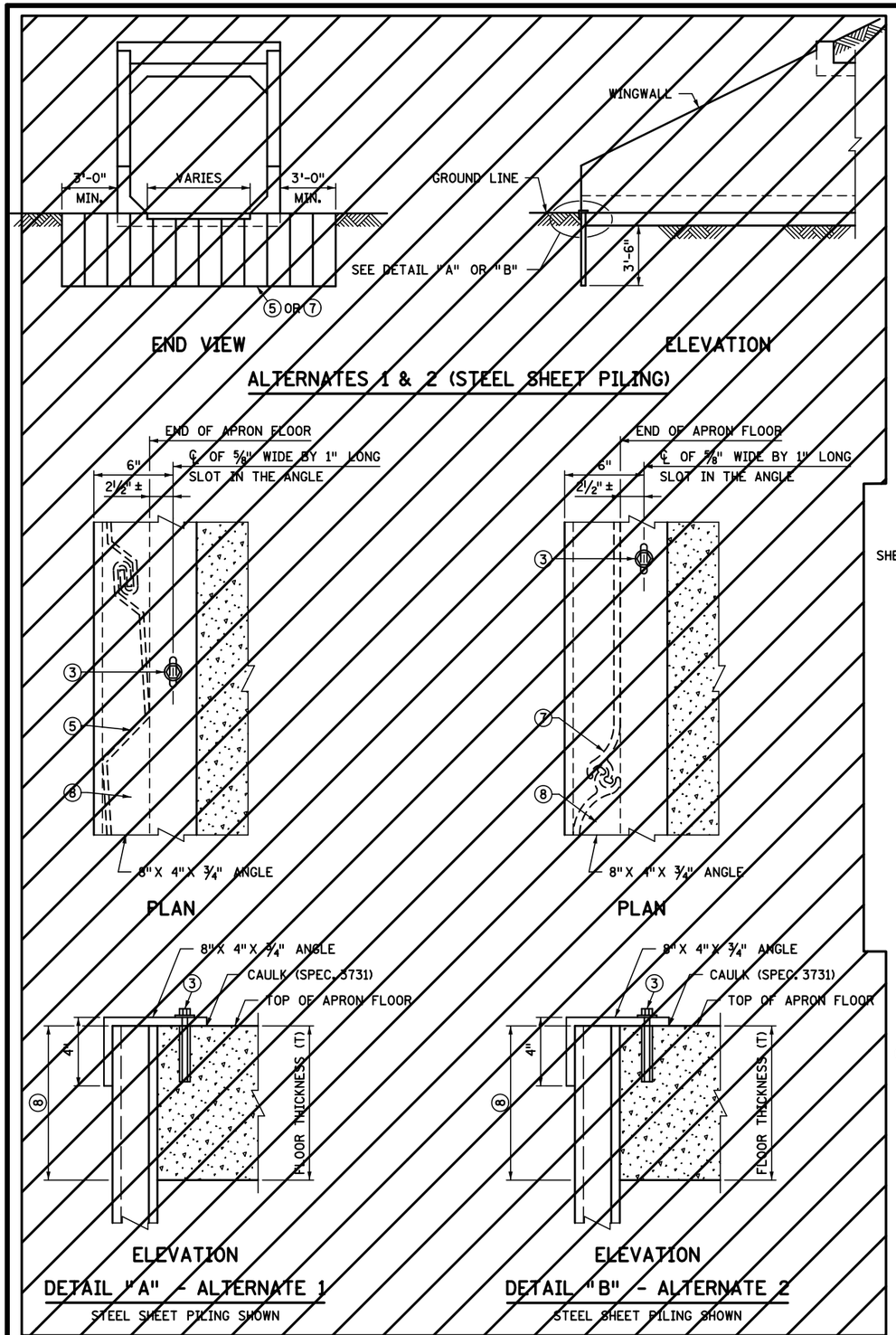
CERTIFIED BY _____ 05/22/2020
LICENSED PROFESSIONAL ENGINEER — DATE
NAME: BENJAMIN BOVEE LIC. NO. 52794

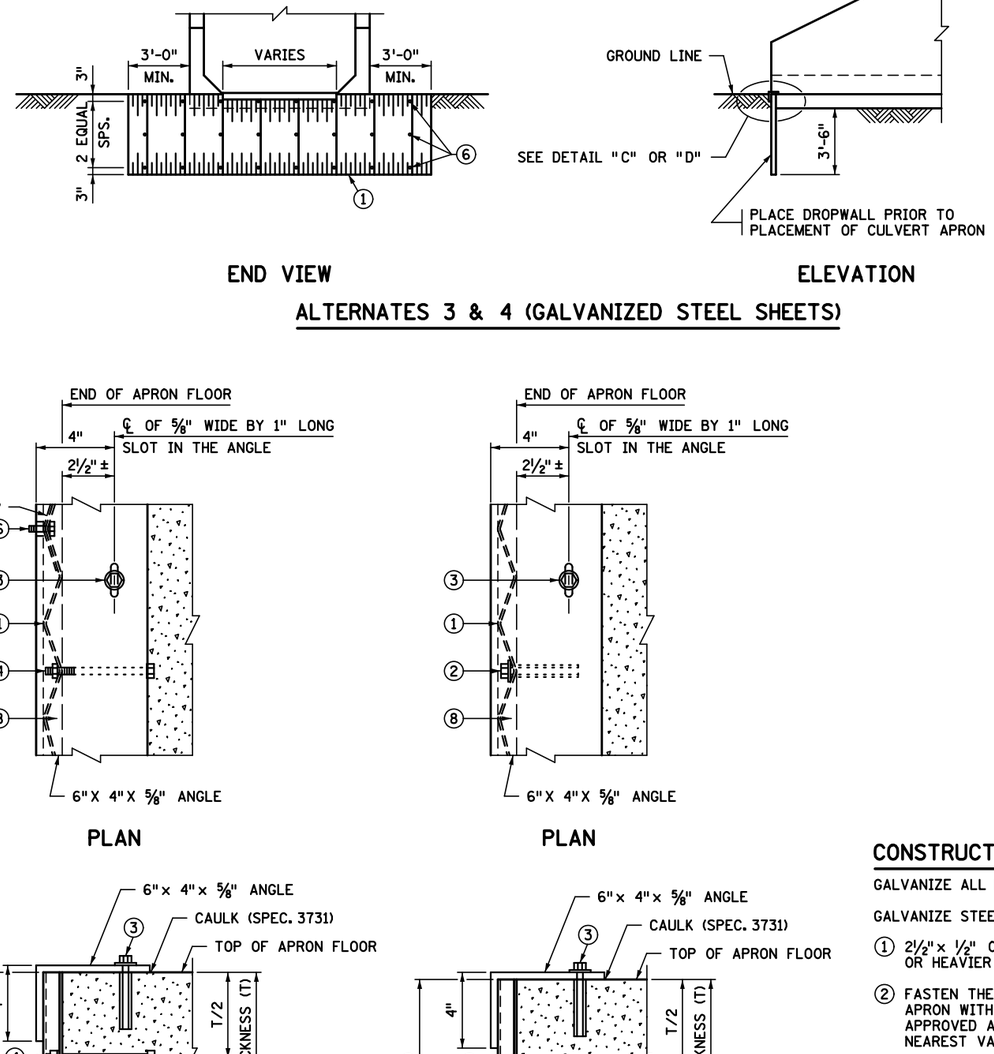
TITLE: PRECAST CONCRETE END SECTION TYPE III - SINGLE OR DOUBLE BARREL FOR SKEWS UP TO 7½°

DES: KLS | DR: RJO | APPROVED:
CHK: BB | CHK: BB

SHEET NO. 5 OF 7 SHEETS

BRIDGE NO. 86X12





CONSTRUCTION NOTES

GALVANIZE ALL FASTENERS AND ANCHORS PER SPEC. 3392.

GALVANIZE STEEL ANGLES PER 3394.

① 2½"x ½" OR 2⅔"x ½" CORRUGATED (12 GAGE) OR HEAVIER GALVANIZED STEEL SHEETS.

② FASTEN THE STEEL SHEETS TO THE FRONT EDGE OF THE APRON WITH ⅜" DIAMETER BY 4" LONG BOLTS AND APPROVED ANCHORAGES (10" ± CENTER TO CENTER, TO THE NEAREST VALLEY).

③ FASTEN THE 8"x 4"x ¾" OR 6"x 4"x ⅝" ANGLE WITH ⅜" DIAMETER 4" LONG BOLTS, 1" O.D. WASHER AND AN APPROVED ANCHORAGE (2'-0" SPACING).

④ FASTEN THE STEEL SHEETS TO THE FRONT EDGE OF THE APRON WITH ⅜" DIAMETER 5" LONG BOLTS, NUT AND LOCK WASHER (10" ± CENTER TO CENTER, TO THE NEAREST VALLEY).

⑤ (12 GAGE) GALVANIZED CORRUGATED STEEL SHEET PILING, INTERLOCKING TYPE A.

⑥ ⅜" DIA. x 1" LONG BOLT WITH NUT, TO LAP STEEL SHEETS.

⑦ STEEL SHEET PILING, SECTION NO. MP-112 OR EQUAL.

⑧ FILL THE VOIDS AS SHOWN, WITH CONCRETE OR CONCRETE GROUT, AS APPROVED BY THE ENGINEER.

FILENAME: $$$@FILENAME@$$$

TIME : $@TIME@$

PLOTTED : $$$$@DATE@$$$$

PATH & FILENAME: $$$@PATHFILENAME@$$$

REVISION: 10-09-2015

APPROVED: MARCH 24, 2011

Nancy Daubenberger
STATE BRIDGE ENGINEER

STATE PROJ. NO 8680-173 (T.H. 94) STA. 1076+36.46

FIG. 5-395.111

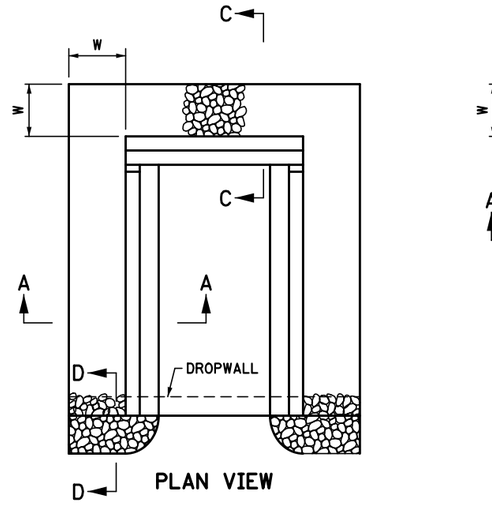
CERTIFIED BY _____ 05/22/2020
LICENSED PROFESSIONAL ENGINEER — DATE

NAME: BENJAMIN BOVEE LIC. NO. 52794

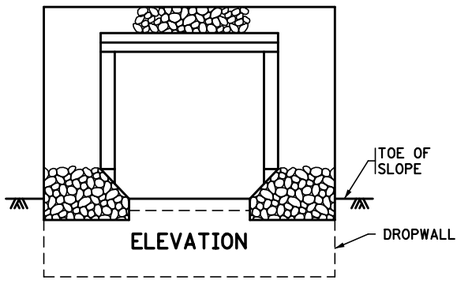
TITLE: ALTERNATE DROPWALLS FOR BOX CULVERTS

DES:	KLS	DR:	RJO	APPROVED:	BRIDGE NO. 86X12
CHK:	BB	CHK:	BB		

SHEET NO. 6 OF 7 SHEETS



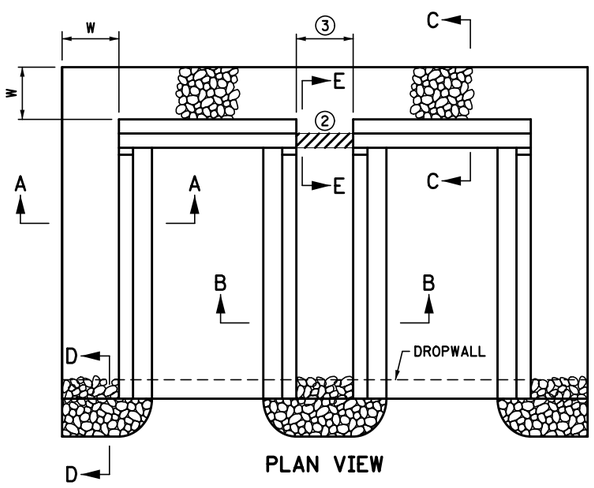
PLAN VIEW



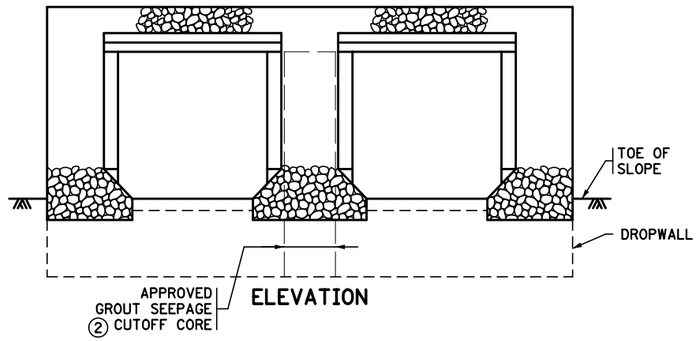
ELEVATION

SINGLE BARREL

CLASS III OR IV SHOWN
FOR SKEWS UP TO 7½°



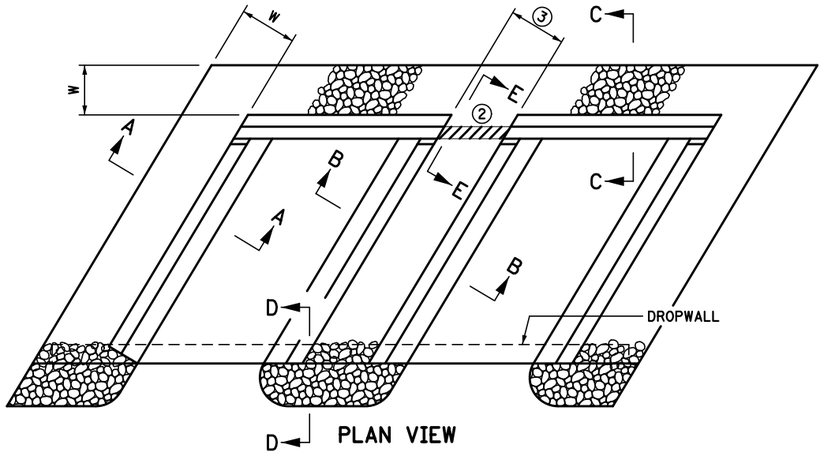
PLAN VIEW



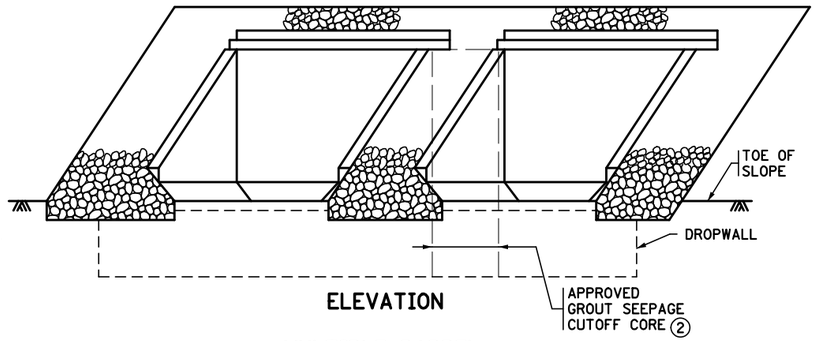
ELEVATION

MULTIPLE BARREL

FOR SKEWS UP TO 7½°
CLASS III OR IV SHOWN
DOUBLE BARREL SHOWN



PLAN VIEW



ELEVATION

MULTIPLE BARREL

FOR SKEWS OVER 7½°
CLASS III OR IV SHOWN
DOUBLE BARREL SHOWN,
OTHER BARREL CONFIGURATIONS SIMILAR.

CONSTRUCTION NOTES

THIS PLAN SHEET IS FOR CULVERT EMBANKMENT PROTECTION ONLY. REFER TO THE GRADING PLANS FOR ADDITIONAL RIPRAP OR OTHER SCOUR PROTECTION MEASURES.

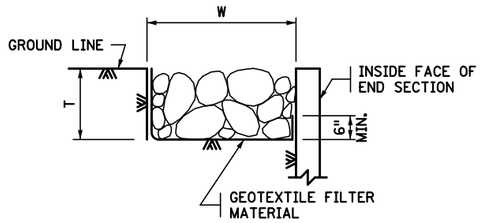
PROVIDE RIPRAP PER SPECS. 2511 AND 3601.

EMBANKMENT PROTECTION, INCLUDING MATERIAL PLACED BETWEEN BARRELS THAT ARE LESS THAN 2'-0" APART, IS INCIDENTAL.

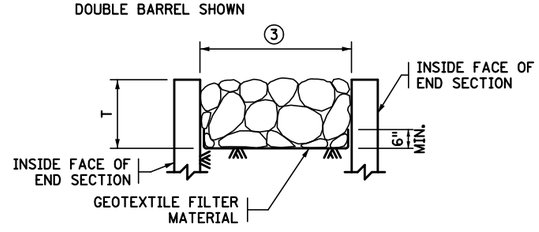
(1) FOR TYPE OF GEOTEXTILE FILTER MATERIAL REQUIRED, SEE SPEC. 3733. PROVIDE GEOTEXTILE STRIPS CONTINUOUS WITHOUT OVERLAPS, EXCEPT FOR THE TOP STRIP, WHICH SHOULD SHINGLE VERTICAL STRIPS. BURY THE TOP EDGE TO PREVENT UNDERMINING.

(2) IF THE DISTANCE BETWEEN DOUBLE BARRELS IS LESS THAN 2'-0" USE EITHER PEA ROCK OR LEAN MIX BACKFILL (SPEC. 2520) BETWEEN THE CULVERTS AS APPROVED BY THE ENGINEER. IF PEA ROCK IS USED PROVIDE APPROVED GROUT SEEPAGE CUTOFF CORE, MINIMUM 12" THICK BETWEEN THE CULVERT'S TWO ENDS AND PROVIDE CLASS I GROUTED RIPRAP IN LIEU OF CLASS III RIPRAP.

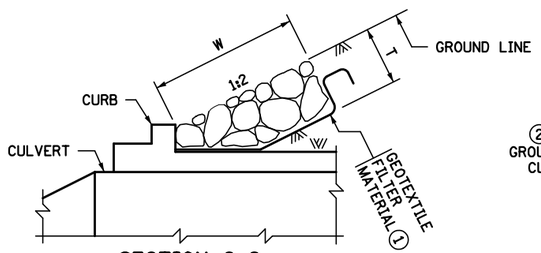
(3) REFER TO THE GENERAL PLAN AND ELEVATION SHEET FOR THE DISTANCE BETWEEN BARRELS OF ADJACENT BOXES.



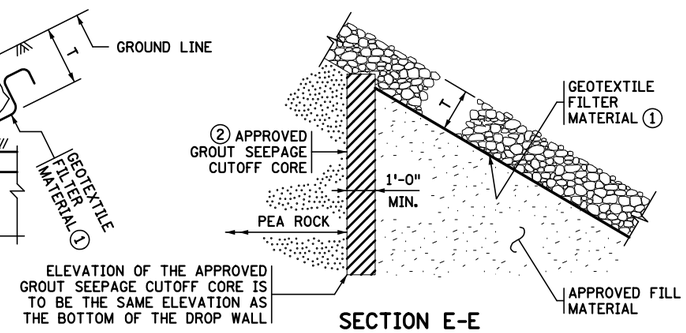
SECTION A-A



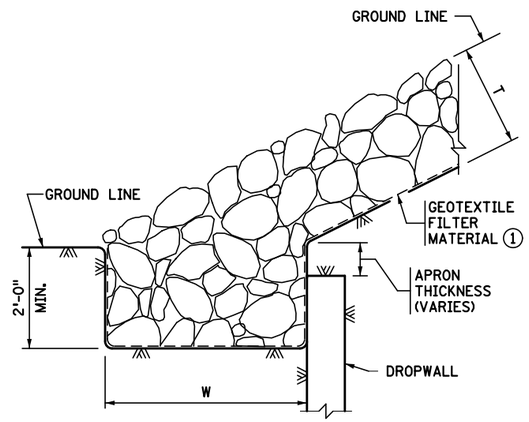
SECTION B-B



SECTION C-C



SECTION E-E



SECTION D-D

RIPRAP CLASS

RIPRAP CLASS	RIPRAP CLASS	T	W
☐	III	1'-6"	3'-0"
☐	IV	2'-0"	4'-0"

REVISION: 10-22-2019

APPROVED: SEPTEMBER 11, 2014
Nancy Dorbenberger
STATE BRIDGE ENGINEER

STATE PROJ. NO. 8680-173 (T.H. 94) STA. 1076+36.46

FIG. 5-395.115

CERTIFIED BY _____ 05/22/2020
LICENSED PROFESSIONAL ENGINEER — DATE

NAME: BENJAMIN BOVEE LIC. NO. 52794

TITLE: EMBANKMENT PROTECTION FOR BOX CULVERTS

DES: KLS	DR: RJO	APPROVED:
CHK: BB	CHK: BB	

SHEET NO. 7 OF 7 SHEETS

BRIDGE NO. 86X12