

MnDOT Bridge Office LRFD Workshop - June 12, 2012

Bridge Standards Update

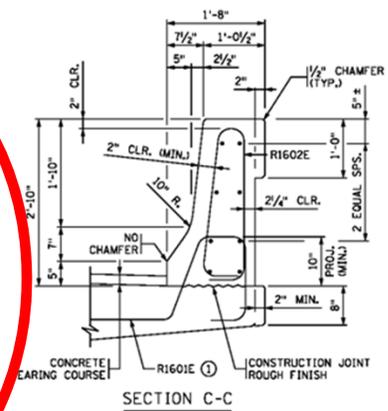
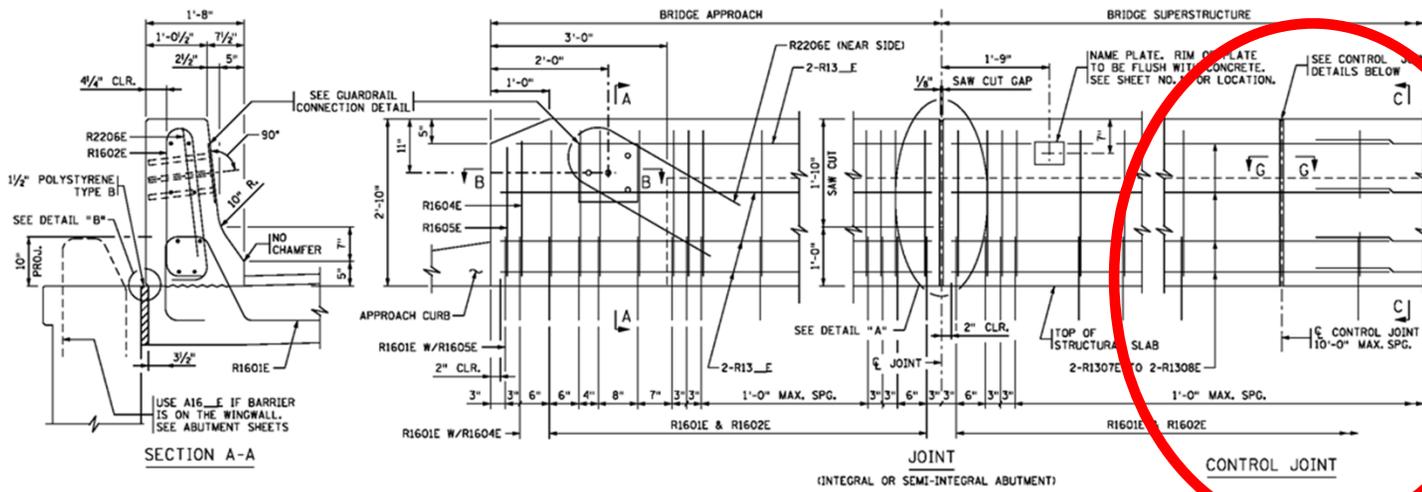
Paul Rowekamp
Bridge Standards Engineer



Overview

- Barriers
- Parapets
- Ornamental Railings
- Approach Panels
- Expansion Devices
- Precast Box Culverts
- MW Prestressed Beams
- Rip Rap Slope Protection
- Tapered Plate Bearing Assembly
- Miscellaneous Issues





DESIGNER NOTE
REMOVE PRIOR TO PLOTTING FINAL PLANS
VERIFY BAR R1601E HAS 10" MIN.
PROJECTION WHEN CROSS SLOPE VARIES
FROM NORMAL 0.02 TO 1%

BARRIER MEETS TEST LEVEL 4 REQUIREMENTS OF NCHRP REPORT 350

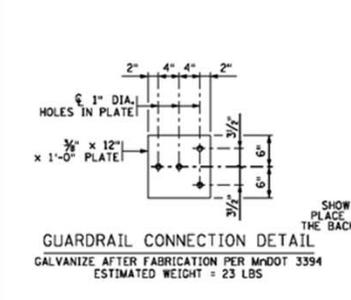
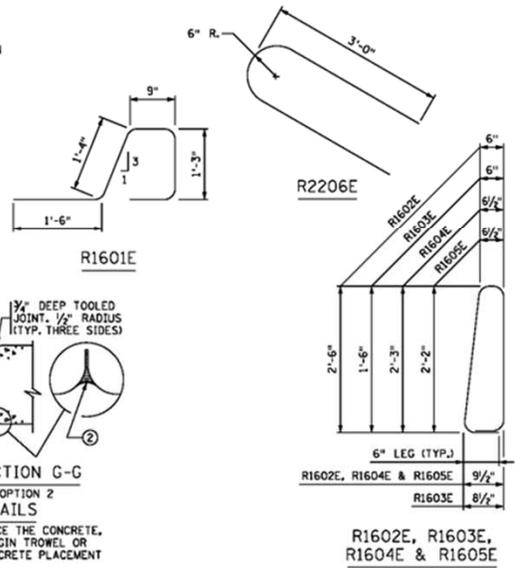
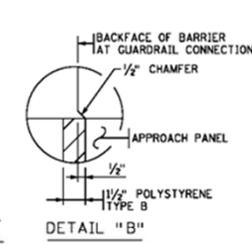
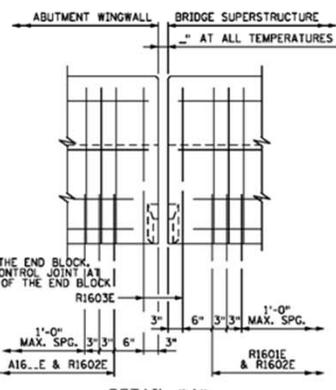
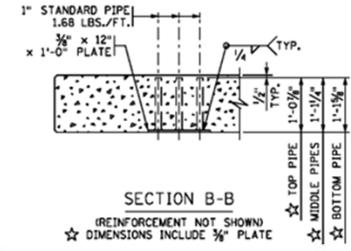
BILL OF REINFORCEMENT FOR BARRIER

BAR	NO.	LENGTH	SHAPE	LOCATION
R1601E	—	5'-5"		BARRIER DOWEL
R1602E	—	6'-7"		BARRIER VERTICAL
R1603E	—	4'-7"		BARRIER VERTICAL
R1604E	—	6'-1"		BARRIER VERTICAL
R1605E	—	5'-11"		BARRIER VERTICAL
R2206E	—	6'-6"		BARRIER LONGIT.
R1307E	—	—	—	BARRIER LONGIT.
R1308E	—	—	—	BARRIER LONGIT.
R1309E	—	—	—	BARRIER LONGIT.
R13_F	—	—	—	BARRIER LONGIT.
R13_E	—	—	—	BARRIER LONGIT.
R13_F	—	—	—	BARRIER LONGIT.
R13_E	—	—	—	BARRIER LONGIT.

* R1603E WHEN PARAPET ABUTMENT IS USED. (SEE DETAIL "A")

GENERAL NOTES

- LENGTH OF TYPE F (TL-4) BARRIER CONCRETE (3Y46 OR 3Y46A) FOR PAYMENT SHALL BE MEASURED BETWEEN THE OUTSIDE FACES OF THE CONCRETE BARRIER.
- CONCRETE BARRIER = 502 LBS./FT. (0.124 CU. YDS./FT.)
- FINISH ALL EDGES OF BARRIER WITH 1/2" CHAMFER, EXCEPT WHERE OTHERWISE NOTED.
- MAXIMUM SPACING OF CONCRETE CONTROL JOINTS SHALL BE 10 FT.
- SEE SUPERSTRUCTURE SHEET FOR JOINT SPACING.
- GUARDRAIL CONNECTION TO BE STRUCTURAL STEEL, M200T 3306.
- GUARDRAIL CONNECTION AND NAME PLATE TO BE CONSIDERED INCIDENTAL TO TYPE F (TL-4) BARRIER CONCRETE (3Y46 OR 3Y46A).
- BARRIER QUANTITIES ARE LISTED IN SUMMARY OF QUANTITIES FOR SUPERSTRUCTURE.
- ① PLACE BAR ON TOP OF BOTTOM REINFORCEMENT MAT.
- ② SEE SPECIAL PROVISIONS FOR JOINT SEALING REQUIREMENTS.



REVISED: 05-26-2006
APPROVED: DECEMBER 03, 2003
NO. 30
STATE BRIDGE ENGINEER

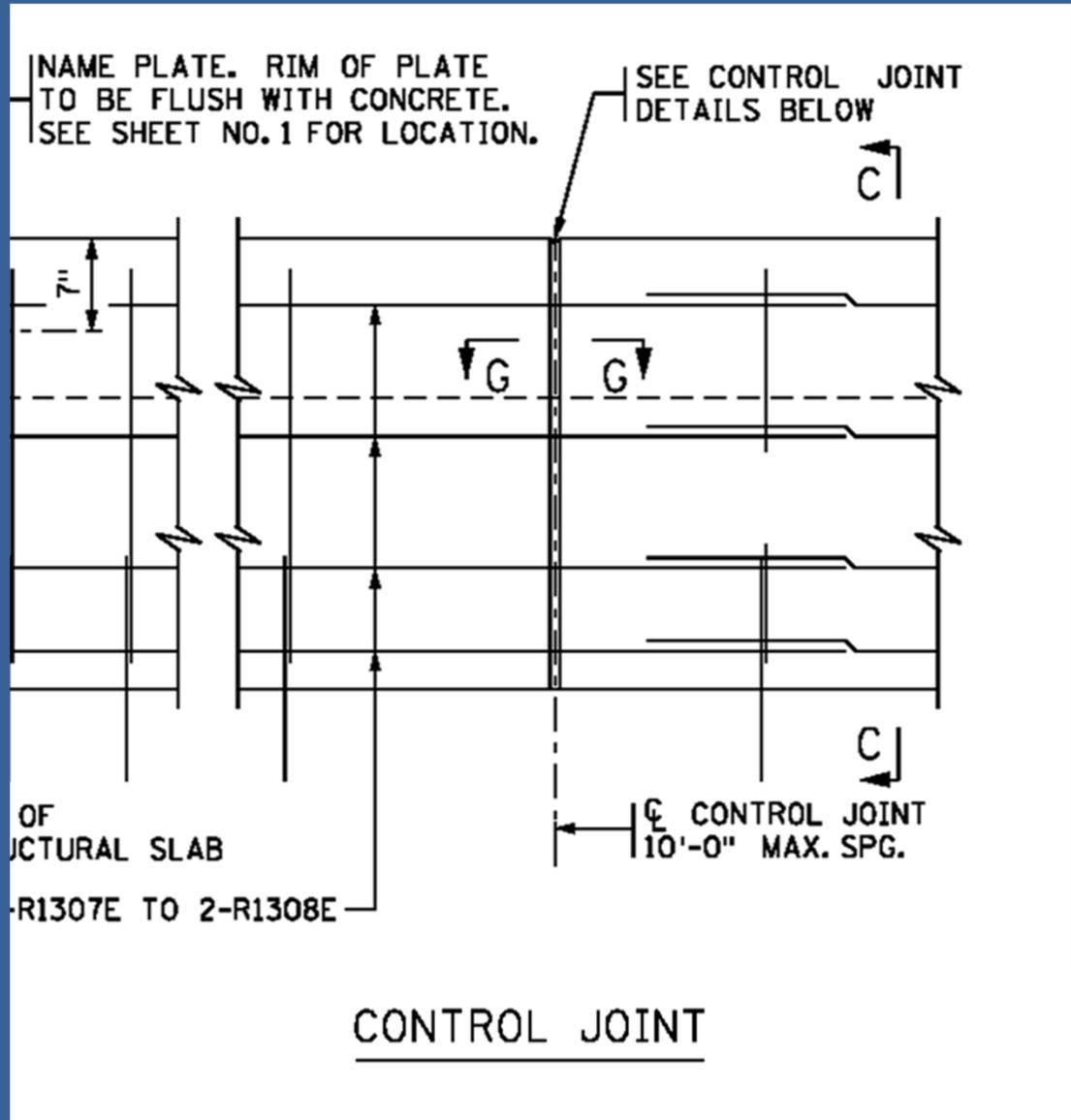
REFERENCE DATE: 04-05-2012

CERTIFIED BY: _____
LICENSED PROFESSIONAL ENGINEER DATE: _____
NAME: _____ L.T.C. NO. _____

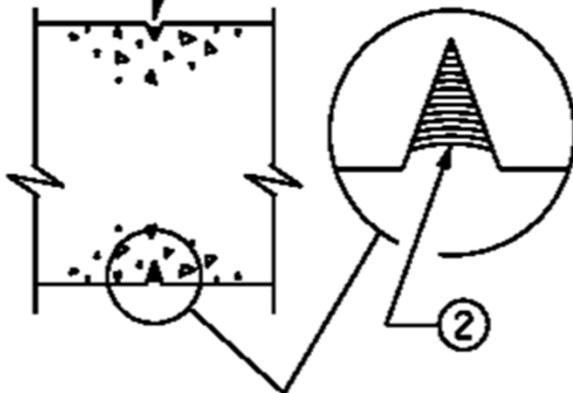
CONCRETE BARRIER (TYPE F, TL-4)
WITH INTEGRAL END POST
(WITH CONCRETE WEARING COURSE)

DESIGNED BY: _____ DRAWN BY: _____ APPROVED BY: _____
CHECKED BY: _____ CHECKED BY: _____

FIG. 5-397.117
BRIDGE NO. _____
SHEET NO. ____ OF ____ SHEETS



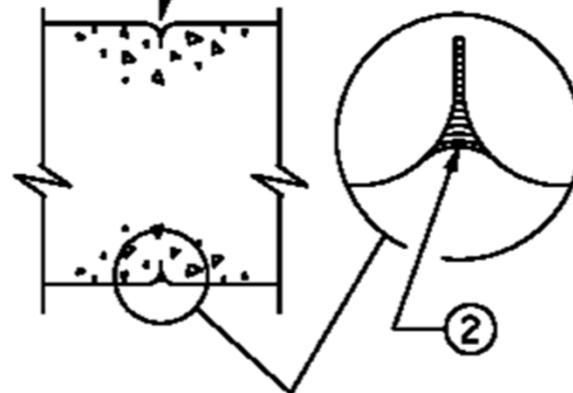
3/4" DEEP X 3/4" WIDE
VEE JOINT
(TYP. THREE SIDES)



SECTION G-G

OPTION 1

3/4" DEEP TOOLED
JOINT. 1/2" RADIUS
(TYP. THREE SIDES)



SECTION G-G

OPTION 2

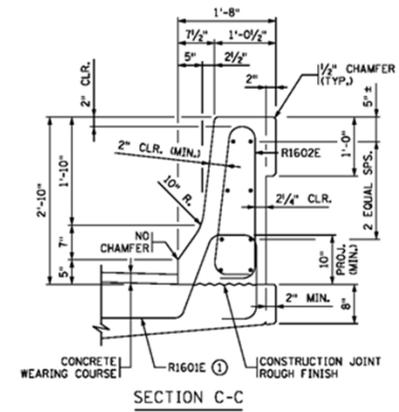
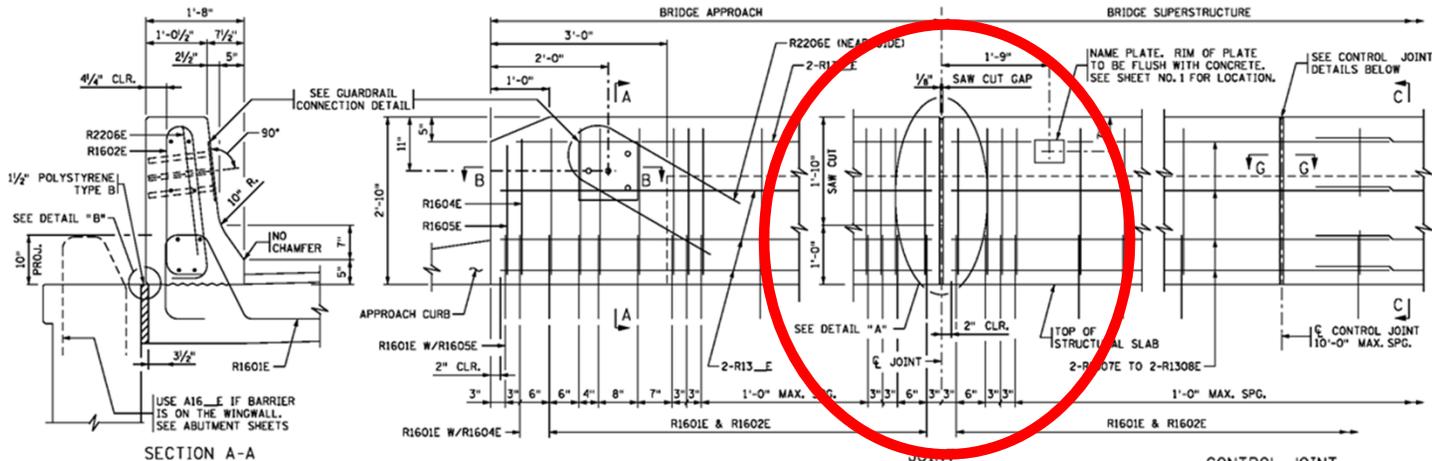
CONTROL JOINT DETAILS

WHEN USING SLIP FORM METHOD TO PLACE THE CONCRETE,
CUT JOINT 3 INCHES DEEP USING MARGIN TROWEL OR
SIMILAR MEANS IMMEDIATELY AFTER CONCRETE PLACEMENT
(TYP. THREE SIDES)





01/18/2012 10:38



DESIGNER NOTE
 REMOVE PRIOR TO PLOTTING FINAL PLAN!
 VERIFY BAR R1601E HAS 10" MIN
 PROJECTION WHEN CROSS SLOPE VARIES
 FROM NORMAL 0.02 FT/FT

BARRIER MEETS TEST LEVEL 4 REQUIREMENTS OF NCHRP REPORT 350

BILL OF REINFORCEMENT FOR BARRIER				
BAR	NO.	LENGTH	SHAPE	LOCATION
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R13_F	—	—	—	BARRIER LONGIT.
R13_E	—	—	—	BARRIER LONGIT.
R13_F	—	—	—	BARRIER LONGIT.
R13_E	—	—	—	BARRIER LONGIT.

* R1603E WHEN PARAPET ABUTMENT IS USED. (SEE DETAIL "A")

GENERAL NOTES

LENGTH OF "TYPE F (TL-4) BARRIER CONCRETE (3Y46 OR 3Y46A)" FOR PAYMENT SHALL BE MEASURED BETWEEN THE OUTSIDE FACES OF THE CONCRETE BARRIER.

CONCRETE BARRIER = 502 LBS./FT. (0.124 CU. YDS./FT.)

FINISH ALL EDGES OF BARRIER WITH 1/2" CHAMFER, EXCEPT WHERE OTHERWISE NOTED.

MAXIMUM SPACING OF CONCRETE CONTROL JOINTS SHALL BE 10 FT.

SEE SUPERSTRUCTURE SHEET FOR JOINT SPACING.

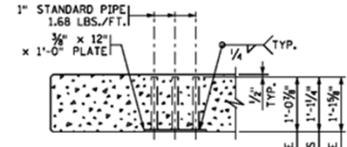
GUARDRAIL CONNECTION TO BE STRUCTURAL STEEL, M200T 3306.

GUARDRAIL CONNECTION AND NAME PLATE TO BE CONSIDERED INCIDENTAL TO "TYPE F (TL-4) BARRIER CONCRETE (3Y46 OR 3Y46A)".

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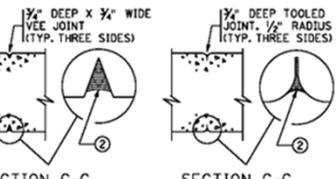
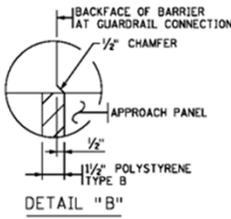
① PLACE BAR ON TOP OF BOTTOM REINFORCEMENT MAT.

② SEE SPECIAL PROVISIONS FOR JOINT SEALING REQUIREMENTS.



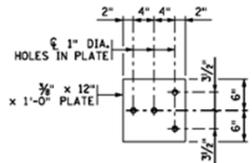
SECTION B-B

(REINFORCEMENT NOT SHOWN)
 ☆ DIMENSIONS INCLUDE 3/8" PLATE



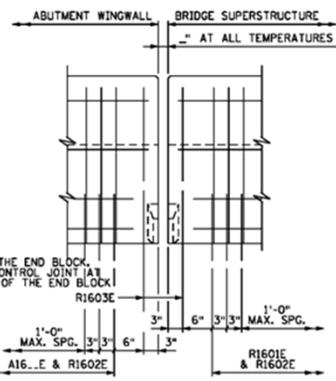
SECTION G-G CONTROL JOINT DETAILS

WHEN USING SLIP FORM METHOD TO PLACE THE CONCRETE, CUT JOINT 3 INCHES DEEP USING MARGIN TROWEL OR SIMILAR MEANS IMMEDIATELY AFTER CONCRETE PLACEMENT (TYP. THREE SIDES)



GUARDRAIL CONNECTION DETAIL

GALVANIZE AFTER FABRICATION PER M200T 3394
 ESTIMATED WEIGHT = 23 LBS



DETAIL "A"

(USE IF PARAPET ABUTMENT)
 (EXPANSION DEVICE NOT SHOWN)

REVISED: 05-26-2006
 APPROVED: DECEMBER 2003
 NO. 30 State Bridge Engineer

REFERENCE DATE: 04-05-2012

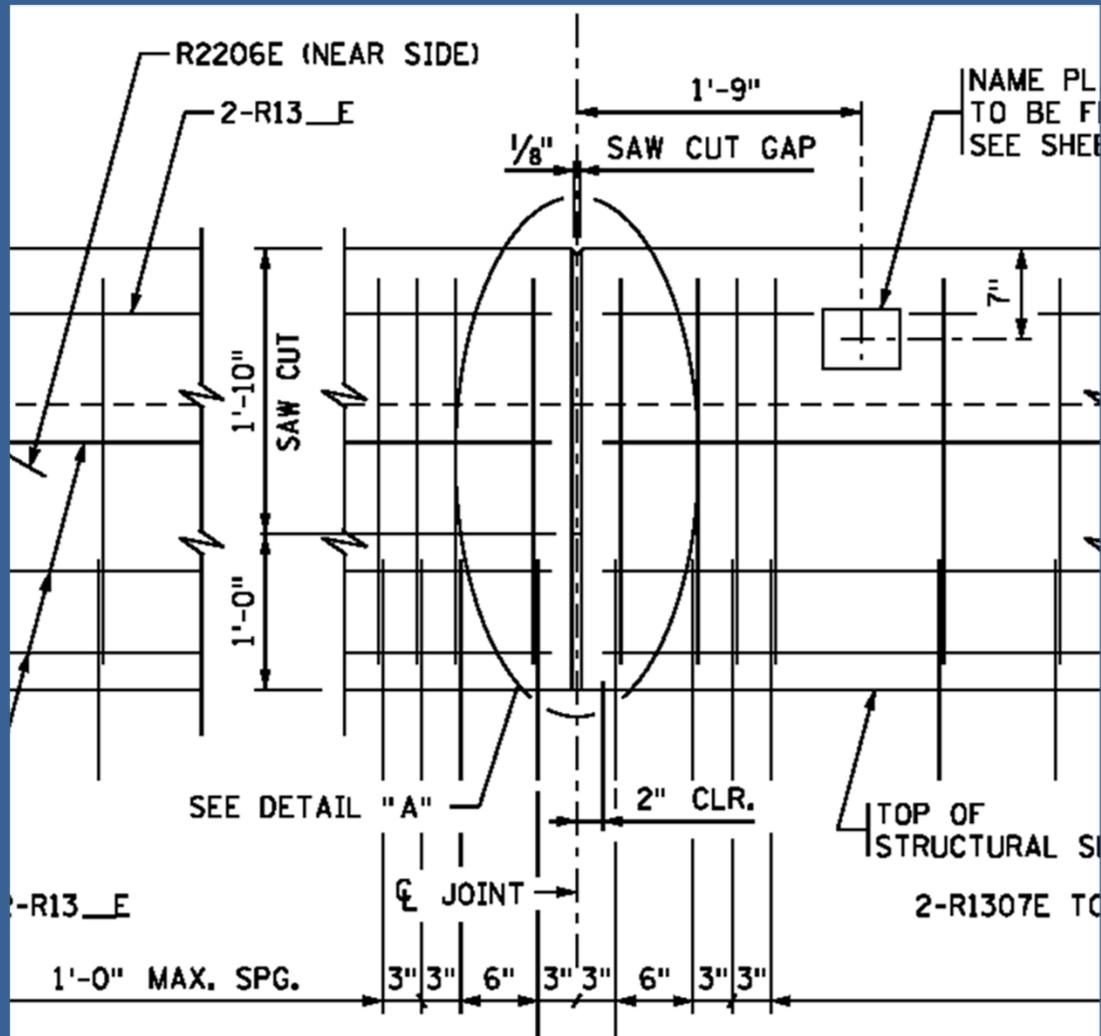
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 LICENSED PROFESSIONAL ENGINEER DATE: _____
 NAME: _____ LIC. NO. _____

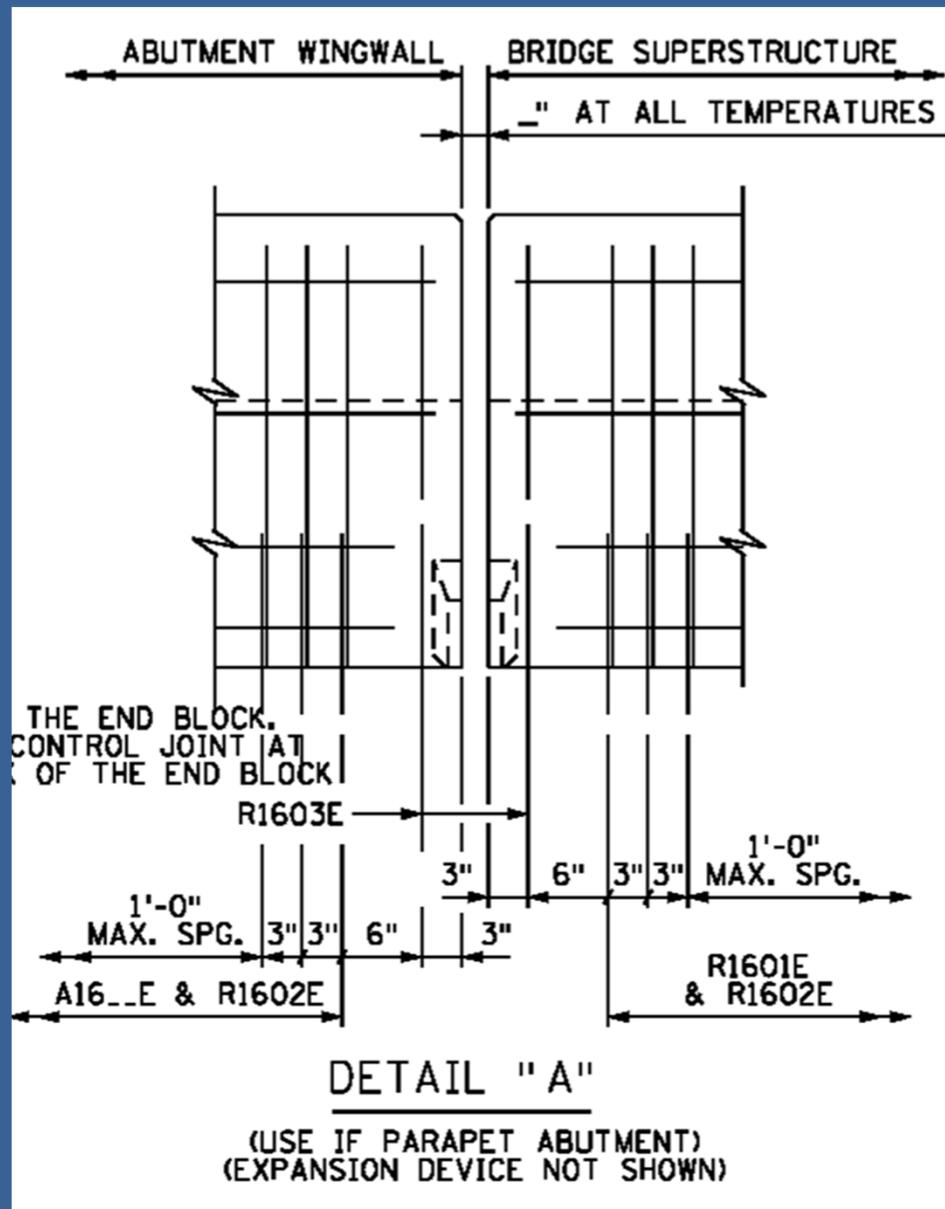
CONCRETE BARRIER (TYPE F, TL-4)
 WITH INTEGRAL END POST
 (WITH CONCRETE WEARING COURSE)

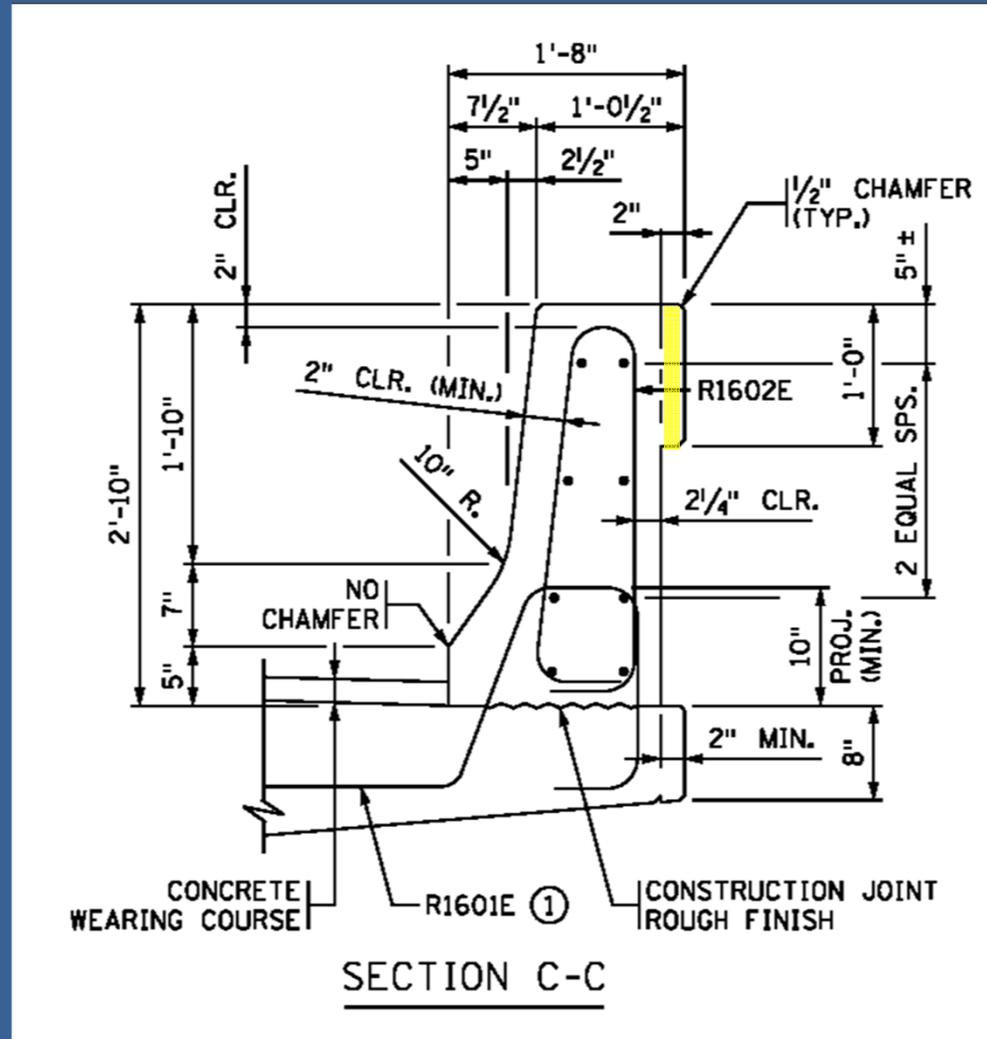
DCS: _____ DR: _____ APPROVED: _____
 CHK: _____ OK: _____
 SHEET NO. ___ OF ___ SHEETS

FIG. 5-397.117

BRIDGE NO. _____



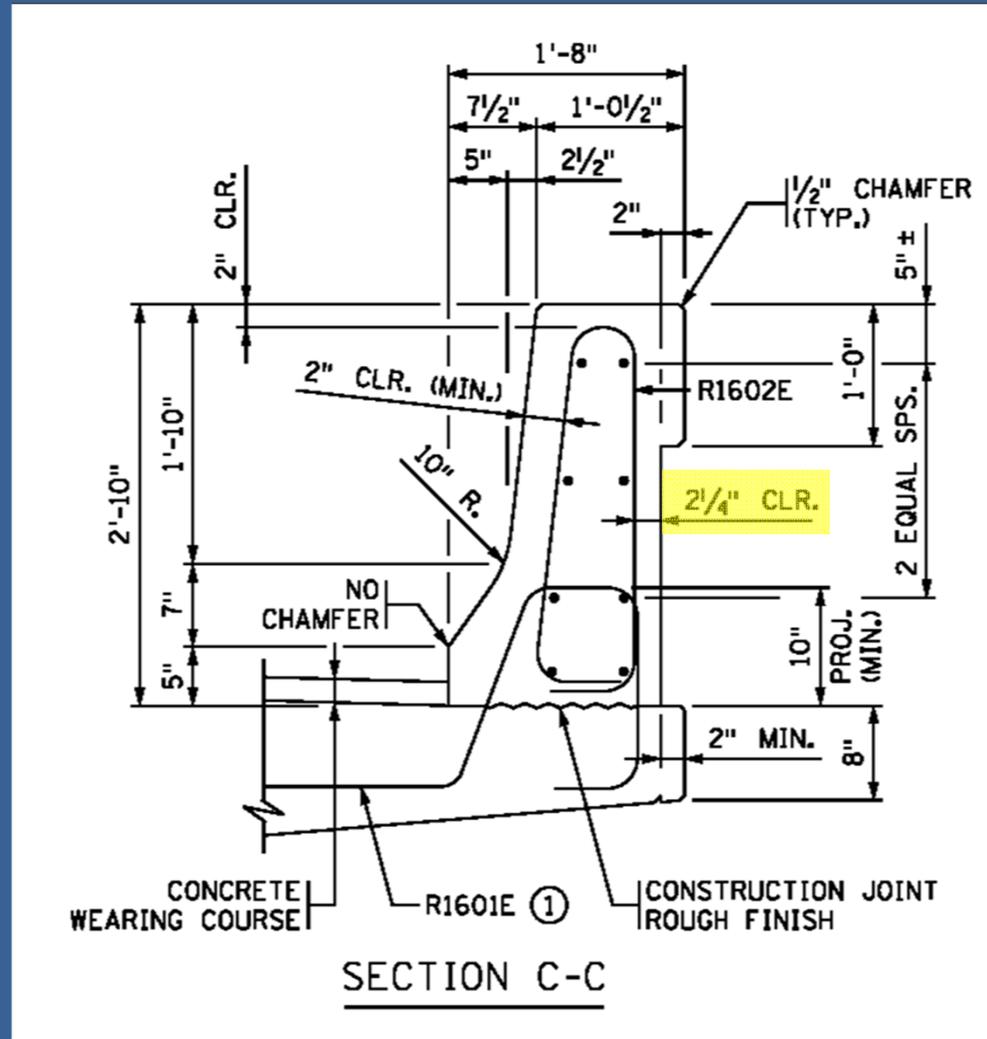






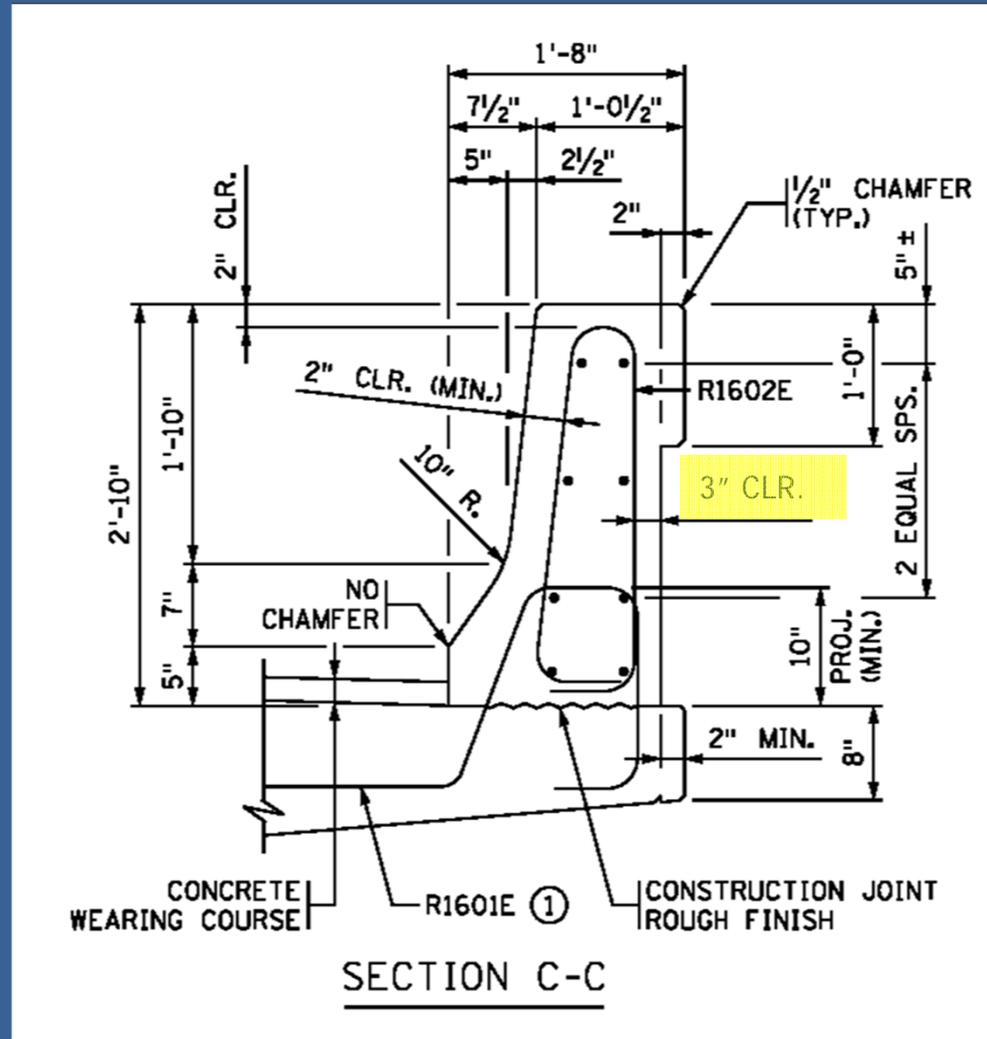


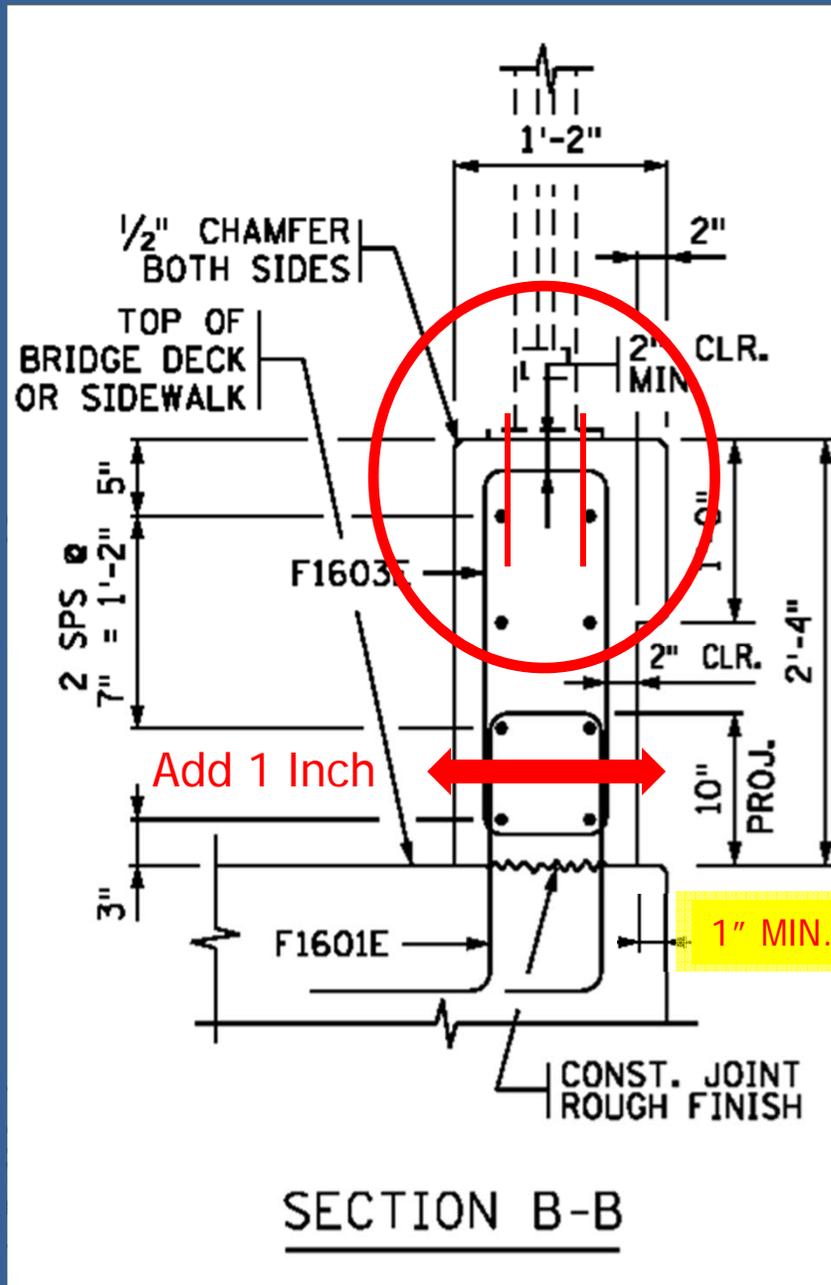




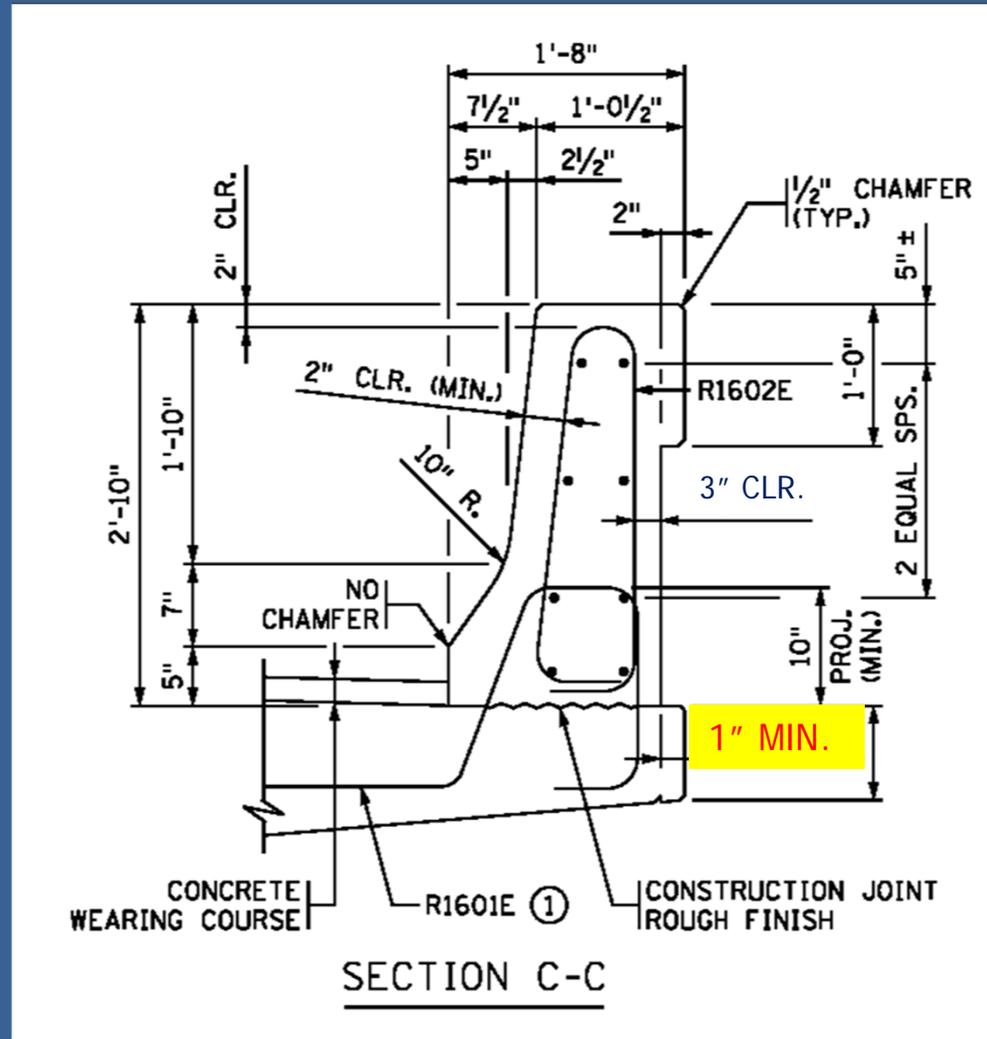


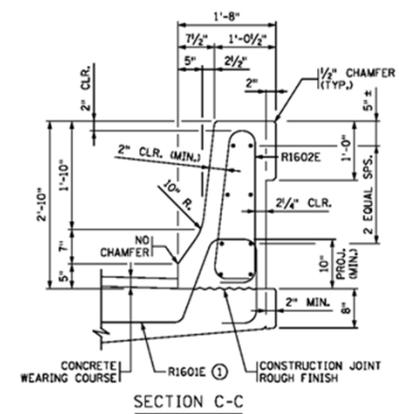
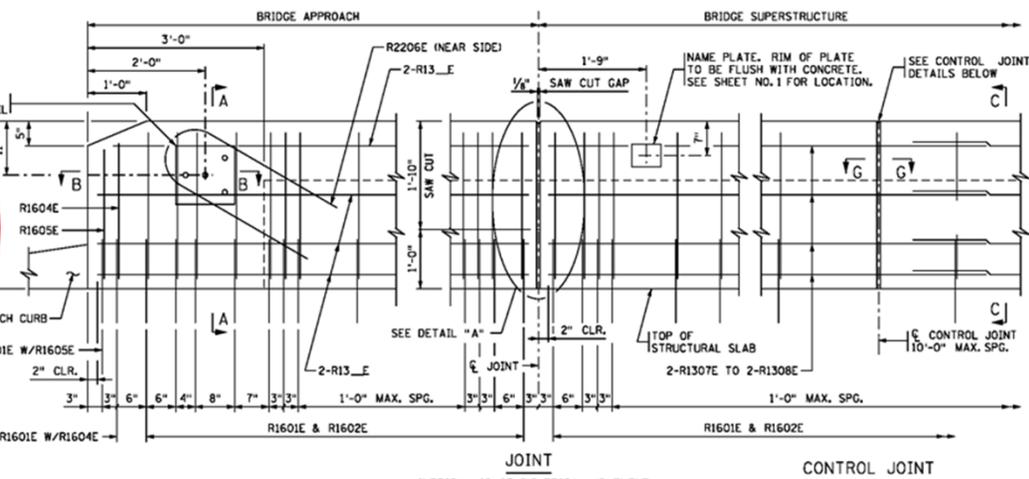
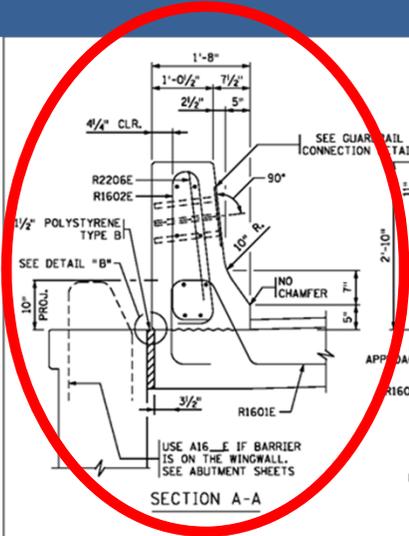
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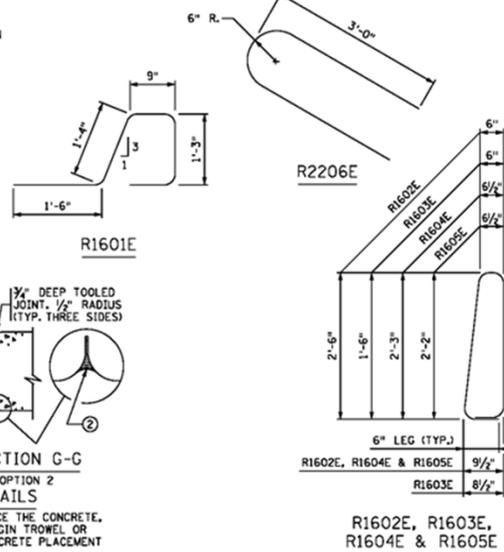
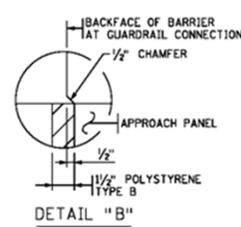
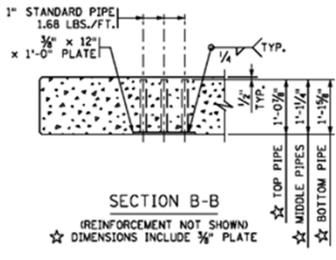






DESIGNER NOTE
REMOVE PRIOR TO PLOTTING FINAL PLANS
VERIFY BAR R1601E HAS 10" MIN
PROJECTION WHEN CROSS SLOPE VARIES
FROM NORMAL 0.02 FT/FT

BARRIER MEETS TEST LEVEL 4 REQUIREMENTS OF NCHRP REPORT 350

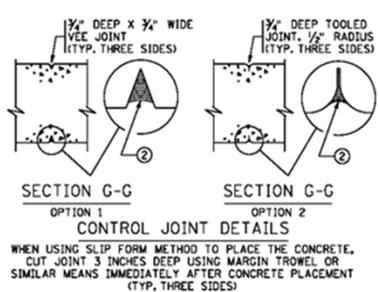
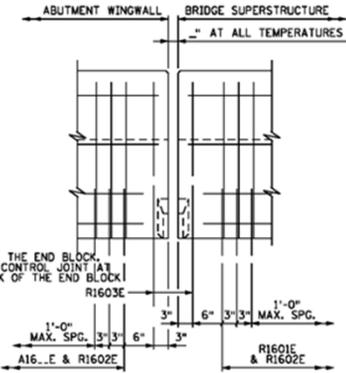
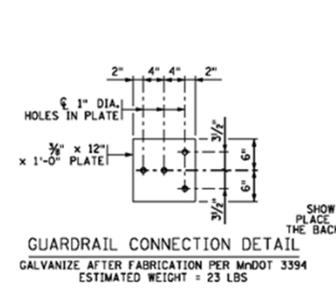


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REVISED: 05-26-2006
APPROVED: DECEMBER 10, 2003
STATE BRIDGE ENGINEER

DETAIL "A"
(USE IF PARAPET ABUTMENT)
(EXPANSION DEVICE NOT SHOWN)

REFERENCE DATE:
04-05-2012

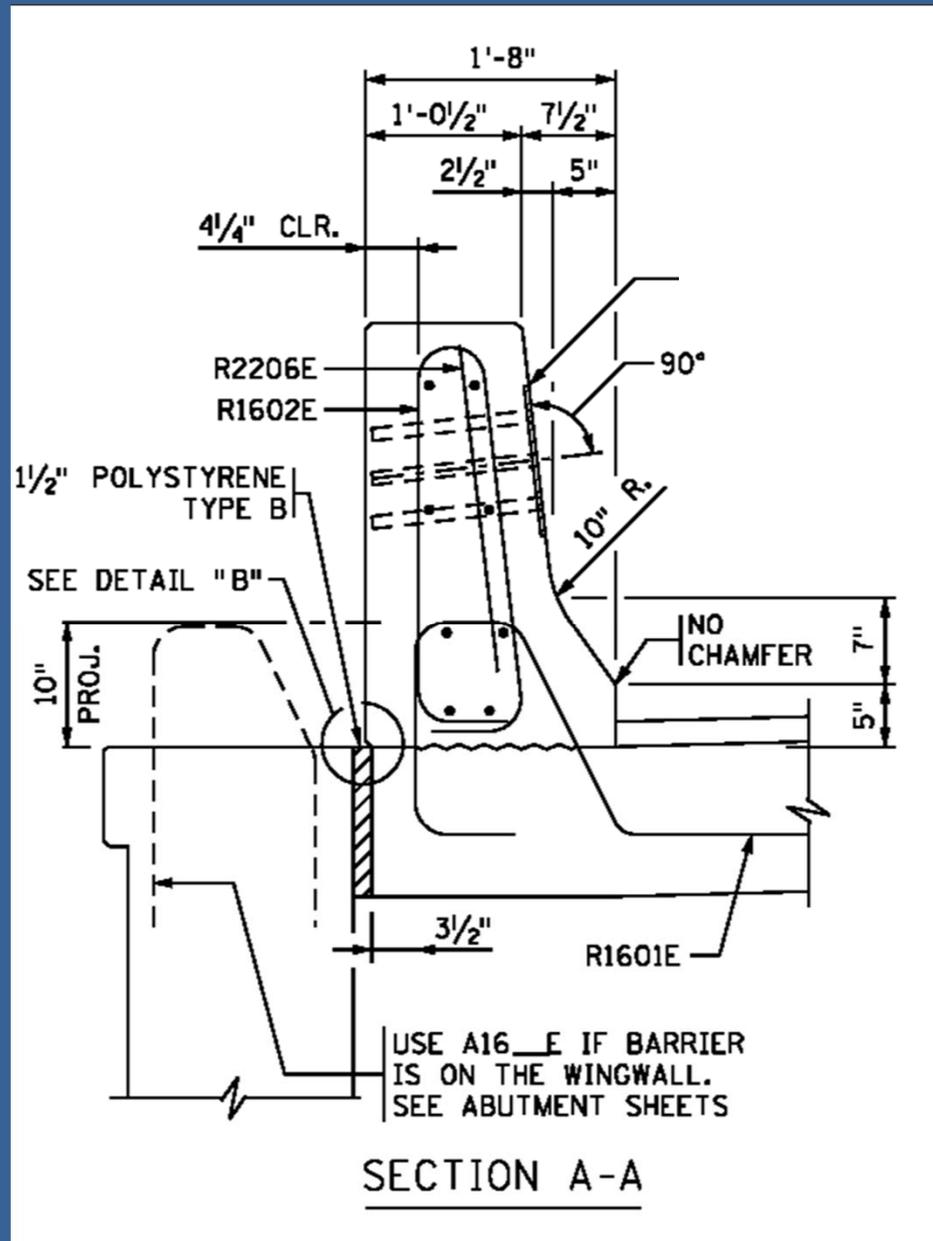
CERTIFIED BY: _____ DATE: _____
LICENSED PROFESSIONAL ENGINEER L.I.C. NO. _____

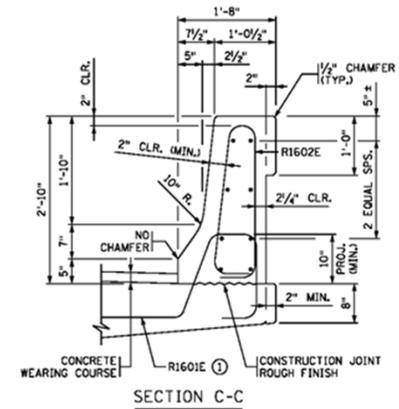
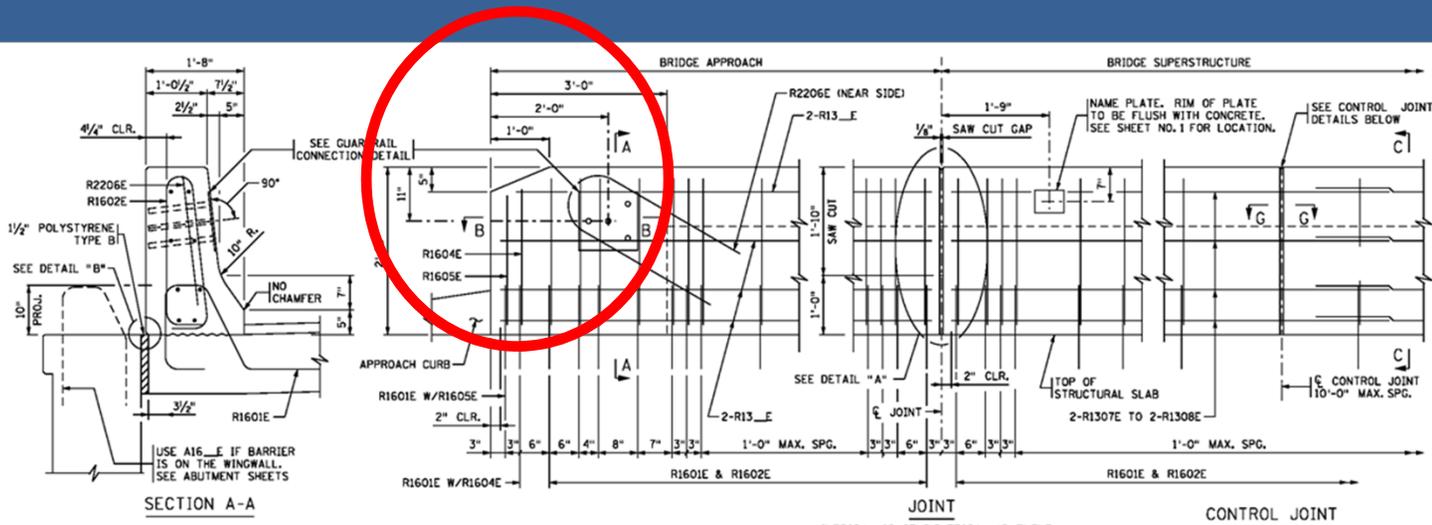
CONCRETE BARRIER (TYPE F, TL-4)
WITH INTEGRAL END POST
(WITH CONCRETE WEARING COURSE)

DESIGNED BY: _____ DRAWN BY: _____
CHECKED BY: _____

APPROVED BY: _____
BRIDGE NO. _____
SHEET NO. ___ OF ___ SHEETS

FIG. 5-397.117





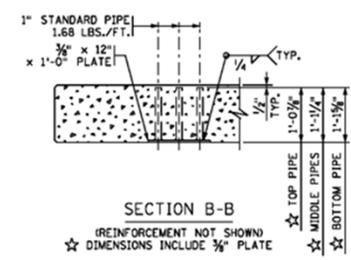
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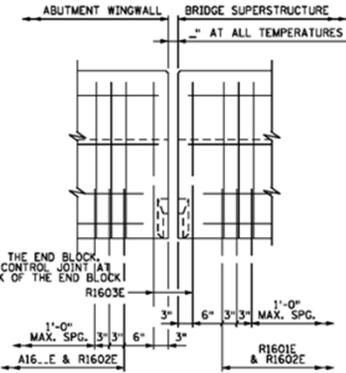
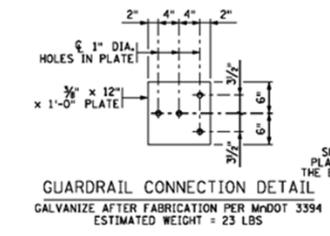
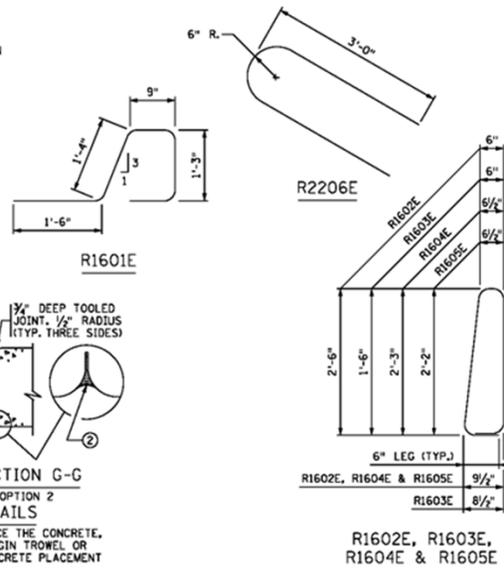
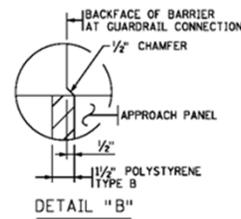
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DESIGNER NOTE
REMOVE PRIOR TO PLOTTING FINAL PLANS
VERIFY BAR R1601E HAS 10" MIN.
PROJECTION WHEN CROSS SLOPE VARIES
FROM NORMAL 0.02 FT/FT



REVISED: 05-26-2006
APPROVED: DECEMBER 10, 2003
NO. 20 AS APPROVED
STATE BRIDGE ENGINEER

REFERENCE DATE:
04-05-2012

CERTIFIED BY: _____ DATE: _____
LICENSED PROFESSIONAL ENGINEER L.I.C. NO. _____

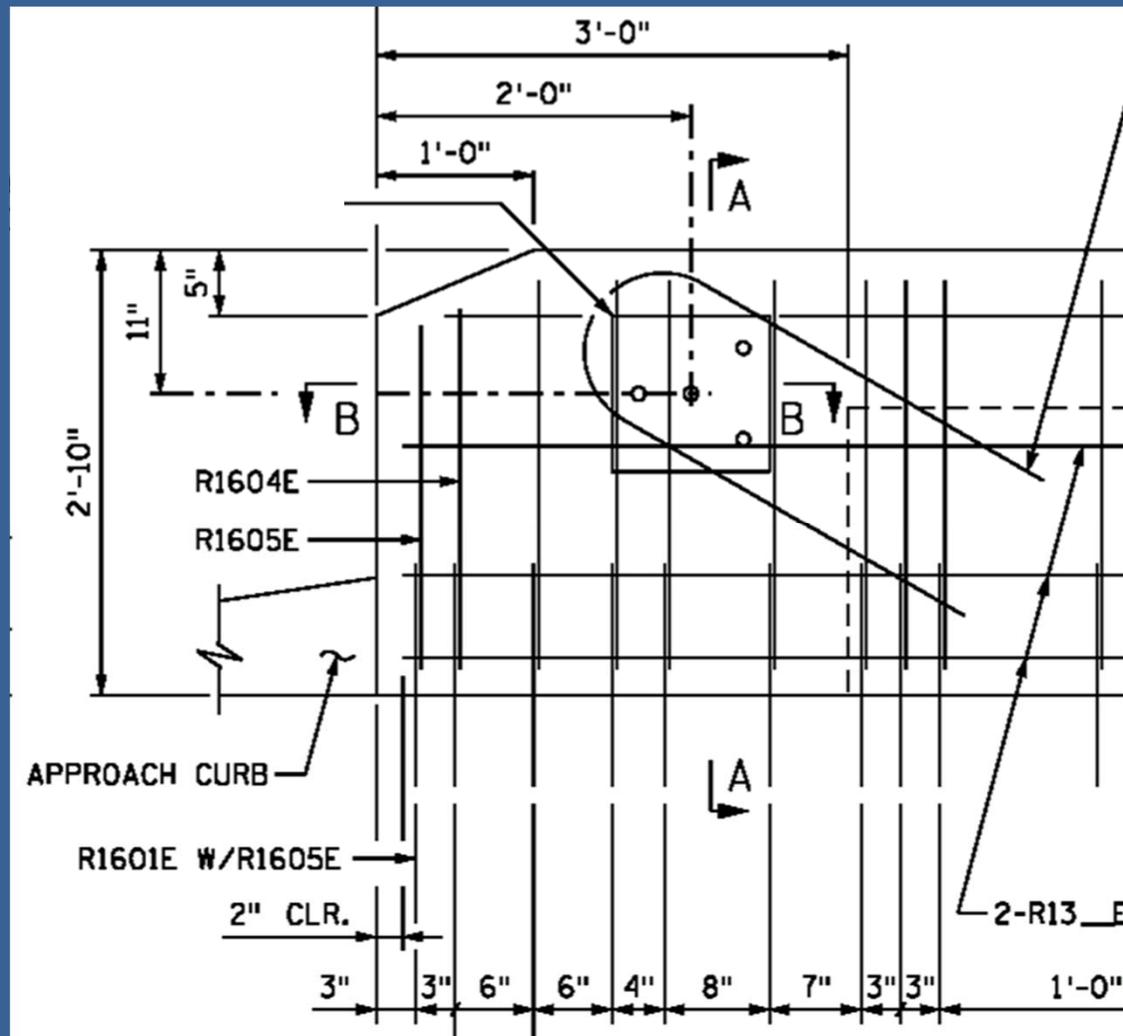
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WITH INTEGRAL END POST
(WITH CONCRETE WEARING COURSE)

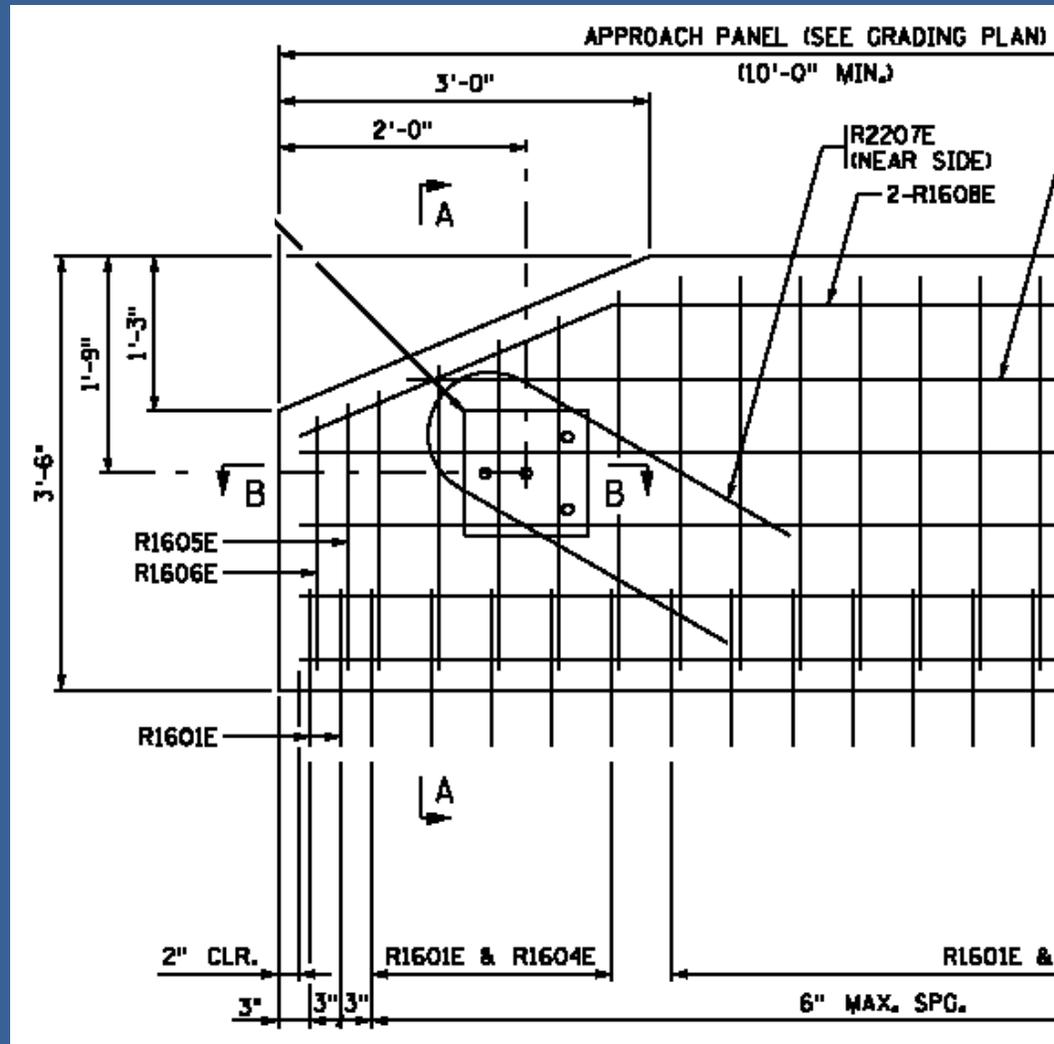
DESIGNED BY: _____ DRAWN BY: _____
CHECKED BY: _____

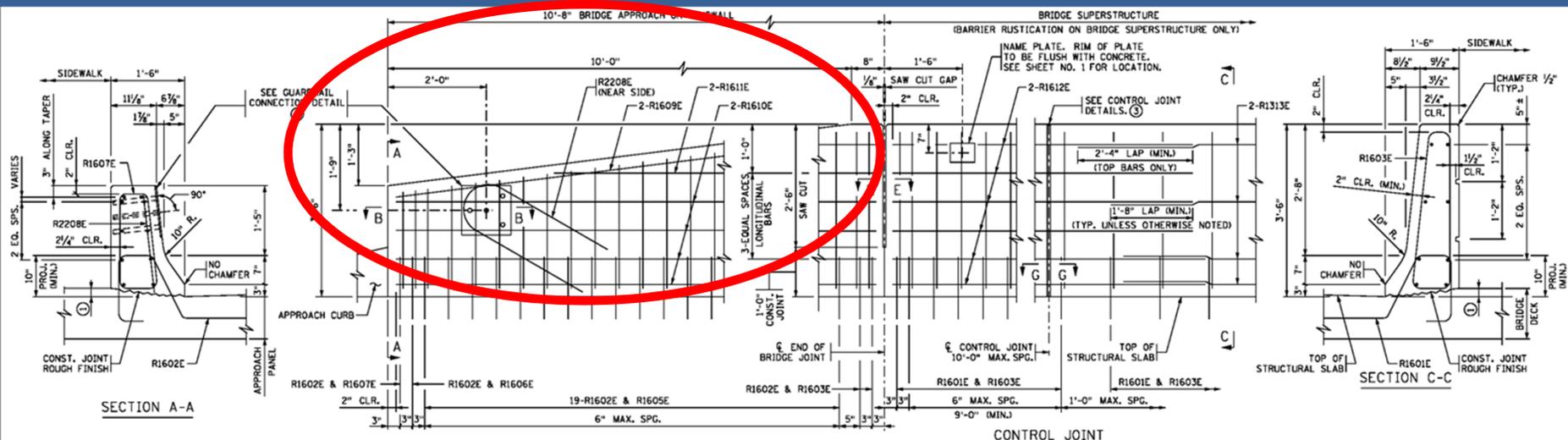
FIG. 5-397.117
APPROVED BY: _____
BRIDGE NO. _____
SHEET NO. ___ OF ___ SHEETS



Bridge Standards Update



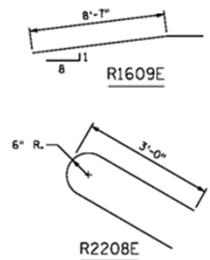




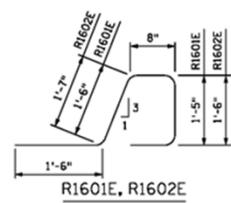
DESIGNER NOTES
 (REMOVE PRIOR TO PLOTTING FINAL PLAN)
 CHECK WITH ROAD DESIGNERS FOR SIGHT DISTANCE REQUIREMENTS.
 COORDINATE BARRIER ON APPROACH PANEL WITH ROAD DESIGNERS.
 VERIFY BAR R1601E HAS 10" MIN. PROJECTION WHEN CROSS SLOPE VARIES FROM NORMAL 0.02 FT/FT.
 VERIFY THAT BRIDGE DECK REINFORCING IS ADEQUATE FOR USE WITH A TL-5 BARRIER.



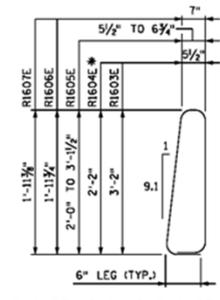
BARRIER RUSTICATION



R2208E



R1601E, R1602E



R1603E, R1604E, R1605E
 R1606E & R1607E

BARRIER ON BRIDGE SUPERSTRUCTURE MEETS TEST LEVEL 5 REQUIREMENTS OF NCHRP REPORT 350
 BARRIER ON BRIDGE APPROACH OR WINGWALL MEETS TEST LEVEL 4 REQUIREMENTS OF NCHRP REPORT 350

BILL OF REINFORCEMENT FOR BARRIER			
BAR NO.	LENGTH	SHAPE	LOCATION
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R1602E	5'-9"		BARRIER DOWEL
R1603E	7'-10"		BARRIER VERTICAL
R1604E	5'-10"		BARRIER VERTICAL
R1605E	SER. OF 19 5'-7" TO 7'-9"		BARRIER VERTICAL
R1606E	5'-7"		BARRIER VERTICAL
R1607E	5'-6"		BARRIER VERTICAL
R2208E	6'-6"		BARRIER VERTICAL
R1609E	10'-4"		BARRIER LONGIT.
R1610E	10'-4"		BARRIER LONGIT.
R1611E	6'-11"		BARRIER LONGIT.
R1612E	12'-6"		BARRIER LONGIT.
R1313E			BARRIER LONGIT.

* R1604E WHEN PARAPET ABUTMENT IS USED. (SEE DETAIL "A")

- GENERAL NOTES**
- LENGTH OF "TYPE F (TL-5) BARRIER CONCRETE (3Y46 OR 3Y46A)" FOR PAYMENT SHALL BE MEASURED BETWEEN THE OUTSIDE FACES OF THE CONCRETE BARRIER.
 - CONCRETE BARRIER = 545 LBS./FT. (0.134 CU. YDS./FT.) EACH 10'-0" TAPERED END OF BARRIER IS 6470 LBS. AND 1.6 CU. YDS.
 - FINISH ALL EDGES OF BARRIER WITH 1/2" CHAMFER, EXCEPT WHERE OTHERWISE NOTED.
 - MAXIMUM SPACING OF CONTROL JOINTS ON SUPERSTRUCTURE, APPROACH AND WINGWALL SHALL BE 10 FT.
 - GUARDRAIL CONNECTION TO BE STRUCTURAL STEEL, SPEC. 3306.
 - GUARDRAIL CONNECTION AND NAME PLATE TO BE CONSIDERED INCIDENTAL TO "TYPE F (TL-5) BARRIER CONCRETE (3Y46 OR 3Y46A)".
 - BARRIER QUANTITIES ARE LISTED IN SUMMARY OF QUANTITIES FOR SUPERSTRUCTURE.
 - ① DIMENSIONS TO BE DETERMINED BASED ON THE BRIDGE DECK SLOPE.
 - ② SEE SPECIAL PROVISIONS FOR JOINT SEALING REQUIREMENTS.
 - ③ FOR DETAILS "A", SECTIONS B-B, E-E AND C-C SEE STANDARD FIGURE 5-397..... "CONCRETE BARRIER DETAILS".

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 APPROVED:
 NOT APPROVED
 STATE BRIDGE ENGINEER

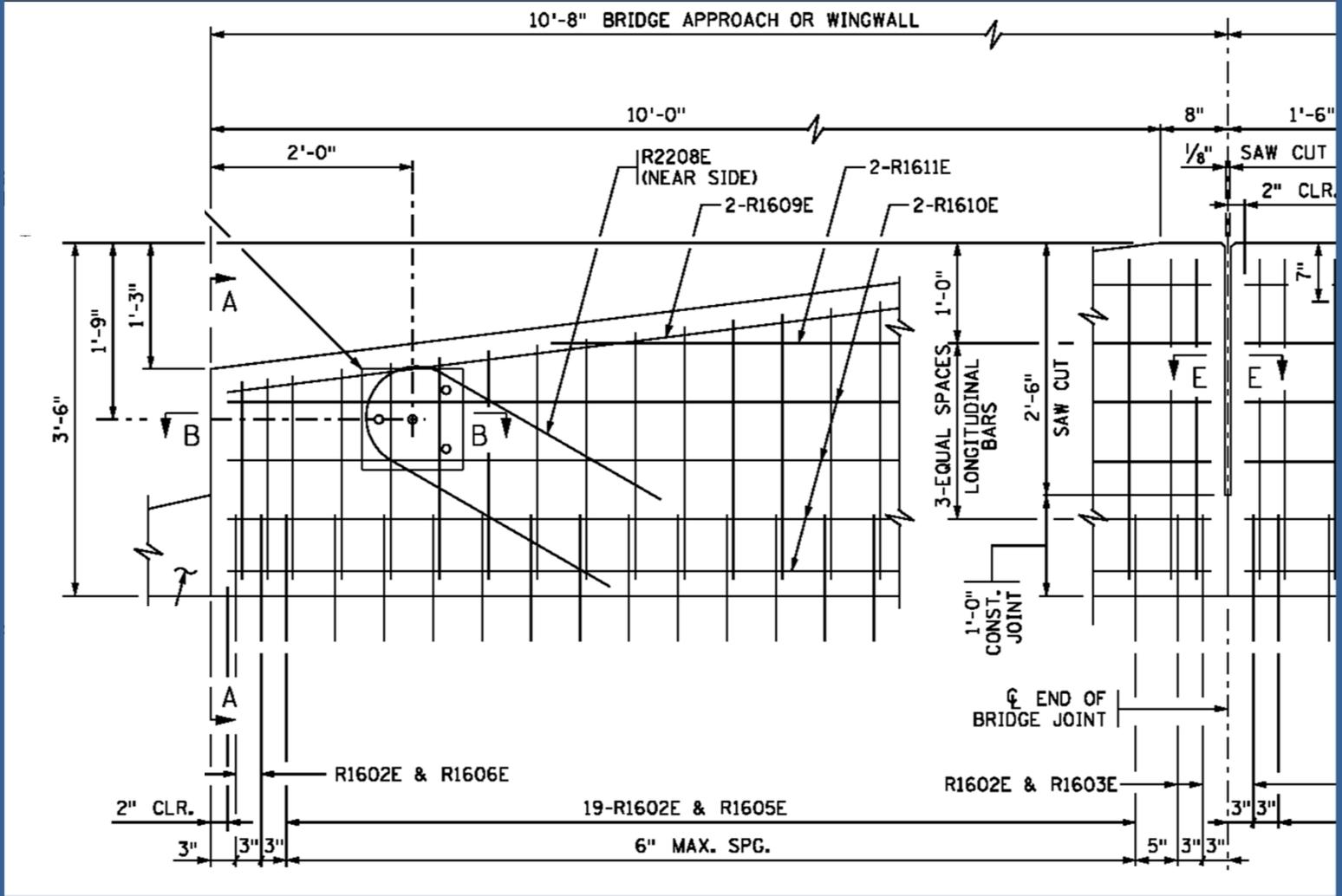
REFERENCE DATE:
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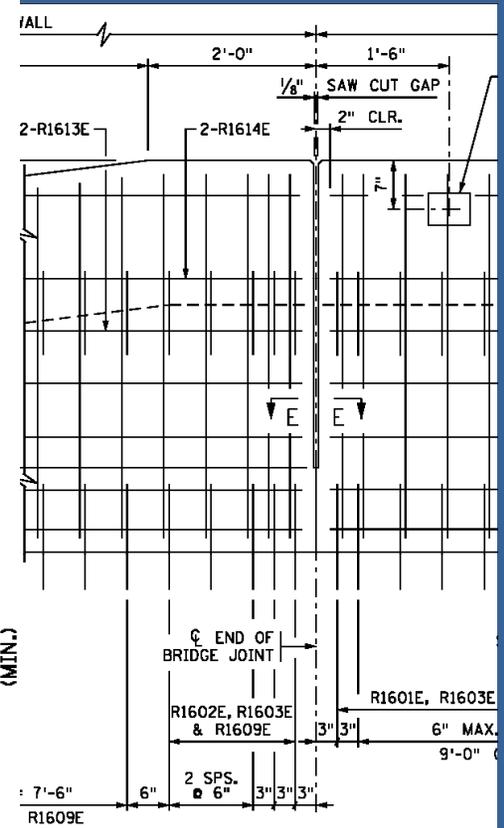
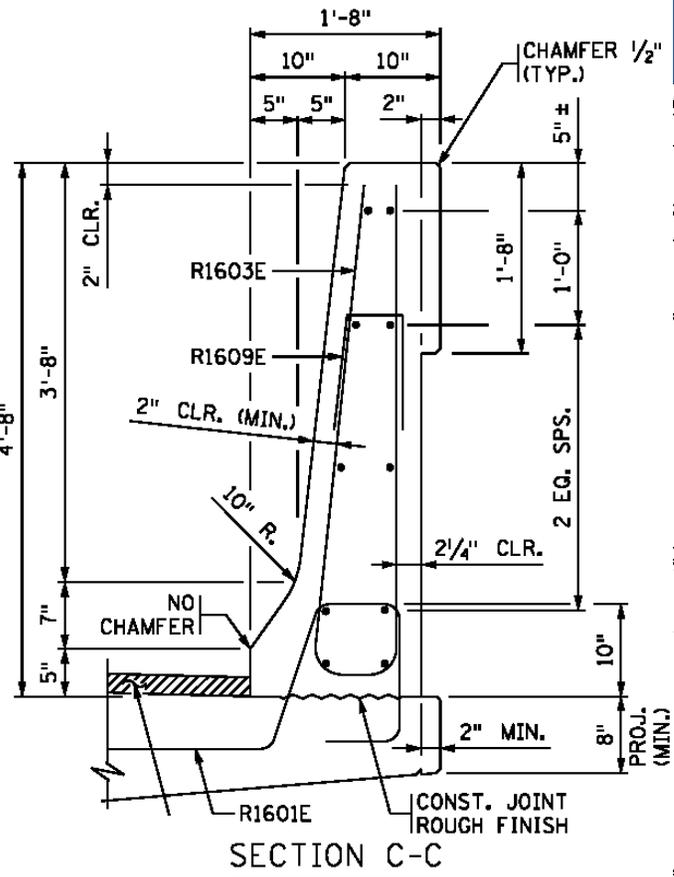
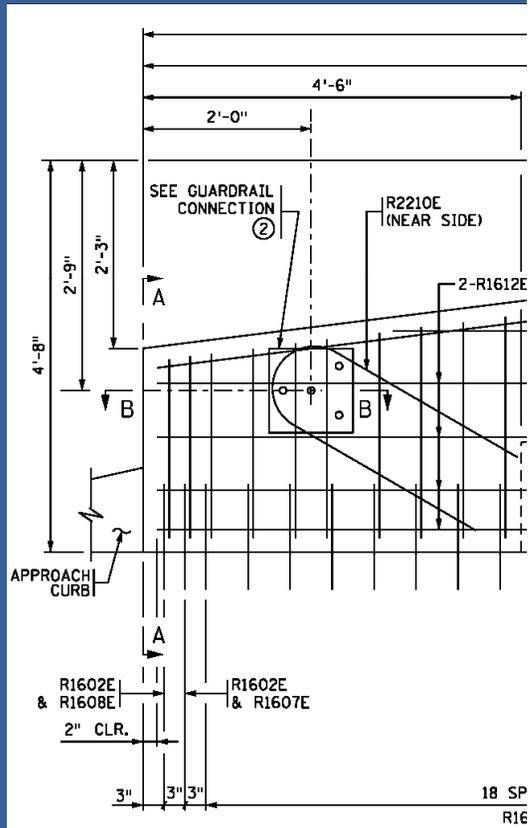
CERTIFIED BY: _____ DATE: _____
 LICENSED PROFESSIONAL ENGINEER
 NAME: _____ L.I.C. NO. _____

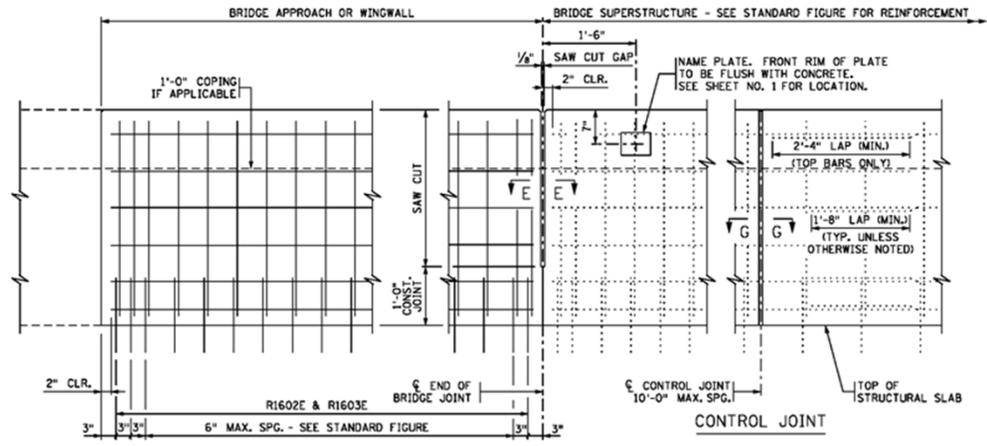
TITLE: CONCRETE BARRIER (TYPE F, TL-5) WITH BRIDGE SLAB SIDEWALK AND INTEGRAL END POST (WITHOUT CONC. WEARING COURSE)

DES: _____ DR: _____
 CHK: _____ CHK: _____
 SHEET NO. ___ OF ___ SHEETS

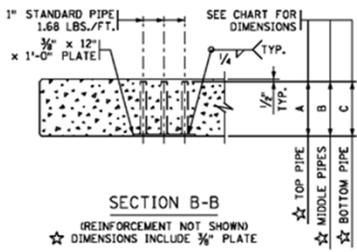
FIG. 5-397.126
 APPROVED: _____
 BRIDGE NO. _____







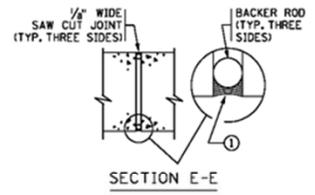
JOINT AT ABUTMENT
 (INTEGRAL OR SEMI-INTEGRAL ABUTMENT) SEE DETAIL "A" FOR PARAPET ABUTMENT
 INSIDE ELEVATION OF BARRIER ON BRIDGE APPROACH OR WINGWALL
 REINFORCEMENT WHEN BARRIER CONTINUES BEYOND APPROACH OR WINGWALL (CONCRETE WEARING COURSE NOT SHOWN)



SECTION B-B

(REINFORCEMENT NOT SHOWN)
 ☆ DIMENSIONS INCLUDE 3/8" PLATE

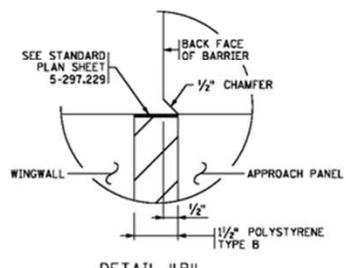
GUARDRAIL CONNECTION PIPE LENGTHS			
STANDARD FIGURE	A	B	C
FIG. 5397.122	1'-0 3/4"	1'-1 1/4"	1'-1 3/4"
FIG. 5397.124	1'-0 3/4"	1'-1 1/4"	1'-1 3/4"
FIG. 5397.125	10 3/4"	11 1/4"	11 3/4"
FIG. 5397.126	10 3/4"	11 1/4"	11 3/4"
FIG. 5397.128	1'-1"	1'-1 3/4"	1'-1 3/4"
FIG. 5397.129	11"	11 3/4"	11 3/4"



SECTION E-E

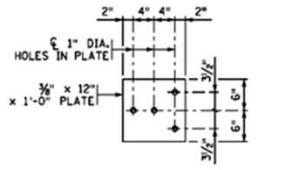
① SEE SPECIAL PROVISIONS FOR JOINT SEALING REQUIREMENTS.

NOTE:
 X-OUT ALL DETAILS THAT DO NOT APPLY

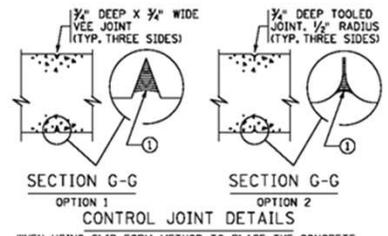


DETAIL "B"

WHERE COPING ON BACK OF BARRIER AT GUARDRAIL CONNECTION EXTENDS TO BOTTOM OF BARRIER

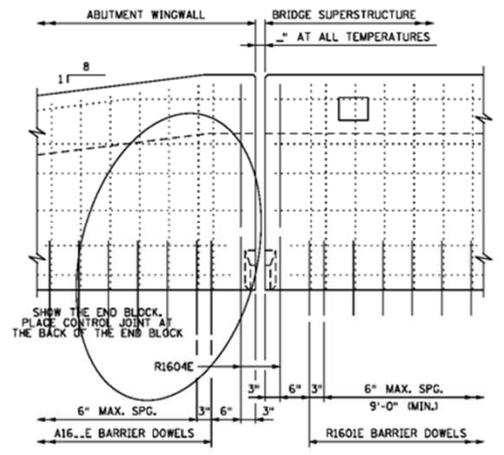


GUARDRAIL CONNECTION DETAIL
 GALVANIZE AFTER FABRICATION PER SPEC. 3394
 ESTIMATED WEIGHT = 23 LBS



SECTION G-G
 OPTION 1
 OPTION 2
 CONTROL JOINT DETAILS

WHEN USING SLIP FORM METHOD TO PLACE THE CONCRETE, CUT JOINT 3 INCHES DEEP USING MARGIN TROWEL OR SIMILAR MEANS IMMEDIATELY AFTER CONCRETE PLACEMENT (TYP. THREE SIDES)



DETAIL "A"

(USE IF PARAPET ABUTMENT) (EXPANSION DEVICE NOT SHOWN)
 BARRIER DOWELS SHOWN, SEE CONCRETE BARRIER SHEET FOR OTHER REINFORCEMENT

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 APPROVED: **APPROVED**
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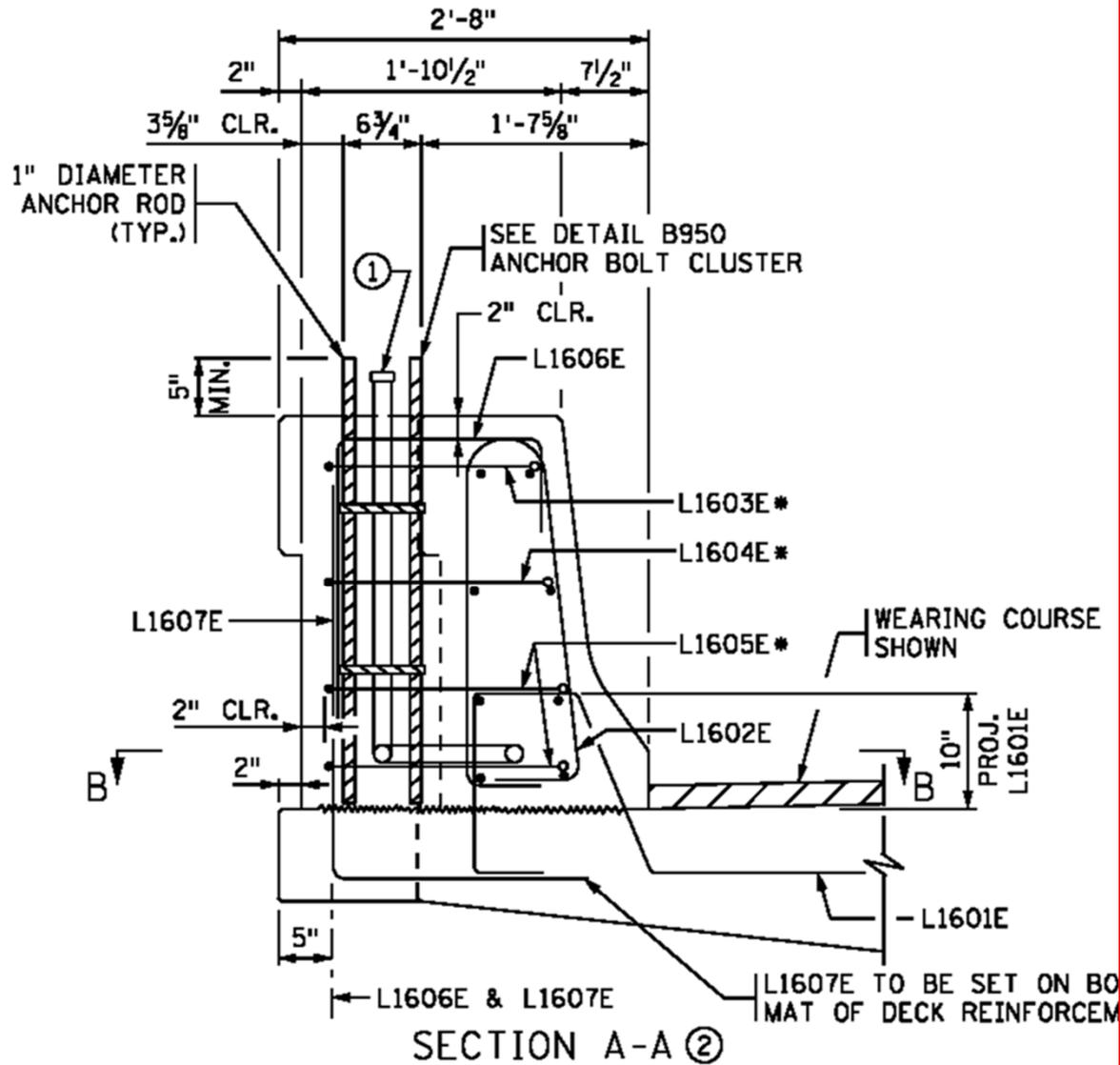
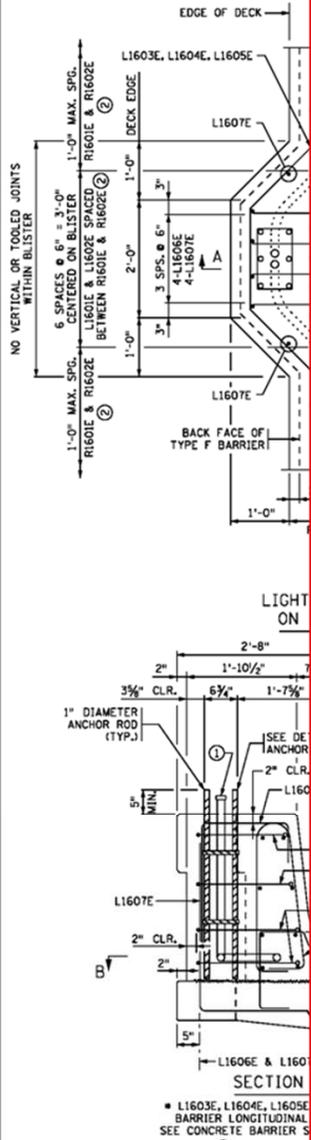
REFERENCE DATE:
 03-09-2012

CERTIFIED BY _____
 LICENSED PROFESSIONAL ENGINEER DATE _____
 NAME: _____ LIC. NO. _____

CONCRETE BARRIER DETAILS
 (TYPE F, TL-5)

DESIGNED BY _____
 CHECKED BY _____
 SHEET NO. ___ OF ___ SHEETS

FIG. 5-397...
 APPROVED: _____
 BRIDGE NO. _____



* L1603E, L1604E, L1605E ARE SPACED WITH BARRIER LONGITUDINAL REINFORCEMENT. SEE CONCRETE BARRIER SHEET FOR SPACING.

SUMMARY OF QUANTITIES FOR CONDUIT SYSTEM (LIGHTING) ③

CLUSTER	—	EACH
S.C.	—	LIN. FT.
END CAPS	—	EACH
DEFLECTION/EXPANSION FITTING	—	EACH
CONCRETE BARS (EPOXY COATED)	—	POUND
POLE / PULLBOX (STD. PLATE 8114)	—	EACH

AND DECK CONCRETE REQUIRED TO CONSTRUCT ANCHORAGE IS INCIDENTAL TO THE CONCRETE DECK CONCRETE PAY ITEMS, RESPECTIVELY.

LISTED ABOVE IS INCLUDED IN PRICE BID FOR CONDUIT SYSTEM (LIGHTING) ③

NOTES

CONDUIT SHALL EXTEND 3" ABOVE THE BARRIER TOP.

CONDUIT SHALL EXTEND 3" ABOVE THE BARRIER TOP.

SEE BARRIER SHEETS FOR TYPICAL BARRIER DETAIL.

QUANTITIES LISTED ARE FOR INFORMATIONAL PURPOSES. ANY MINOR ITEMS OR CHANGES IN QUANTITIES SHALL BE FURNISHED BY THE CONTRACTOR WITH NO COMPENSATION.

QUANTITIES ARE FOR ONE LIGHT BLISTER.

BILL OF REINFORCEMENT FOR BARRIER AT ONE LIGHT POLE ④

BAR	NO.	LENGTH	SHAPE	LOCATION
L1601E	3			BARRIER DOWEL
L1602E	3			BARRIER VERTICAL
L1603E	1	8'-11"		LONGITUDINAL TIE
L1604E	1	9'-2"		LONGITUDINAL TIE
L1605E	2	9'-4"		LONGITUDINAL TIE
L1606E	4	4'-9"		VERTICAL TIE
L1607E	6	4'-7"		VERTICAL DOWEL

TOTAL REINFORCEMENT PER LIGHT POLE LOCATION IS 125 LBS.

IN ITALICS ARE NOTES. REMOVE PRIOR TO SETTING FINAL PLAN. MAKE OUT THE PLAN NOT USED ON L1602E SHAPE.

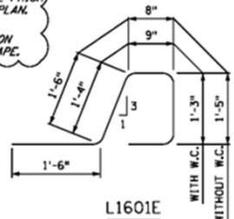
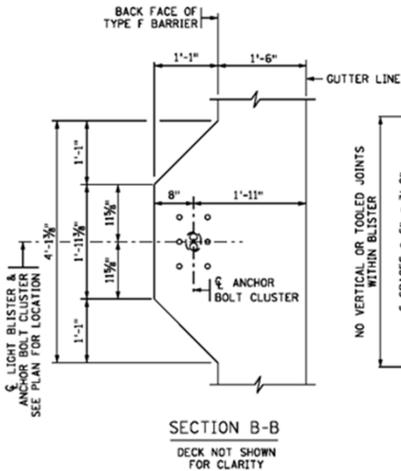


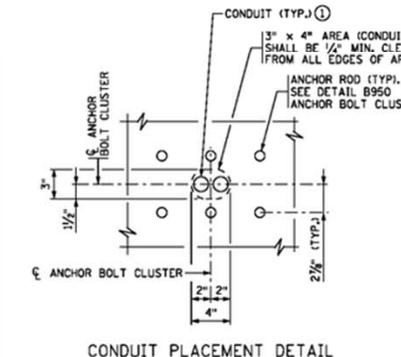
FIG. 5-397.406

REVISED:
 APPROVED: MAY 21, 2011
 Nancy A. Subenberger
 STATE BRIDGE ENGINEER

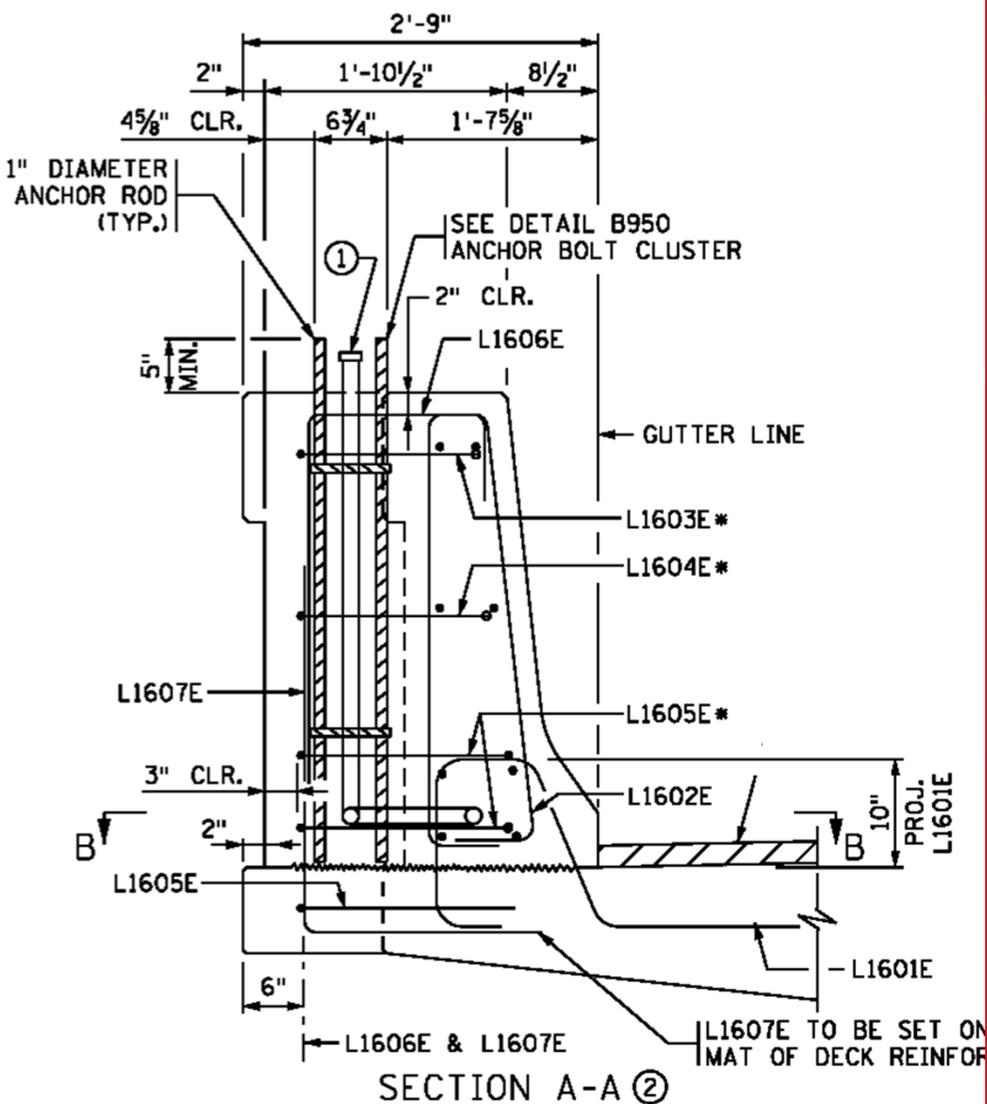
DRG	APPROVED:	BRIDGE NO.
NO. OF SHEETS		



TEXT IN ITALICS ARE DESIGNER NOTES. REMOVE PRIOR TO PLO
 DON'T SHOW EXPANSION/DEFLECTION FITTING OR EXPANSION
 IN BARRIER FOR INTEGRAL OR SEMI-INTEGRAL ABUTMENT
 ADD THE FOLLOWING NOTE TO EACH OF THE CONCRETE BARRIER
 PLAN.....REFER TO THE "CONDUIT SYSTEM (LIGHTING) SHEET"
 ADDITIONAL REINFORCING FOR LIGHT BLISTERS.



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* L1603E, L1604E, L1605E ARE SPACED WITH
 BARRIER LONGITUDINAL REINFORCEMENT.
 SEE CONCRETE BARRIER SHEET FOR SPACING.

SUMMARY OF QUANTITIES FOR
 CONDUIT SYSTEM (LIGHTING) ③

ANCHOR BOLT CLUSTER	— EACH
1/2" DIA. R.S.C.	— LIN. FT.
1/2" DIA. END CAPS	— EACH
COMBINATION DEFLECTION/EXPANSION FITTING	— EACH
REINFORCEMENT BARS (EPOXY COATED)	— POUND
P.V.C. HANDHOLE / PULLBOX (STD. PLATE 8114)	— EACH

ADDITIONAL BARRIER AND DECK CONCRETE REQUIRED TO CONSTRUCT
 THE LIGHT POLE ANCHORAGE IS INCIDENTAL TO THE CONCRETE
 BARRIER AND DECK CONCRETE PAY ITEMS, RESPECTIVELY.

ALL MATERIAL LISTED ABOVE IS INCLUDED IN PRICE BID FOR
 "CONDUIT SYSTEM (LIGHTING)"

GENERAL NOTES

BOND AND GROUND THE CONDUIT SYSTEM (LIGHTING) IN ACCORDANCE
 WITH THE APPLICABLE PORTIONS OF SPEC 2545.3R.

- ① THE 1/2" DIA. CONDUIT SHALL EXTEND 3" ABOVE THE BARRIER
 AND BE CAPPED.
- ② SEE CONCRETE BARRIER SHEETS FOR TYPICAL BARRIER
 REINFORCEMENT.
- ③ QUANTITIES LISTED ARE FOR INFORMATIONAL PURPOSES, ANY
 ADDITIONAL MINOR ITEMS OR CHANGES IN QUANTITIES
 REQUIRED SHALL BE FURNISHED BY THE CONTRACTOR WITH NO
 ADDITIONAL COMPENSATION.
- ④ BARS SHOWN ARE FOR ONE LIGHT BLISTER.

BILL OF REINFORCEMENT FOR
 BARRIER AT ONE LIGHT POLE ④

BAR NO.	LENGTH	SHAPE	LOCATION
L1601E	3		BARRIER DOWEL
L1602E	3		BARRIER VERTICAL
L1603E	1	8'-8"	LONGITUDINAL TIE
L1604E	1	8'-11"	LONGITUDINAL TIE
L1605E	3	9'-4"	LONGITUDINAL TIE
L1606E	4	5'-2"	VERTICAL TIE
L1607E	6	5'-0"	VERTICAL DOWEL

TOTAL REINFORCEMENT PER LIGHT POLE LOCATION
 IS 145 LBS.

NOTE:
 W.C. DENOTES WEARING COURSE.

DESIGNER NOTES:
 FINAL PLAN
 IN THE BILL OF
 AND L1602E.
 RISE = 5'-4"
 RISE = 5'-7"
 RISE = 8'-1"
 RISE = 7'-9"

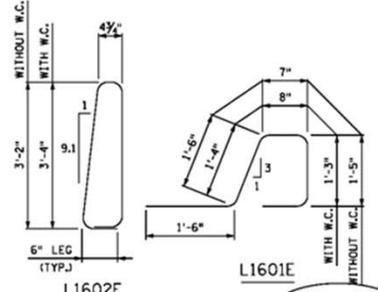
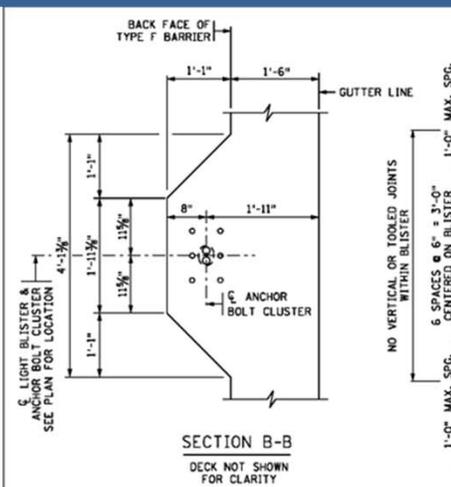


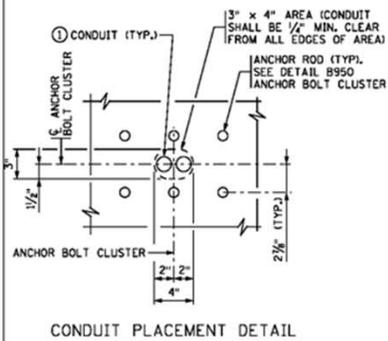
FIG. E-397.XXX
 BRIDGE NO. _____
 SHEET NO. ___ OF ___ SHEETS



TEXT IN ITALICS ARE DESIGNER NOTES. REMOVE PRIOR TO PLOTTING FINAL DRAWING.

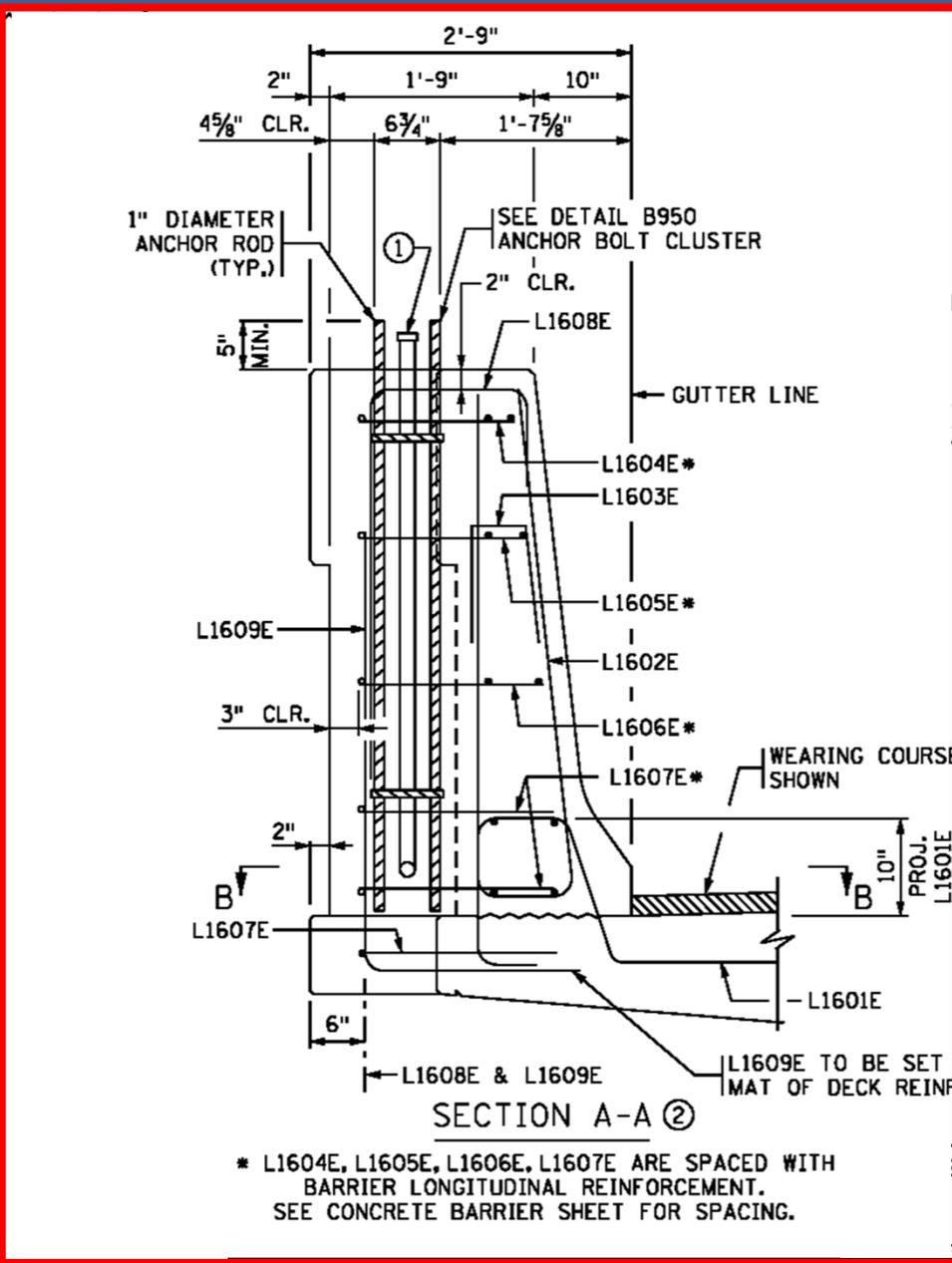
DON'T SHOW EXPANSION/DEFLECTION FITTING OR EXPANSION JOINT OF IN BARRIER FOR INTEGRAL OR SEMI-INTEGRAL ABUTMENT BRIDGES.

ADD THE FOLLOWING NOTE TO EACH OF THE CONCRETE BARRIER SHEETS PLAN.....REFER TO THE "CONDUIT SYSTEM (LIGHTING) SHEET" FOR DETAIL. ADDITIONAL REINFORCING FOR LIGHT BLISTERS.



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* L1604E, L1605E, L1606E, L1607E ARE SPACED WITH BARRIER LONGITUDINAL REINFORCEMENT. SEE CONCRETE BARRIER SHEET FOR SPACING.

SUMMARY OF QUANTITIES FOR CONDUIT SYSTEM (LIGHTING) ③

ANCHOR BOLT CLUSTER	— EACH
1 1/2" DIA. R.S.C.	— LIN. FT.
1 1/2" DIA. END CAPS	— EACH
COMBINATION DEFLECTION/EXPANSION FITTING	— EACH
REINFORCEMENT BARS (EPOXY COATED)	— POUND
P.V.C. HANDHOLE / PULLBOX (STD. PLATE 8114)	— EACH

ADDITIONAL BARRIER AND DECK CONCRETE REQUIRED TO CONSTRUCT THE LIGHT POLE ANCHORAGE IS INCIDENTAL TO THE CONCRETE BARRIER AND DECK CONCRETE PAY ITEMS, RESPECTIVELY.

ALL MATERIAL LISTED ABOVE IS INCLUDED IN PRICE BID FOR "CONDUIT SYSTEM (LIGHTING)"

GENERAL NOTES

- BOND AND GROUND THE CONDUIT SYSTEM (LIGHTING) IN ACCORDANCE WITH THE APPLICABLE PORTIONS OF SPEC 2545.3R.
- ① THE 1 1/2" DIA. CONDUIT SHALL EXTEND 3" ABOVE THE BARRIER AND BE CAPPED.
 - ② SEE CONCRETE BARRIER SHEETS FOR TYPICAL BARRIER REINFORCEMENT.
 - ③ QUANTITIES LISTED ARE FOR INFORMATIONAL PURPOSES. ANY ADDITIONAL MINOR ITEMS OR CHANGES IN QUANTITIES REQUIRED SHALL BE FURNISHED BY THE CONTRACTOR WITH NO ADDITIONAL COMPENSATION.
 - ④ BARS SHOWN ARE FOR ONE LIGHT BLISTER.

BILL OF REINFORCEMENT FOR BARRIER AT ONE LIGHT POLE ④

BAR	NO.	LENGTH	SHAPE	LOCATION
L1601E	3	5'-4"		BARRIER DOWEL
L1602E	3	9'-5"		BARRIER VERTICAL
L1603E	3	2'-5"		BARRIER TIE
L1604E	1	8'-2"		LONGITUDINAL TIE
L1605E	1	8'-8"		LONGITUDINAL TIE
L1606E	1	8'-11"		LONGITUDINAL TIE
L1607E	3	9'-4"		LONGITUDINAL TIE
L1608E	4	5'-6"		VERTICAL TIE
L1609E	6	5'-7"		VERTICAL DOWEL

TOTAL REINFORCEMENT PER LIGHT POLE LOCATION IS 170 LBS.

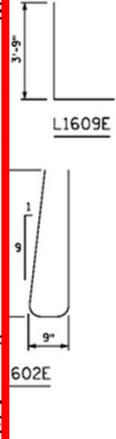


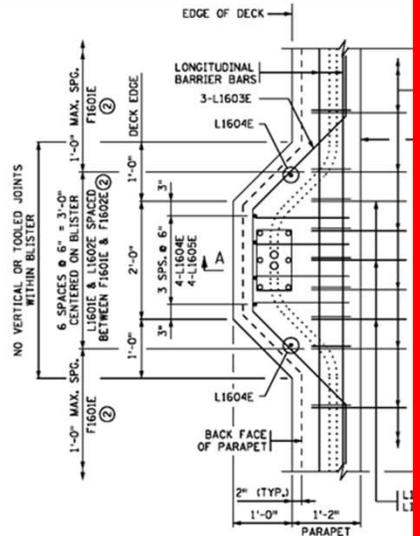
FIG. 5-397.xxx

DESIGNED BY: _____ DATE: _____ APPROVED BY: _____

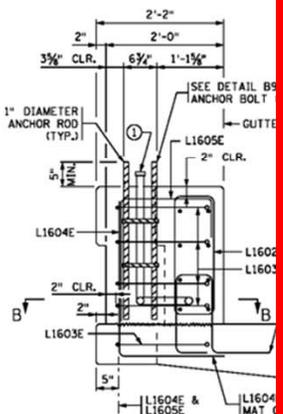
CHECKED BY: _____ DATE: _____

BRIDGE NO. _____

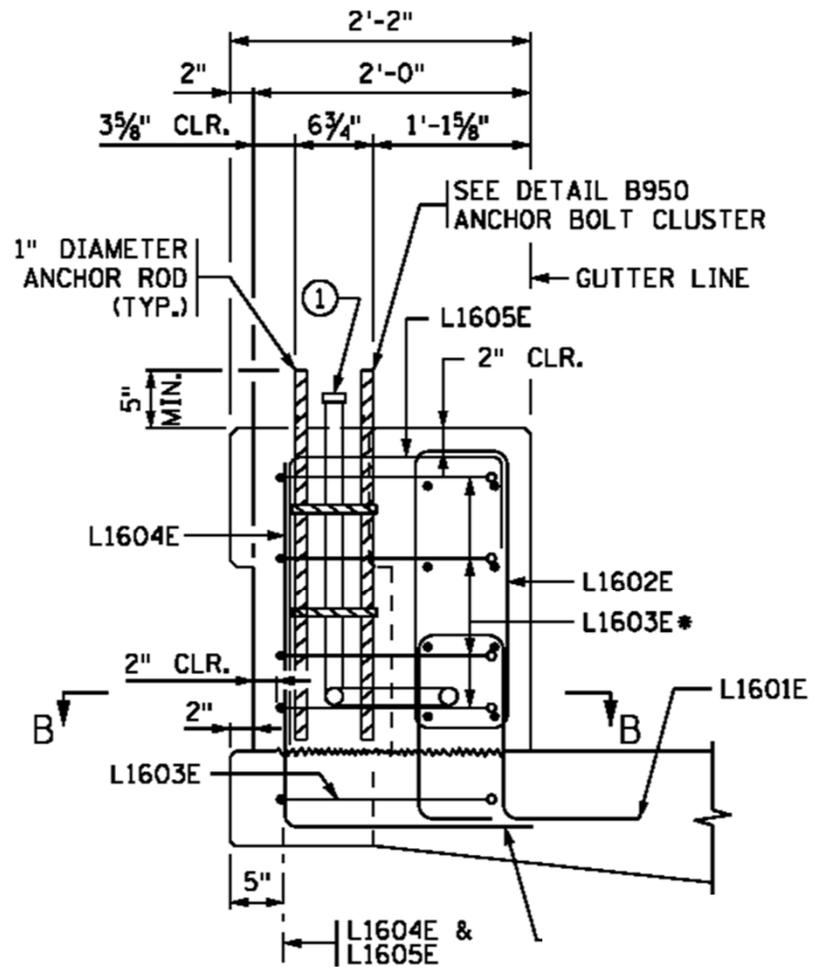
SHEET NO. _____ OF _____ SHEETS



PLAN
LIGHT POLE ANCHORAGE
ON CONCRETE PARAPET



SECTION A-A
* L1603E SPACED WITH PARAPET
LONGITUDINAL REINFORCEMENT. SEE CONCRETE
PARAPET (TYPE P-1) SHEET FOR SPACING.



SECTION A-A

* L1603E SPACED WITH PARAPET
LONGITUDINAL REINFORCEMENT. SEE CONCRETE
PARAPET (TYPE P-1) SHEET FOR SPACING.

SUMMARY OF QUANTITIES FOR
CONDUIT SYSTEM (LIGHTING) ④

ANCHOR BOLT CLUSTER	—	EACH
1 1/2" DIA. R.S.C.	—	LIN. FT.
1 1/2" DIA. END CAPS	—	EACH
COMBINATION DEFLECTION/EXPANSION FITTING	—	EACH
REINFORCEMENT BARS (EPOXY COATED)	—	POUND
P.V.C. HANDHOLE / PULLBOX (STD. PLATE 8114)	—	EACH

ADDITIONAL PARAPET AND DECK CONCRETE REQUIRED TO CONSTRUCT THE LIGHT POLE ANCHORAGE IS INCIDENTAL TO THE CONCRETE PARAPET AND DECK CONCRETE PAY ITEMS, RESPECTIVELY.

ALL MATERIAL LISTED ABOVE IS INCLUDED IN PRICE BID FOR "CONDUIT SYSTEM (LIGHTING)"

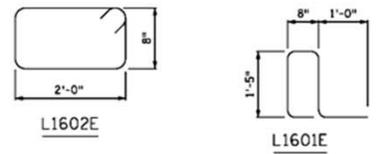
GENERAL NOTES

- BOND AND GROUND THE CONDUIT SYSTEM (LIGHTING) IN ACCORDANCE WITH THE APPLICABLE PORTIONS OF SPEC 2545.3R.
- ① THE 1 1/2" DIA. CONDUIT SHALL EXTEND 3" ABOVE THE CONCRETE PARAPET AND BE CAPPED.
- ② SEE CONCRETE PARAPET (TYPE P-1) SHEETS FOR TYPICAL CONCRETE PARAPET REINFORCEMENT.
- ③ QUANTITIES LISTED ARE FOR INFORMATIONAL PURPOSES, ANY ADDITIONAL MINOR ITEMS OR CHANGES IN QUANTITIES REQUIRED SHALL BE FURNISHED BY THE CONTRACTOR WITH NO ADDITIONAL COMPENSATION.
- ④ BARS SHOWN ARE FOR ONE LIGHT BLISTER.

BILL OF REINFORCEMENT FOR CONCRETE
PARAPET AT ONE LIGHT POLE ④

BAR NO.	LENGTH	SHAPE	LOCATION
L1601E	3 5'-0"	[Symbol]	PARAPET DOWEL
L1602E	3 6'-3"	[Symbol]	PARAPET VERTICAL
L1603E	4 9'-2"	[Symbol]	LONGITUDINAL TIE
L1604E	6 4'-5"	[Symbol]	VERTICAL DOWEL
L1605E	4 4'-6"	[Symbol]	VERTICAL TIE

TOTAL REINFORCEMENT PER LIGHT POLE LOCATION IS 120 LBS.



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FIG. 5-397.XXX

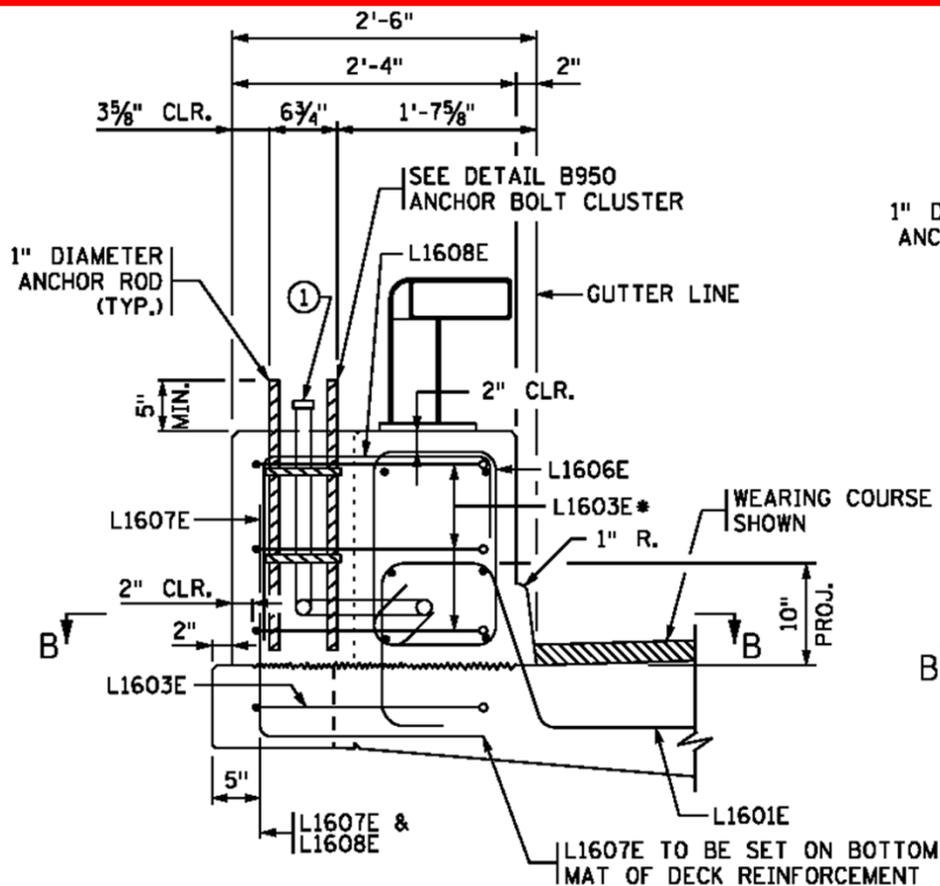
(LIGHTING)
P-1) BLISTER,
COURSE)

DES: _____ DIB: _____
CHK: _____ CHK: _____

APPROVED: _____

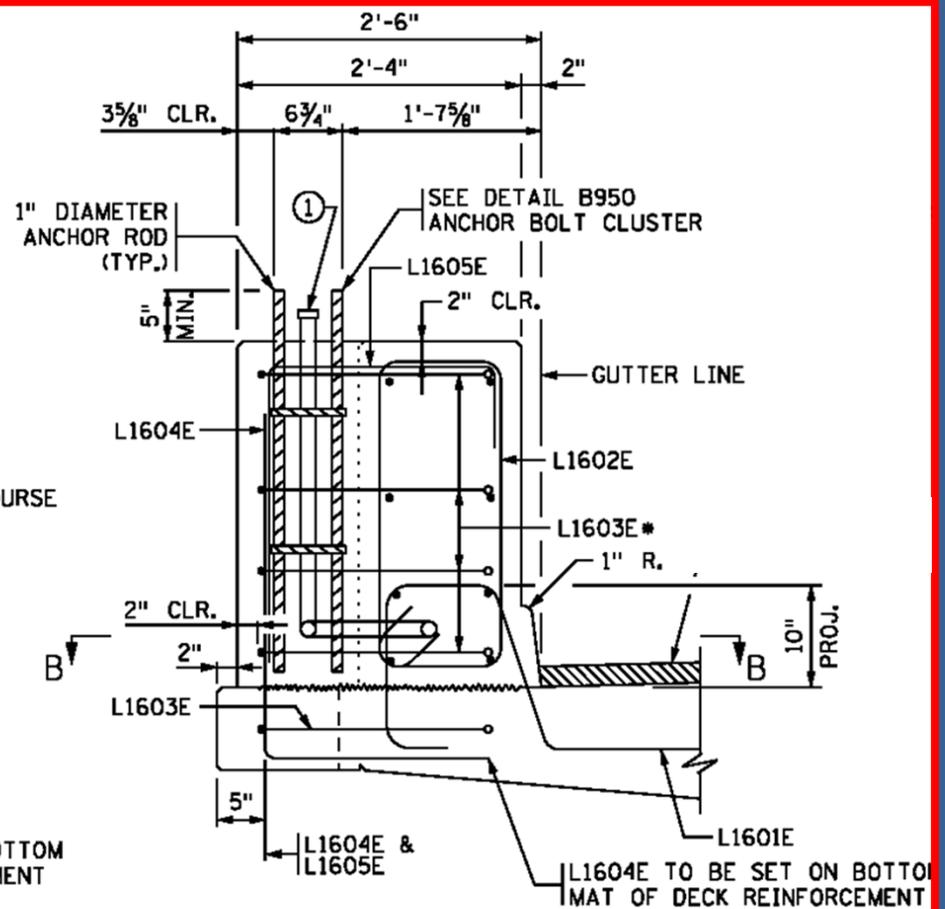
SHEET NO. ___ OF ___ SHEETS

BRIDGE NO. _____



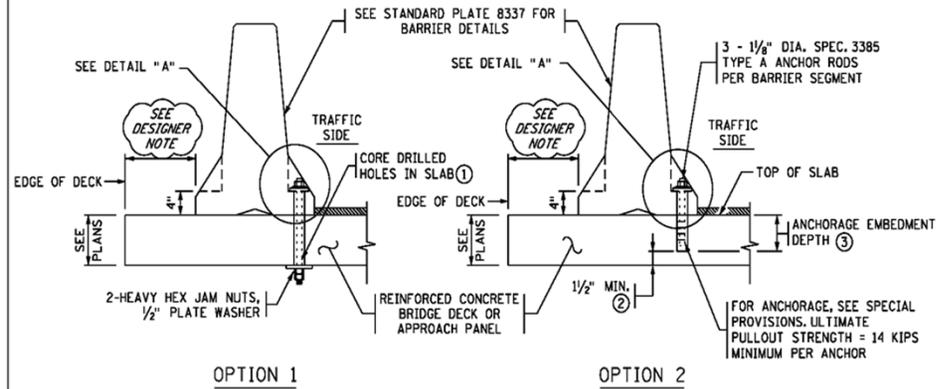
SECTION A-A (TYPE P-2 BARRIER)
WITH STRUCTURAL TUBE RAILING

* L1603E SPACED WITH PARAPET LONGITUDINAL REINFORCEMENT.
SEE CONCRETE PARAPET (TYPE P-2) SHEET FOR SPACING.



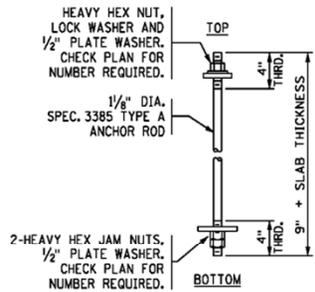
SECTION A-A (TYPE P-4 BARRIER)

* L1603E SPACED WITH PARAPET LONGITUDINAL REINFORCEMENT.
SEE CONCRETE PARAPET (TYPE P-4) SHEET FOR SPACING.

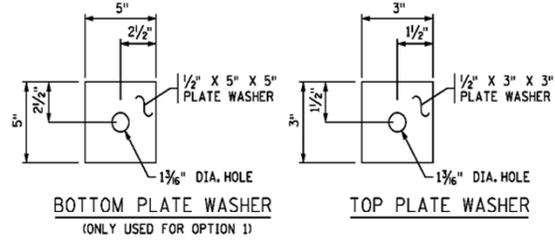


OPTION 1
DO NOT USE ON NEW DECK

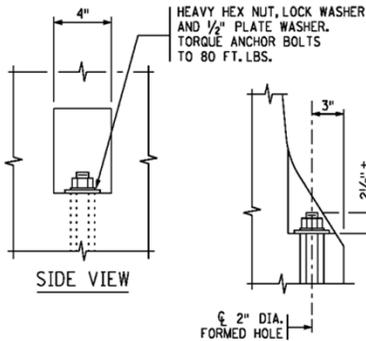
OPTION 2



ANCHORAGE DETAILS
REINFORCEMENT NOT SHOWN



OPTION 1 ANCHOR
(3 PER BARRIER SEGMENT)



- NOTES:**
- ALL HARDWARE TO BE GALVANIZED PER SPEC. 3392.
 - ALL STRUCTURAL STEEL TO BE SPEC. 3306 UNLESS OTHERWISE NOTED.
 - COST OF ANCHORAGE SYSTEM, ANCHOR REMOVAL AND GROUTING OF HOLE ARE INCIDENTAL TO THE COST OF PLACING THE TEMPORARY PORTABLE PRECAST BARRIER.
 - PIN BARRIERS TOGETHER PER STANDARD PLATE 8337.
 - THROUGH BOLT ANCHORS MUST BE USED IF THE DECK IS PENETRATED DURING DRILLING PROCESS.
 - DO NOT USE ON BRIDGES OR APPROACH PANELS WITH A BITUMINOUS OVERLAY.
 - REFER TO TRAFFIC CONTROL PLANS FOR DEPLOYMENT LENGTH AND BARRIER TERMINATION REQUIREMENTS.
 - ANCHOR ON TRAFFIC SIDE OF BARRIER ONLY.
 - SEE SPECIAL PROVISIONS FOR BARRIER INSTALLATION AND REMOVAL REQUIREMENTS.
- ① PERCUSSION DRILLING OF THESE HOLES IS NOT PERMITTED.
 - ② 1/2" MINIMUM TO PREVENT BOTTOM OF SLAB FROM SPALLING OR FRACTURING DURING DRILLING.
 - ③ 5/8" MINIMUM AND 6" MAXIMUM FOR BRIDGE DECKS WITH TOP MAT REINFORCEMENT AND SOUND CONCRETE. 9" MINIMUM AND 10 1/2" MAXIMUM FOR SOUND CONCRETE APPROACH PANELS.

TEXT IN ITALICS ARE DESIGNER NOTES. REMOVE PRIOR TO PLOTTING FINAL PLAN.

REFER TO MnDOT LRFD MANUAL "MEMO TO DESIGNERS (2011-03)" FOR GUIDANCE ON EDGE DISTANCE.

APPROVED: DECEMBER 21, 2011	STATE OF MINNESOTA DEPARTMENT OF TRANSPORTATION TEMPORARY PORTABLE PRECAST CONCRETE BARRIER ANCHORAGE (TEMPORARY USAGE IN LIMITED BARRIER DISPLACEMENT AREAS)	REVISED 05-24-2012	DETAIL NO. B920
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Nancy Duberberger
STATE BRIDGE ENGINEER

Minimum Distance from Edge of Deck to Back (Non-Traffic) Side of Barrier on Bridges and Approach Panels			
Construction Posted Speed Limit	50 mph or greater or with significant geometric elements*	40-45 mph	35 mph or less
Anchored	4'-0"	2'-0"	6"
Unanchored	N/A	6'-0"	3'-0"

*Significant geometric elements include installation on all interstate highways and curved alignments.

Designers may also choose to use a more restrictive setback distance for bridges where travel speeds may significantly exceed the posted speed limit, with heavy truck traffic, or where other situations may warrant increasing the dimensions in the chart above.

The following anchor requirements must be met if utilizing an anchored alternative:

- For each barrier segment, install three, 1½" diameter anchor rods (MnDOT Spec. 3385 Type A) on traffic side only.
- For bridge decks in good condition, chemical anchors shall have 5½" minimum embedment and 6" maximum embedment. Maximum depth of the hole shall be 1½ inches less than the slab depth to help ensure that the bottom of the slab doesn't spall or fracture during hole drilling.
- For approach panels with top and bottom mats of reinforcement, chemical anchors shall have 5½" minimum embedment.
- For approach panels with no reinforcement or only a bottom mat of reinforcement, chemical anchors shall have 9" minimum embedment.
- Chemical anchors may only be used where concrete is in good condition. Regional Bridge Engineer will confirm adequacy for installations on in-place bridges.
- Through-deck anchoring may be utilized on existing bridge decks in poor condition.
- For the minimum length noted above, the anchor manufacturer's minimum bond stress shall provide an ultimate (nominal) strength of 14 kips and will be proof tested to 7 kips. See the Special Provision for additional testing requirements.

These requirements are only valid when installing anchors on a reinforced bridge deck or approach panel. The anchorage provisions included here are not applicable for non-reinforced concrete or bituminous surfaces. Minimum deployment length and anchorage requirements past the end of the bridge and approach panels are to be determined by the roadway designer and shown in the traffic control plans.

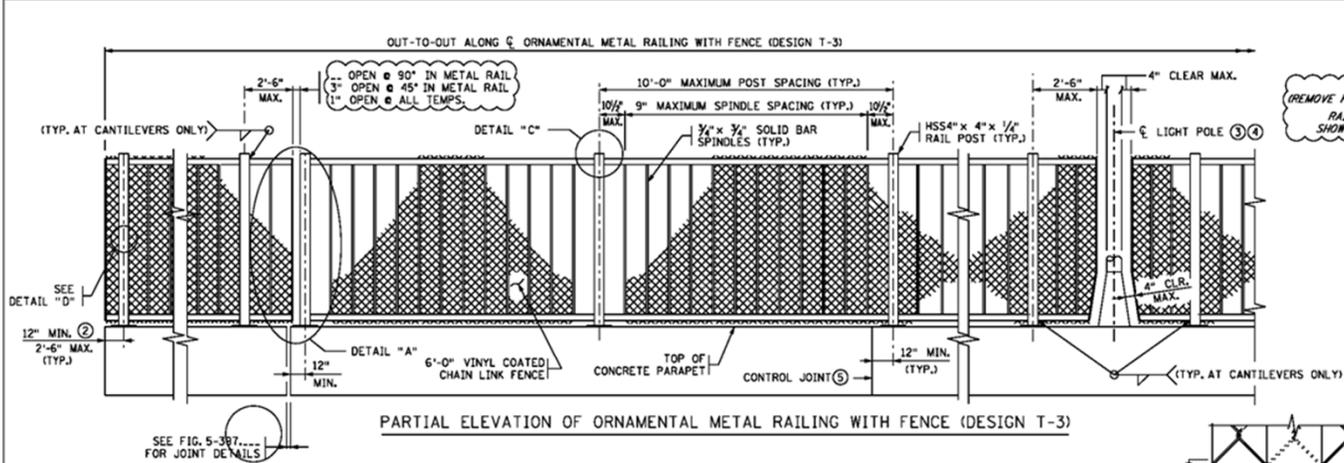
With the release of this memo, Standard Detail B920 (see attached) will be reactivated for use. Note that the details have been modified to reference this memo. Please see me if you have questions on these guidelines.

cc: C. Harer/Design Consultants
M. Elle
J. Rosenow
C. Mittelstadt

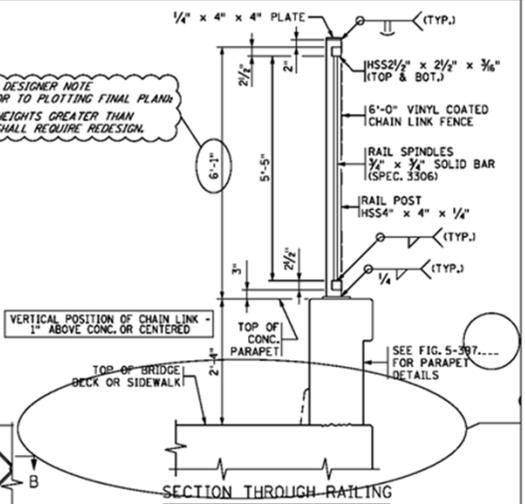
An Equal Opportunity Employer

Page 2 of 2



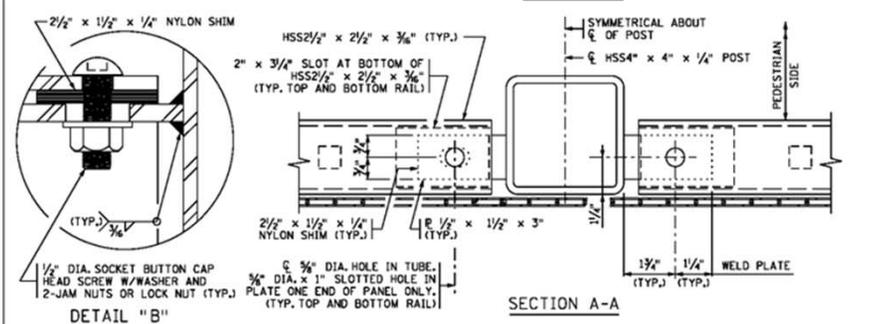
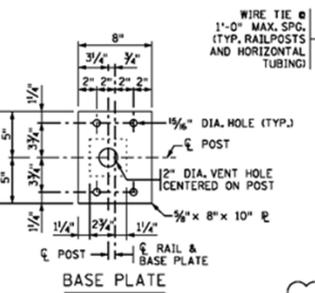
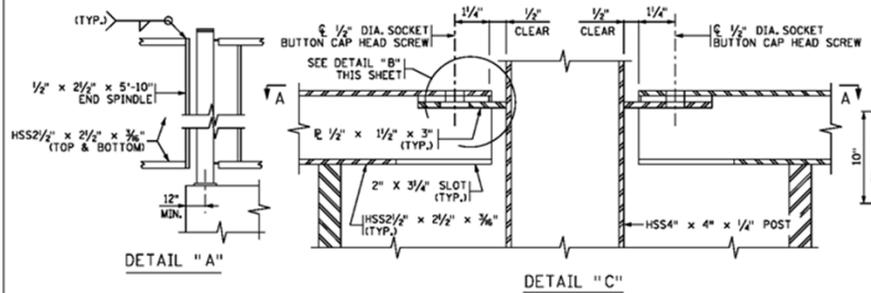


DESIGNER NOTE
 (REMOVE PRIOR TO PLOTTING FINAL PLANS)
 RAIL HEIGHTS GREATER THAN SHOWN SHALL REQUIRE REDESIGN.



GENERAL NOTES

- THE METAL RAILING SHALL BE CONTINUOUSLY GROUND. SEE THE SPECIAL PROVISIONS. REFER TO THE ELECTRICAL PLANS AND ELECTRICAL SPECIAL PROVISIONS FOR DETAILS REGARDING BONDING MULTIPLE ELECTRICAL GROUNDING SYSTEMS.
 - PAYMENT LENGTH OF "ORNAMENTAL METAL RAILING WITH FENCE, DESIGN T-3" SHALL BE MEASURED AS THE OUT TO OUT LENGTH ALONG THE CENTERLINE OF THE RAILING BETWEEN THE OUTSIDE ENDS.
 - STRUCTURAL STEEL TUBING (HSS) IN THE RAIL SHALL BE A500, GRADE B. MATERIAL SHALL CONFORM TO SPEC. 336. ALL OTHER STEEL SHALL CONFORM TO SPEC. 3306.
 - VENT HOLES SHALL BE DRILLED IN THE RAIL POST BASE AND THE RAIL TUBES AS NECESSARY TO FACILITATE GALVANIZING.
 - GALVANIZE BOLTS, NUTS, AND WASHERS PER SPEC. 3392.
 - GALVANIZE ALL OTHER STRUCTURAL STEEL PER SPEC. 3394, AFTER FABRICATION.
 - THE RAILING, BASE PLATES, AND PROTRUDING PORTIONS OF BOLTS, NUTS AND WASHERS SHALL BE PAINTED IN ACCORDANCE WITH THE SPECIAL PROVISIONS.
 - RAIL POSTS AND SPINDLES SHALL BE [NORMAL TO GRADE OR VERTICAL].
 - HORIZONTAL RAILS SHALL BE CURVED WHERE APPLICABLE AND PARALLEL TO THE EDGE OF SIDEWALK PROFILE.
 - CHAIN LINK FENCE MUST BE USED WITH THIS RAILING. [SEE SPECIAL PROVISIONS FOR REQUIREMENTS OF CHAIN LINK FABRIC AND TIES.]
- 1 ADHESIVE ANCHORAGE WITH 3/8" DIA. ANCHOR ROD PER SPEC. 3385, TYPE A WITH HEX NUT AND WASHER, MINIMUM ULTIMATE PULL-OUT STRENGTH OF ADHESIVE SHALL BE XXK KIPS WITH A 10" MINIMUM EMBEDMENT. SEE SPECIAL PROVISIONS.
 - 2 PLACE C OF END POST 12" FROM END OF CONCRETE PARAPET IF GUARDRAIL CONNECTION PLATE IS PRESENT.
 - 3 IF LIGHT POLE IS MOUNTED ON BLISTER, RAILING MAY BE CONTINUOUS IN FRONT OF LIGHT POLE (SEE PARAPET & LIGHT POLE DETAILS).
 - 4 THE CONTRACTOR SHALL COORDINATE LIGHT POLE DETAILS WITH THE RAILING FABRICATOR TO ENSURE PROPER CLEARANCES AND RAILING CONFIGURATION ADJACENT TO THE POLE.
 - 5 SEE SUPERSTRUCTURE AND PARAPET SHEETS FOR CONTROL JOINT SPACING AND DETAILS.



DESIGNER NOTE
 (REMOVE PRIOR TO PLOTTING FINAL PLANS)
 DESIGNER SHALL CONSULT WITH BRIDGE OFFICE ARCHITECTURAL SPECIALIST. CHANGE NOTE ACCORDINGLY.

REVISIONS:
 APPROVED: **NOT APPROVED**
 STATE BRIDGE ENGINEER

REFERENCE DATE
 03-08-2012

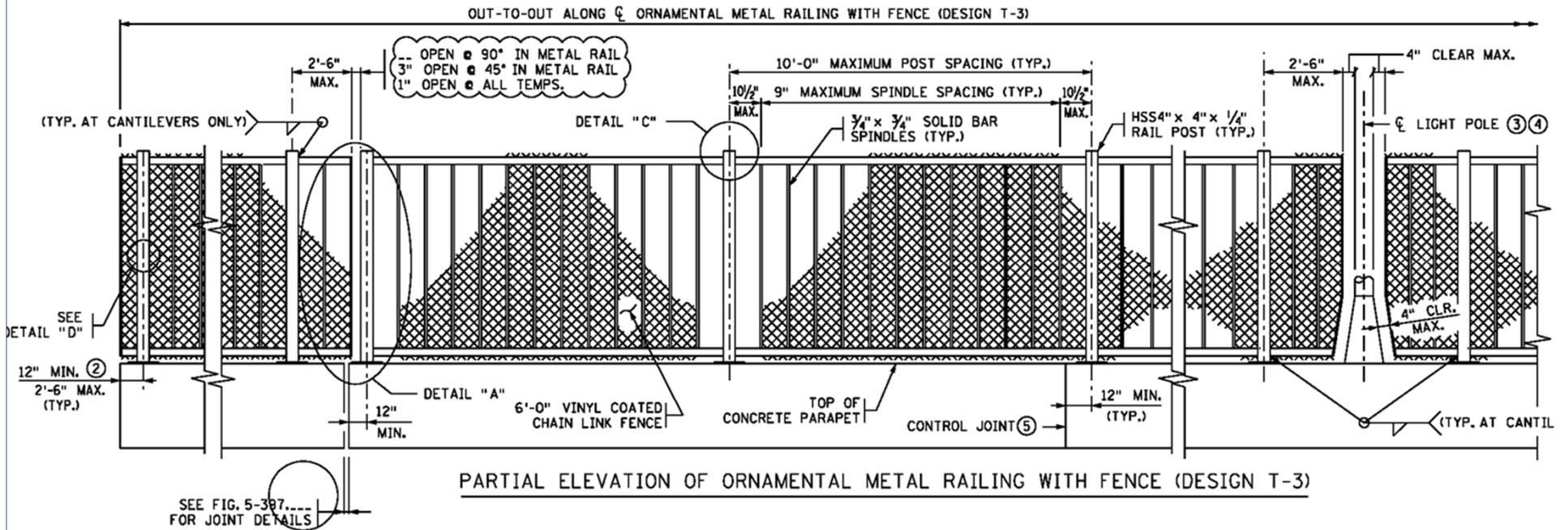
CERTIFIED BY _____ DATE _____
 LICENSED PROFESSIONAL ENGINEER
 NAME: _____ LIC. NO. _____

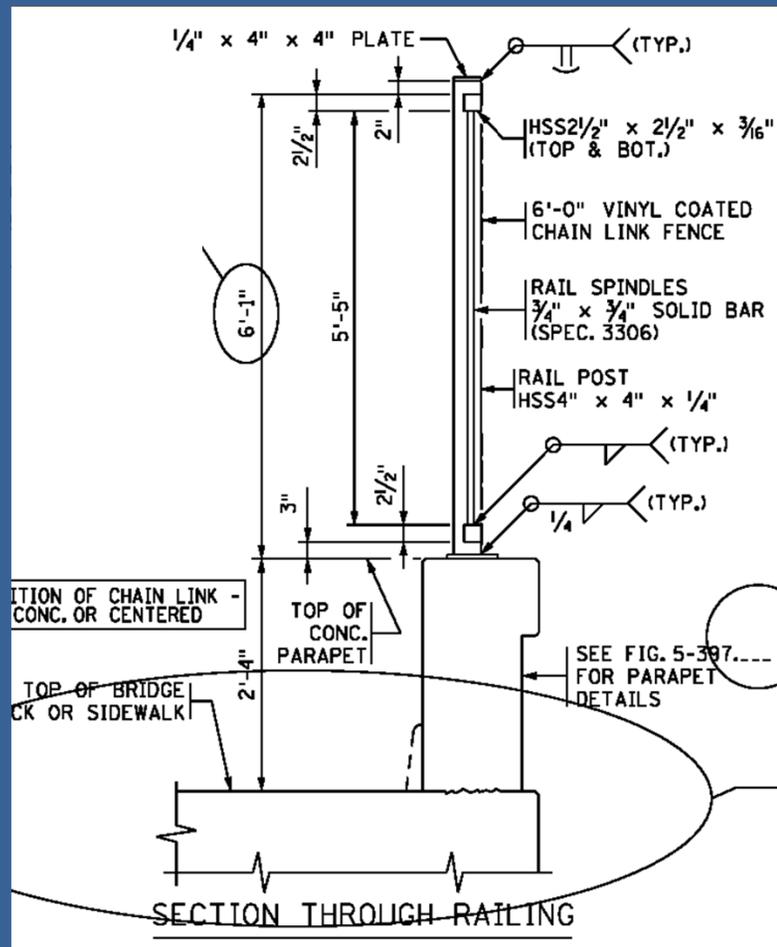
TITLE: ORNAMENTAL METAL RAILING
 PARAPET MOUNT WITH
 FENCE (DESIGN T-3)

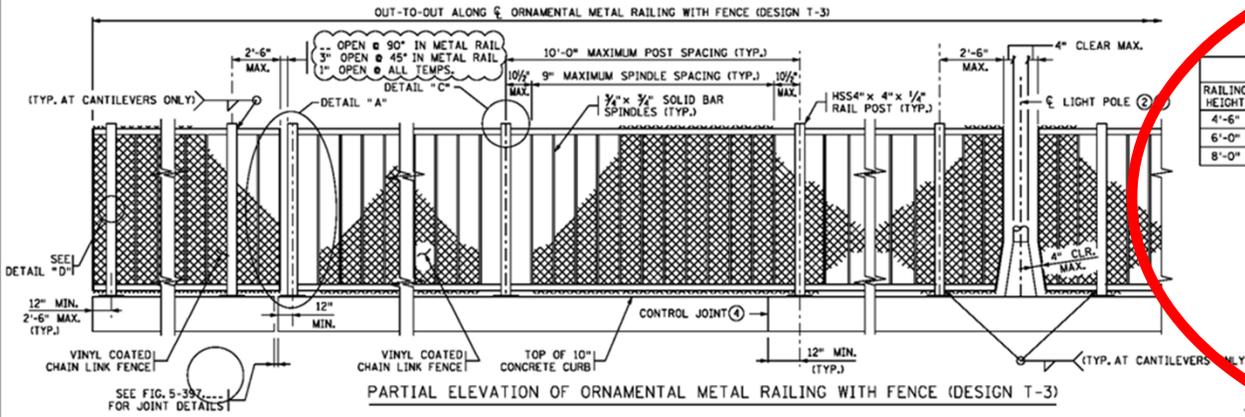
DES: _____ DIB: _____
 CHK: _____ CRK: _____
 SHEET NO. ___ OF ___ SHEETS

FIG 5-397.160

APPROVED: _____
 BRIDGE NO. _____

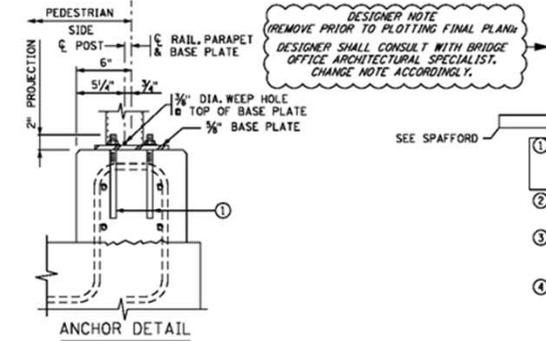
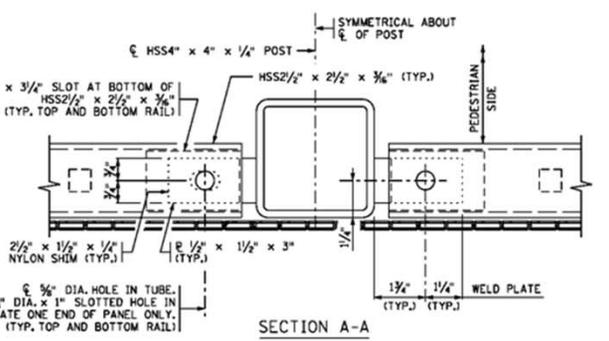
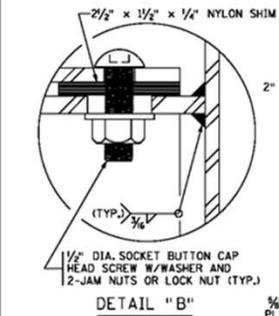
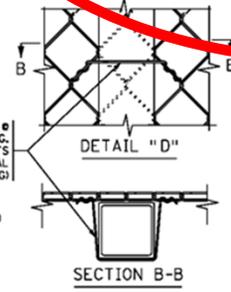
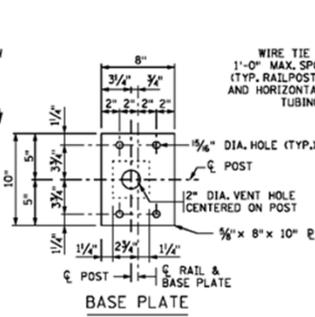
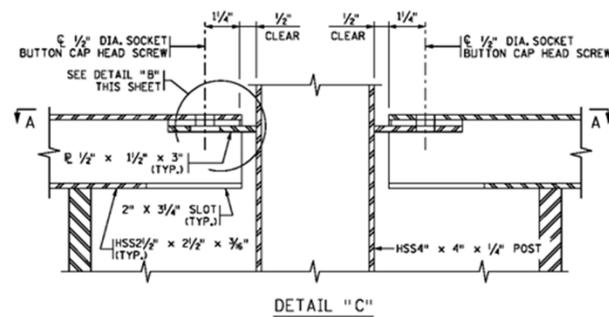
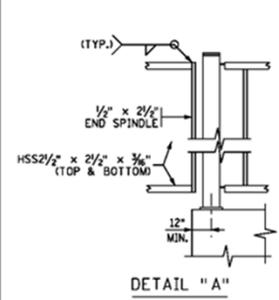
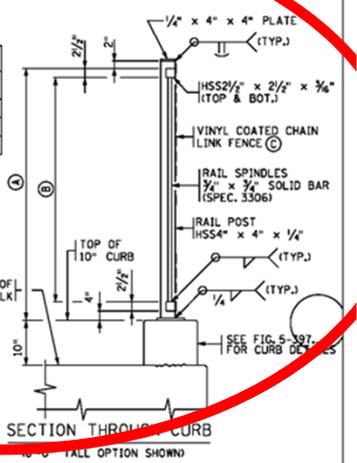






TABLE

RAILING HEIGHT	(A)	(B)	(C)	EMBEDMENT DEPTH	PULL-OUT STRENGTH
4'-6"	X	X	X	X	X
6'-0"	X	X	X	X	X
8'-0"	X	X	X	X	X



GENERAL NOTES

THE METAL RAILING SHALL BE CONTINUOUSLY GROUNDING, SEE THE SPECIAL PROVISIONS. REFER TO THE ELECTRICAL PLANS AND ELECTRICAL SPECIAL PROVISIONS FOR DETAILS REGARDING BONDING MULTIPLE ELECTRICAL GROUNDING SYSTEMS.

PAYMENT LENGTH OF ORNAMENTAL METAL RAILING WITH FENCE, DESIGN T-3 SHALL BE MEASURED AS THE OUT TO OUT LENGTH ALONG THE CENTERLINE OF THE RAILING BETWEEN THE OUTSIDE ENDS.

STRUCTURAL STEEL TUBING (HSS) IN THE RAIL SHALL BE A500, GRADE B. MATERIAL SHALL CONFORM TO SPEC. 3361. ALL OTHER STEEL SHALL CONFORM TO SPEC. 3306.

VENT HOLES SHALL BE DRILLED IN THE RAIL POST BASE AND THE RAIL TUBES AS NECESSARY TO FACILITATE GALVANIZING.

GALVANIZE BOLTS, NUTS, AND WASHERS PER SPEC. 3392.

GALVANIZE ALL OTHER STRUCTURAL STEEL PER SPEC. 3394, AFTER FABRICATION.

THE RAILING, BASE PLATES, AND PROTRUDING PORTIONS OF BOLTS, NUTS AND WASHERS SHALL BE PAINTED IN ACCORDANCE WITH THE SPECIAL PROVISIONS.

RAIL POSTS AND SPINDLES SHALL BE [NORMAL TO GRADE OR VERTICAL.]

HORIZONTAL RAILS SHALL BE CURVED WHERE APPLICABLE AND PARALLEL TO THE EDGE OF SIDEWALK PROFILE.

CHAIN LINK FENCE MUST BE USED WITH THIS RAILING. SEE SPECIAL PROVISIONS FOR REQUIREMENTS OF CHAIN LINK FABRIC AND TIES.

1 ADHESIVE ANCHORAGE WITH 3/8\"/>

2 IF LIGHT POLE IS MOUNTED ON BLISTER, RAILING MAY BE CONTINUOUS IN FRONT OF LIGHT POLE (SEE PARAPET & LIGHT POLE DETAILS).

3 THE CONTRACTOR SHALL COORDINATE LIGHT POLE DETAILS WITH THE RAILING FABRICATOR TO ENSURE PROPER CLEARANCES AND RAILING CONFIGURATION ADJACENT TO THE POLE.

4 SEE SUPERSTRUCTURE AND PARAPET SHEETS FOR CONTROL JOINT SPACING AND DETAILS.

REVISIONS
 APPROVED: **NOT APPROVED**
 STATE BRIDGE ENGINEER

REFERENCE DATE
 03-08-2012

CERTIFIED BY _____ DATE _____
 LICENSED PROFESSIONAL ENGINEER
 NAME: _____ LIC. NO. _____

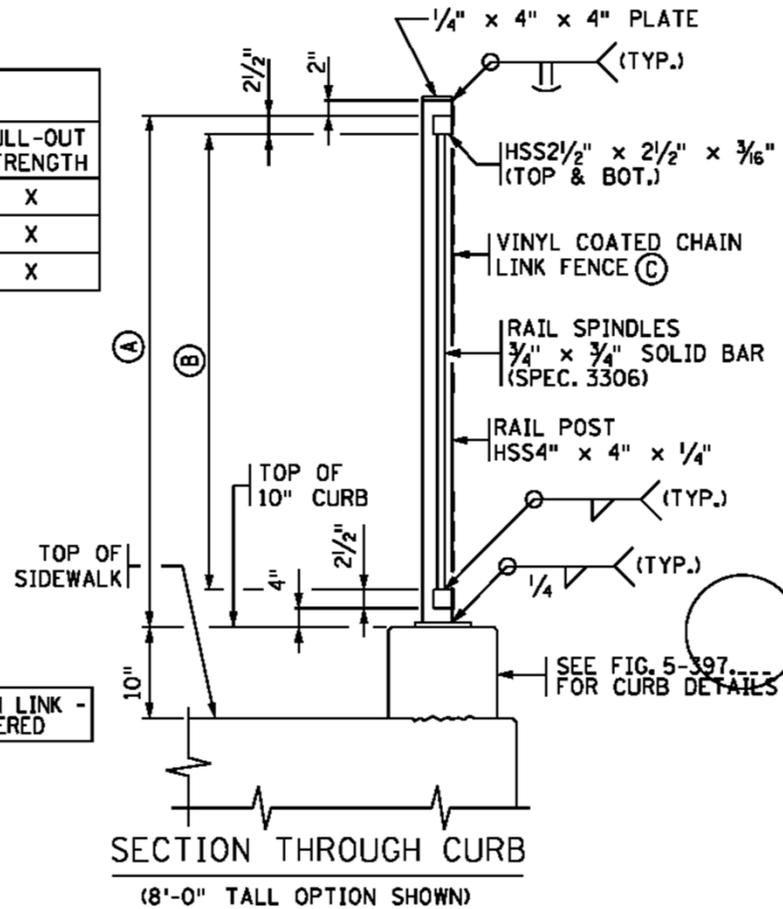
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DES: _____ DIB: _____
 CHK: _____ CRK: _____
 SHEET NO. ___ OF ___ SHEETS

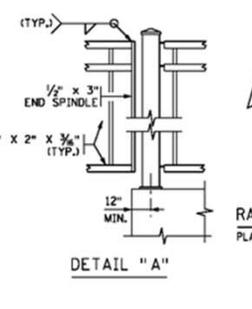
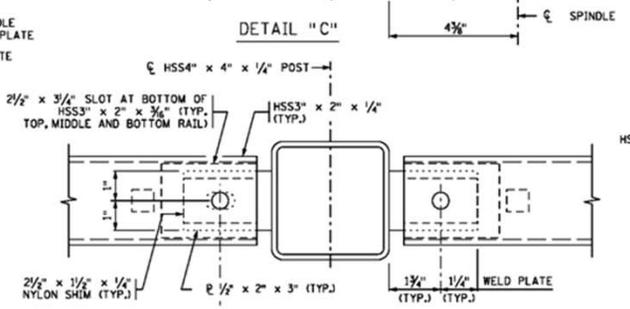
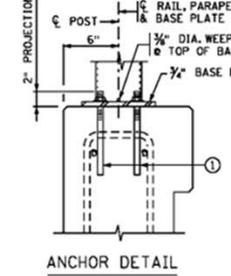
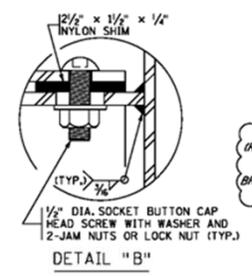
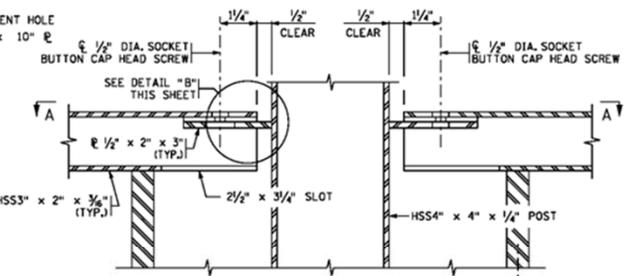
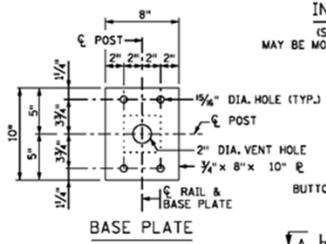
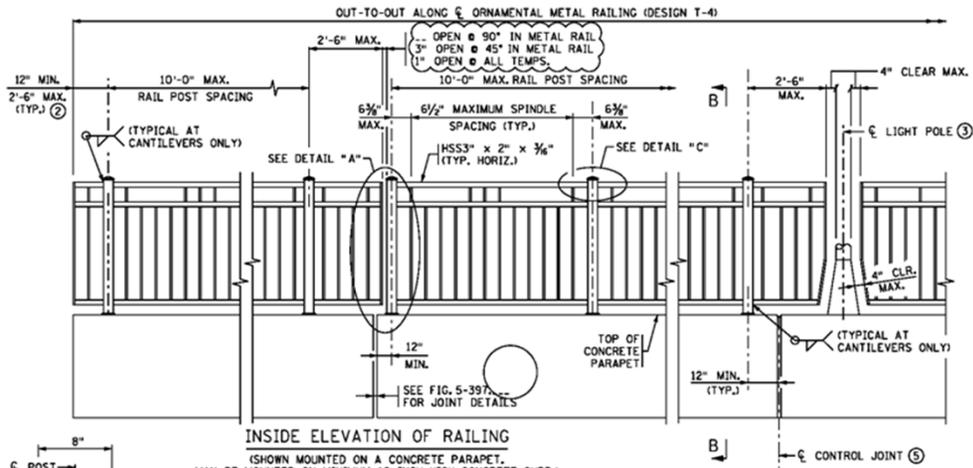
FIG. 5-397.161

APPROVED: _____
 BRIDGE NO. _____

TABLE					
RAILING HEIGHT	(A)	(B)	(C)	EMBEDMENT DEPTH	PULL-OUT STRENGTH
4'-6"	X	X	X	X	X
6'-0"	X	X	X	X	X
8'-0"	X	X <td X	X	X	



VERTICAL POSITION OF CHAIN LINK - 1" ABOVE CONC. OR CENTERED



REVISIONS
 APPROVED: **NOT APPROVED**
 STATE BRIDGE ENGINEER

SECTION A-A
 3/4" DIA. HOLE IN TUBE,
 3/4" DIA. x 1" SLOTTED HOLE IN
 PLATE ONE END OF PANEL ONLY,
 (TYP. TOP AND BOTTOM RAIL)

REFERENCE DATE
 03-08-2012

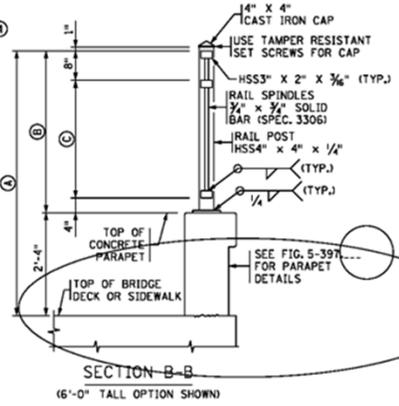
CERTIFIED BY _____ DATE _____
 LICENSED PROFESSIONAL ENGINEER L.I.C. NO. _____

ORNAMENTAL METAL RAILING
 PARAPET MOUNT (DESIGN T-4)

DESIGNED BY _____ DRAWN BY _____
 CHECKED BY _____

APPROVED: _____
 MODIFIED _____

TABLE					
RAILING HEIGHT	(A)	(B)	(C)	EMBEDMENT DEPTH	PULL-OUT STRENGTH
4'-6"	X	X	X	X	X
6'-0"	X	X	X	X	X
8'-0"	X	X	X	X	X

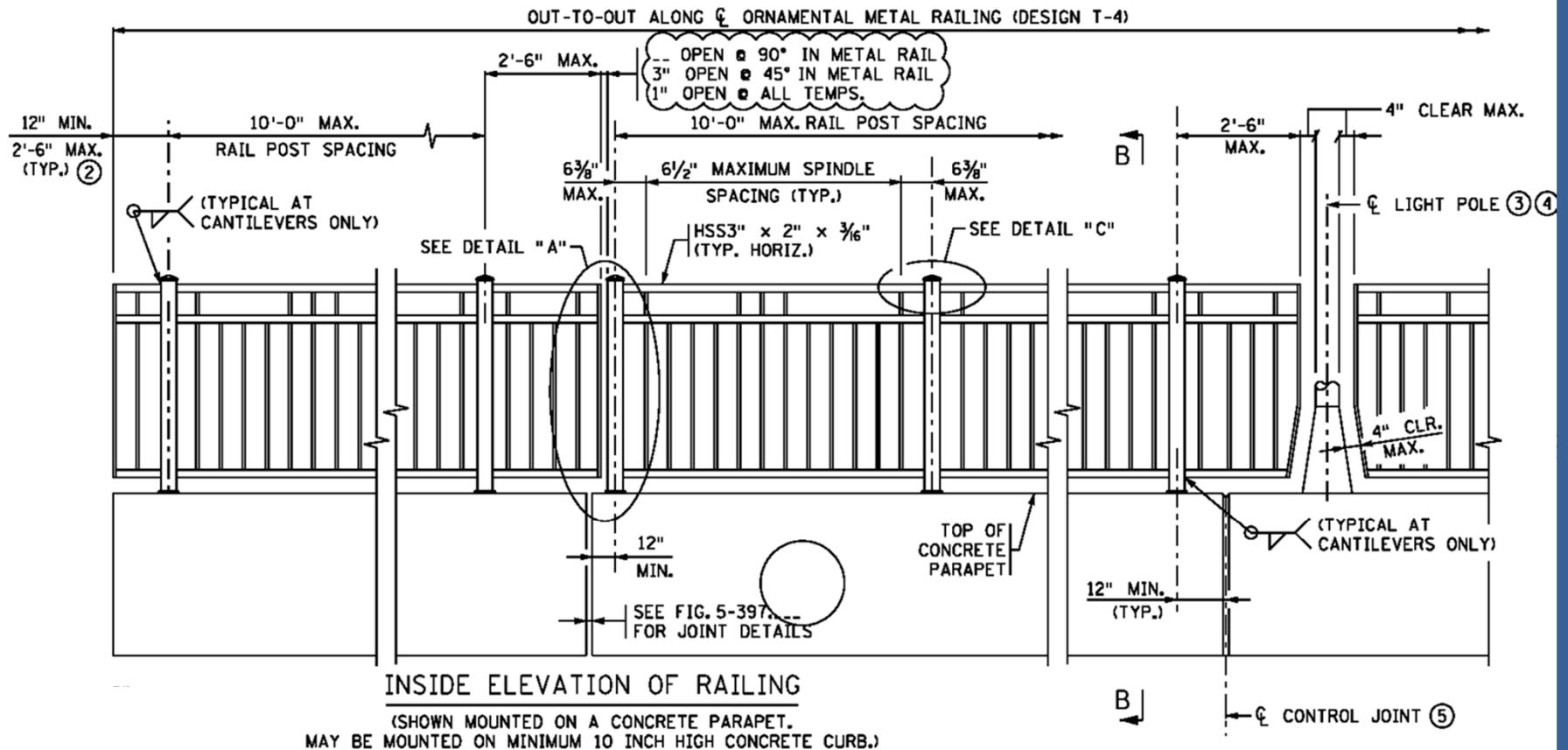


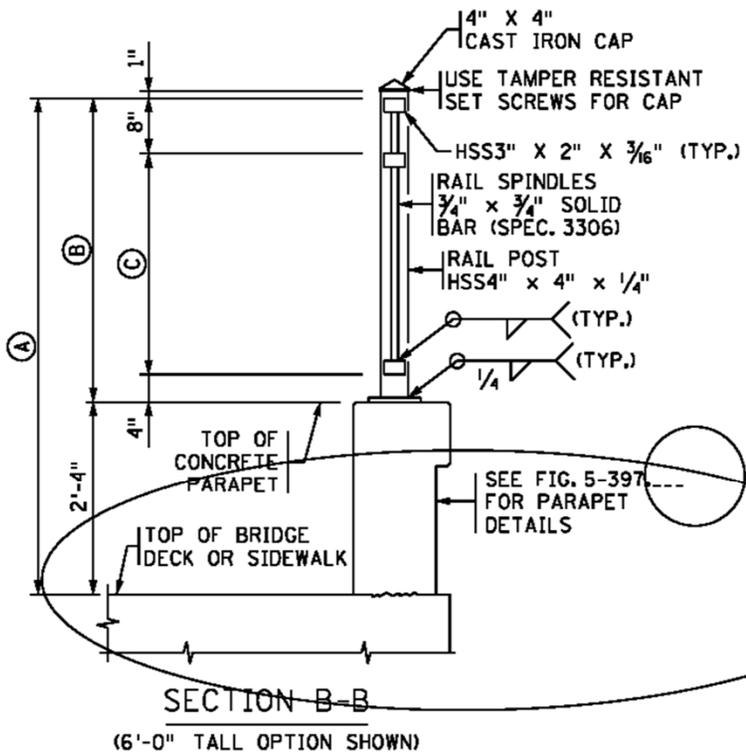
GENERAL NOTES
 THE METAL RAILING SHALL BE CONTINUOUSLY GROUNDED, SEE THE SPECIAL PROVISIONS. REFER TO THE ELECTRICAL PLANS AND ELECTRICAL SPECIAL PROVISIONS FOR DETAILS REGARDING BONDING MULTIPLE ELECTRICAL GROUNDING SYSTEMS.
 PAYMENT LENGTH OF "ORNAMENTAL METAL RAILING DESIGN T-4" (...) SHALL BE MEASURED AS THE OUT TO OUT LENGTH ALONG THE CENTERLINE OF THE RAILING BETWEEN THE OUTSIDE ENDS.
 STRUCTURAL STEEL TUBING IN THE RAIL SHALL BE A500, GRADE B. MATERIAL SHALL CONFORM TO SPEC. 3361. ALL OTHER STEEL SHALL CONFORM TO SPEC. 3306.
 VENT HOLES SHALL BE DRILLED IN THE RAIL POST BASE AND THE RAIL TUBES AS NECESSARY TO FACILITATE GALVANIZING.
 GALVANIZE BOLTS, NUTS, AND WASHERS PER SPEC. 3392.
 GALVANIZE ALL OTHER STRUCTURAL STEEL PER SPEC. 3394, AFTER FABRICATION.
 THE RAILING, BASE PLATES, AND PROTRUDING PORTIONS OF BOLTS, NUTS AND WASHERS SHALL BE PAINTED IN ACCORDANCE WITH THE SPECIAL PROVISIONS.
 RAIL POSTS AND SPINDLES SHALL BE [NORMAL TO GRADE OR VERTICAL.]
 HORIZONTAL RAILS SHALL BE CURVED WHERE APPLICABLE AND PARALLEL TO THE EDGE OF SIDEWALK PROFILE.
 SEE SUPERSTRUCTURE SHEET FOR JOINT SPACING.
 SEE SPECIAL PROVISIONS FOR REQUIREMENTS NOT INCLUDED ON THIS SHEET AND FOR BASIS OF PAYMENT.

DESIGNER NOTE
 (REMOVE PRIOR TO PLOTTING FINAL PLANS)
 DESIGNER SHALL CONSULT WITH
 BRIDGE OFFICE ARCHITECTURAL SPECIALIST,
 CHANGE NOTE ACCORDINGLY.

- ADHESIVE ANCHORAGE WITH 3/8" DIA. ANCHOR ROD PER SPEC. 3385, TYPE A WITH HEX NUT AND WASHER, MINIMUM ULTIMATE PULL-OUT STRENGTH OF ADHESIVE SHALL BE XXX KIPS WITH A X" MINIMUM EMBEDMENT, SEE SPECIAL PROVISIONS.
- PLACE & OF END POST 12" FROM END OF CONCRETE PARAPET IF GUARDRAIL CONNECTION PLATE IS PRESENT.
- IF LIGHT POLE IS MOUNTED ON BLISTER, RAILING MAY BE CONTINUOUS IN FRONT OF LIGHT POLE (SEE PARAPET & LIGHT POLE DETAILS).
- THE CONTRACTOR SHALL COORDINATE LIGHT POLE DETAILS WITH THE RAILING FABRICATOR TO ENSURE PROPER CLEARANCES AND RAILING CONFIGURATION ADJACENT TO THE POLE.
- SEE SUPERSTRUCTURE AND PARAPET SHEETS FOR CONTROL JOINT SPACING AND DETAILS.

FIG. 5-397.162





RAILING HEIGHT	(A)	(B)	(C)	EMBEDMENT DEPTH	PULL-OUT STRENGTH
4'-6"	X	X	X	X	X
6'-0"	X	X	X	X	X
8'-0"	X	X	X	X	X

TOP OF BRIDGE DECK OR SIDEWALK

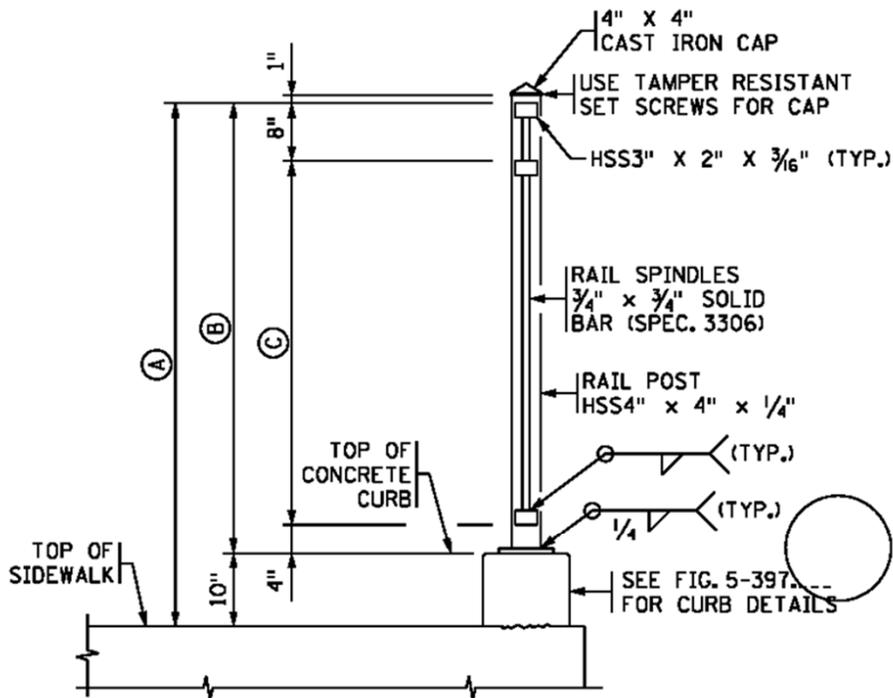
DO WE WANT TO SHOW THIS PARAPET EXTENDING DOWN TO THE DECK WITH A SIDEWALK STOPPING AT THE FRONT FACE OF THE PARAPET

GENERAL NOTES

THE METAL RAILING SHALL BE CONTINUOUSLY GROUNDED, SEE THE SPECIAL PROVISIONS. REFER TO THE ELECTRICAL PLANS AND ELECTRICAL SPECIAL PROVISIONS FOR DETAILS REGARDING BONDING MULTIPLE ELECTRICAL GROUNDING SYSTEMS.

PAYMENT LENGTH OF "ORNAMENTAL METAL RAILING DESIGN T-4" SHALL BE MEASURED AS THE OUT TO OUT LENGTH ALONG THE CENTERLINE OF THE RAILING BETWEEN THE OUTSIDE ENDS.

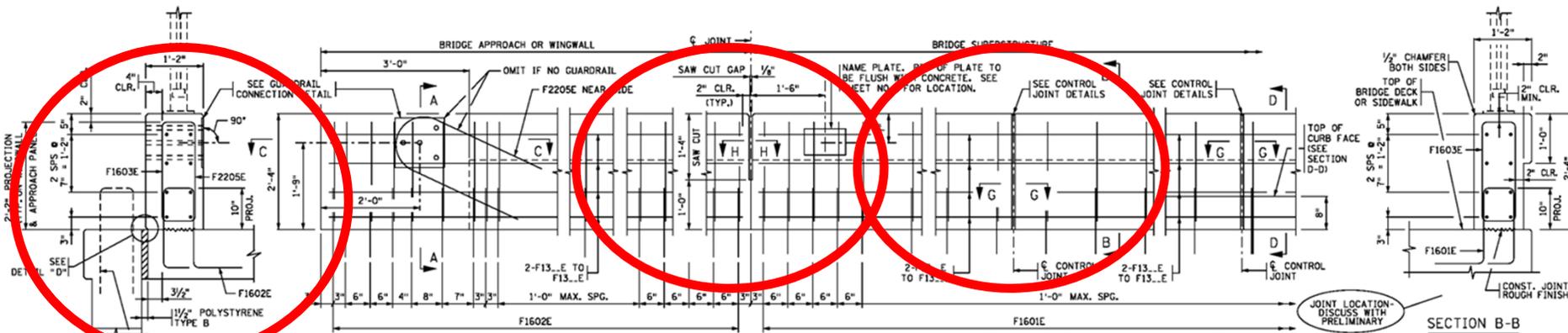




SECTION B-B
(6'-0" TALL OPTION SHOWN)

TABLE					
RAILING HEIGHT	(A)	(B)	(C)	EMBEDMENT DEPTH	PULL-OUT STRENGTH
4'-6"	X	X	X	X	X
6'-0"	X	X	X	X	X
8'-0"	X	X	X	X	X





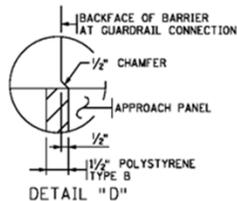
SECTION A-A

JOINT AT ABUTMENT
(INTEGRAL OR SEMI-INTEGRAL ABUTMENT) SEE DETAIL "A" FOR PARAPET ABUTMENT
INSIDE ELEVATION OF PARAPET
CONCRETE WEARING COURSE NOT SHOWN

CONTROL JOINT

CONTROL JOINT
(WITH 8" CURB FACE)

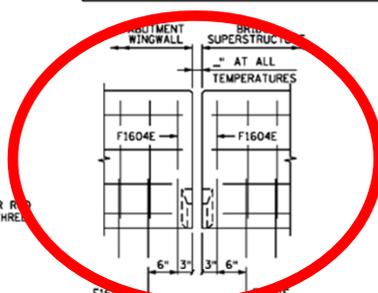
SECTION B-B



WHERE COPING ON BACK OF BARRIER AT GUARDRAIL CONNECTION EXTENDS TO BOTTOM OF BARRIER

PARAPET MEETS TEST LEVEL 2 REQUIREMENTS OF NCHRP REPORT 350

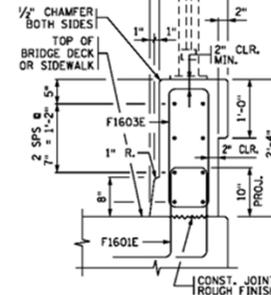
TEXT IN ITALICS ARE DESIGNER NOTES. REMOVE PRIOR TO PLOTTING FINAL PLAN. X-OUT ALL DETAILS NOT BEING USED.



DETAIL "A"
(USE IF PARAPET ABUTMENT) (EXPANSION DEVICE NOT SHOWN)

BILL OF REINFORCEMENT FOR PARAPET			
BAR NO.	LENGTH	SHAPE	LOCATION
F1601E	5'-0"		PARAPET VERTICAL
F1602E	5'-2"		PARAPET VERTICAL
F1603E	6'-3"		PARAPET VERTICAL
F1604E	4'-7"		PARAPET VERTICAL
F2205E	6'-7"		PARAPET VERTICAL
F13...E			PARAPET LONGIT.
F13...E			PARAPET LONGIT.
F13...E			PARAPET LONGIT.

* F1604E WHEN PARAPET ABUTMENT IS USED. (SEE DETAIL "A")



SECTION D-D
(WITH 8" CURB FACE)

GENERAL NOTES

PAYMENT LENGTH OF "TYPE P-1 PARAPET CONCRETE (3Y46 OR 3Y46A)" SHALL BE MEASURED BETWEEN THE OUTSIDE FACES OF THE CONCRETE PARAPET.

CONCRETE PARAPET = 375 LBS./FT. (0.093 CU. YDS./FT.)

CONCRETE PARAPET W/CURB FACE = 387 LBS./FT. (0.096 CU. YDS./FT.)

FINISH ALL EDGES OF PARAPET WITH 1/2" CHAMFER, EXCEPT WHERE OTHERWISE NOTED.

MAXIMUM SPACING OF CONCRETE CONTROL JOINTS ON SUPERSTRUCTURE, APPROACH AND WINGWALL SHALL BE 10 FT.

SEE SUPERSTRUCTURE SHEET FOR JOINT SPACING.

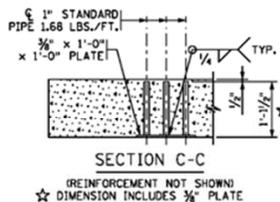
GUARDRAIL CONNECTION TO BE STRUCTURAL STEEL, SPEC. 3306.

GUARDRAIL CONNECTION AND NAME PLATE TO BE CONSIDERED INCIDENTAL TO "TYPE P-1 PARAPET CONCRETE (3Y46 OR 3Y46A)".

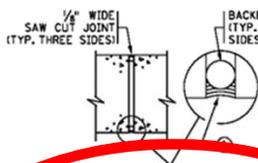
SEE STANDARD FIGURE 5-397... FOR LIGHT BLISTER DETAILS.

PARAPET QUANTITIES ARE LISTED IN SUMMARY OF QUANTITIES FOR SUPERSTRUCTURE.

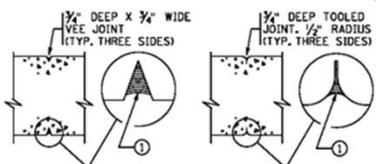
SEE SPECIAL PROVISIONS FOR JOINT SEALING REQUIREMENTS.



SECTION C-C
(REINFORCEMENT NOT SHOWN) DIMENSION INCLUDES 3/8" PLATE



SECTION H-H



SECTION G-G
OPTION 1

SECTION G-G
OPTION 2

CONTROL JOINT DETAILS

WHEN USING SLIT JOINTS IN THE CONCRETE, CUT JOINT 3 INCHES DEEP USING MARGIN TROWEL OR SIMILAR MEANS IMMEDIATELY AFTER CONCRETE PLACEMENT (TYP. THREE SIDES)

REFERENCE DATE
05-02-2012

CERTIFIED BY _____ DATE _____
LICENSED PROFESSIONAL ENGINEER L.T.C. NO. _____

CONCRETE PARAPET (TYPE P-1)
WITH INTEGRAL END POST
(WITHOUT CONCRETE WEARING COURSE)

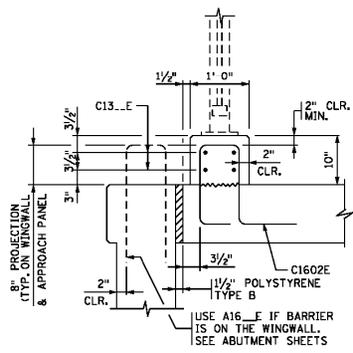
DESIGNED BY _____ DRAWN BY _____ APPROVED BY _____
CHECKED BY _____

FIG. 5-397.166

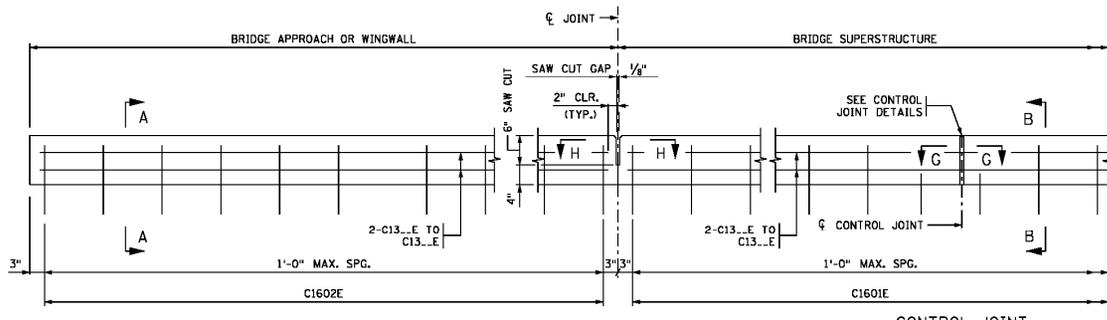
BRIDGE NO. _____

SHEET NO. ___ OF ___ SHEETS

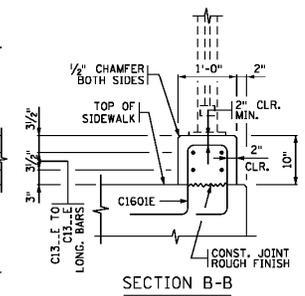
REVISED: _____
APPROVED: NOT APPROVED
STATE BRIDGE ENGINEER



SECTION A-A



JOINT AT ABUTMENT
(INTEGRAL OR SEMI-INTEGRAL ABUTMENT) SEE DETAIL "A" FOR PARAPET ABUTMENT
INSIDE ELEVATION OF 10" CURB



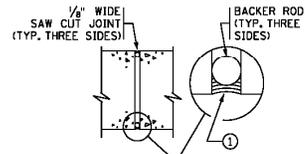
SECTION B-B

*TEXT IN ITALICS ARE DESIGNER NOTES.
REMOVE PRIOR TO PLOTTING FINAL PLAN.
X-OUT ALL DETAILS NOT BEING USED.*

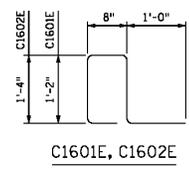
CURB DOES NOT MEET CRASH TEST
REQUIREMENTS OF NCHRP REPORT 350

REINFORCING NEEDS TO BE CHECKED

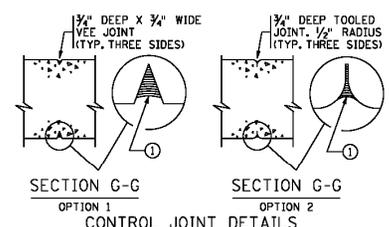
BILL OF REINFORCEMENT FOR CURB				
BAR	NO.	LENGTH	SHAPE	LOCATION
C1601E	—	4'-6"	□	CURB BASE VERTICAL
C1602E	—	4'-8"	□	CURB BASE VERTICAL
C13...E	—	—	□	CURB BASE LONGIT.
C13...E	—	—	□	CURB BASE LONGIT.
C13...E	—	—	□	CURB BASE LONGIT.



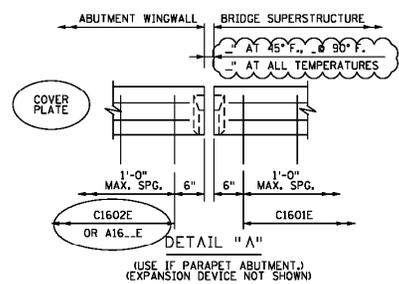
SECTION H-H



C1601E, C1602E



SECTION G-G
OPTION 1
OPTION 2
CONTROL JOINT DETAILS



DETAIL "A"
(USE IF PARAPET ABUTMENT)
(EXPANSION DEVICE NOT SHOWN)

GENERAL NOTES

- PAYMENT LENGTH OF "CONCRETE CURB (3Y46 OR 3Y46A)" SHALL BE MEASURED BETWEEN THE OUTSIDE FACES OF THE CONCRETE CURB.
- CONCRETE CURB = 125 LBS./FT. (0.031 CU. YDS./FT.)
- FINISH ALL EDGES OF CURB WITH 1/2" CHAMFER, EXCEPT WHERE OTHERWISE NOTED.
- MAXIMUM SPACING OF CONCRETE CONTROL JOINTS ON SUPERSTRUCTURE, APPROACH AND WINGWALL SHALL BE 10 FT.
- SEE SUPERSTRUCTURE SHEET FOR JOINT SPACING.
- CONCRETE CURB QUANTITIES ARE LISTED IN SUMMARY OF QUANTITIES FOR SUPERSTRUCTURE.
- SEE SPECIAL PROVISIONS FOR JOINT SEALING REQUIREMENTS.

REVISED: —
APPROVED: **NOT APPROVED**
STATE BRIDGE ENGINEER

WHEN USING SLIP FORM METHOD TO PLACE THE CONCRETE, CUT JOINT 3 INCHES DEEP USING MARGIN TROWEL OR SIMILAR MEANS IMMEDIATELY AFTER CONCRETE PLACEMENT (TYP. THREE SIDES)

REFERENCE DATE
02-22-2012

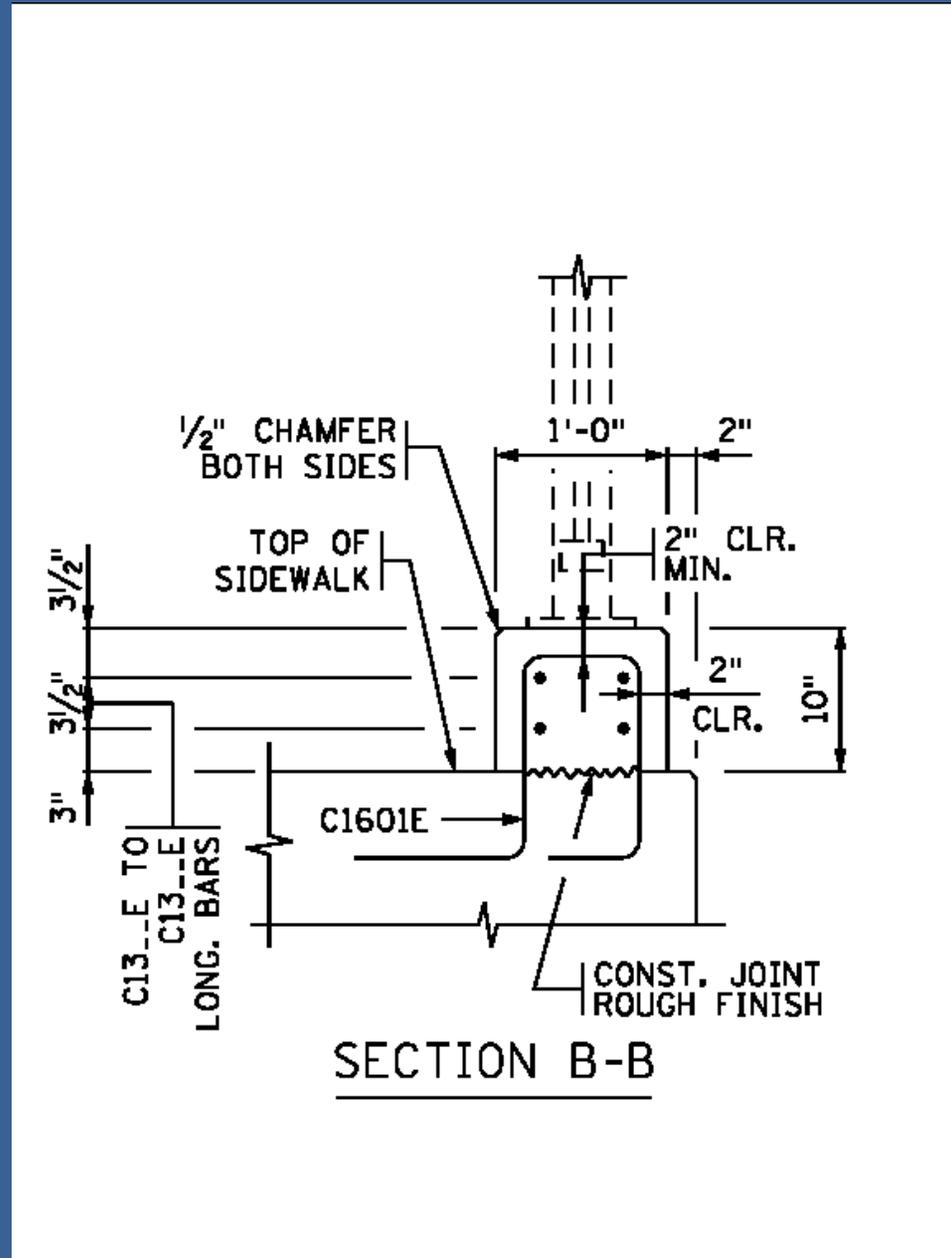
CERTIFIED BY _____ DATE _____
LICENSED PROFESSIONAL ENGINEER
NAME: _____ LIC. NO. _____

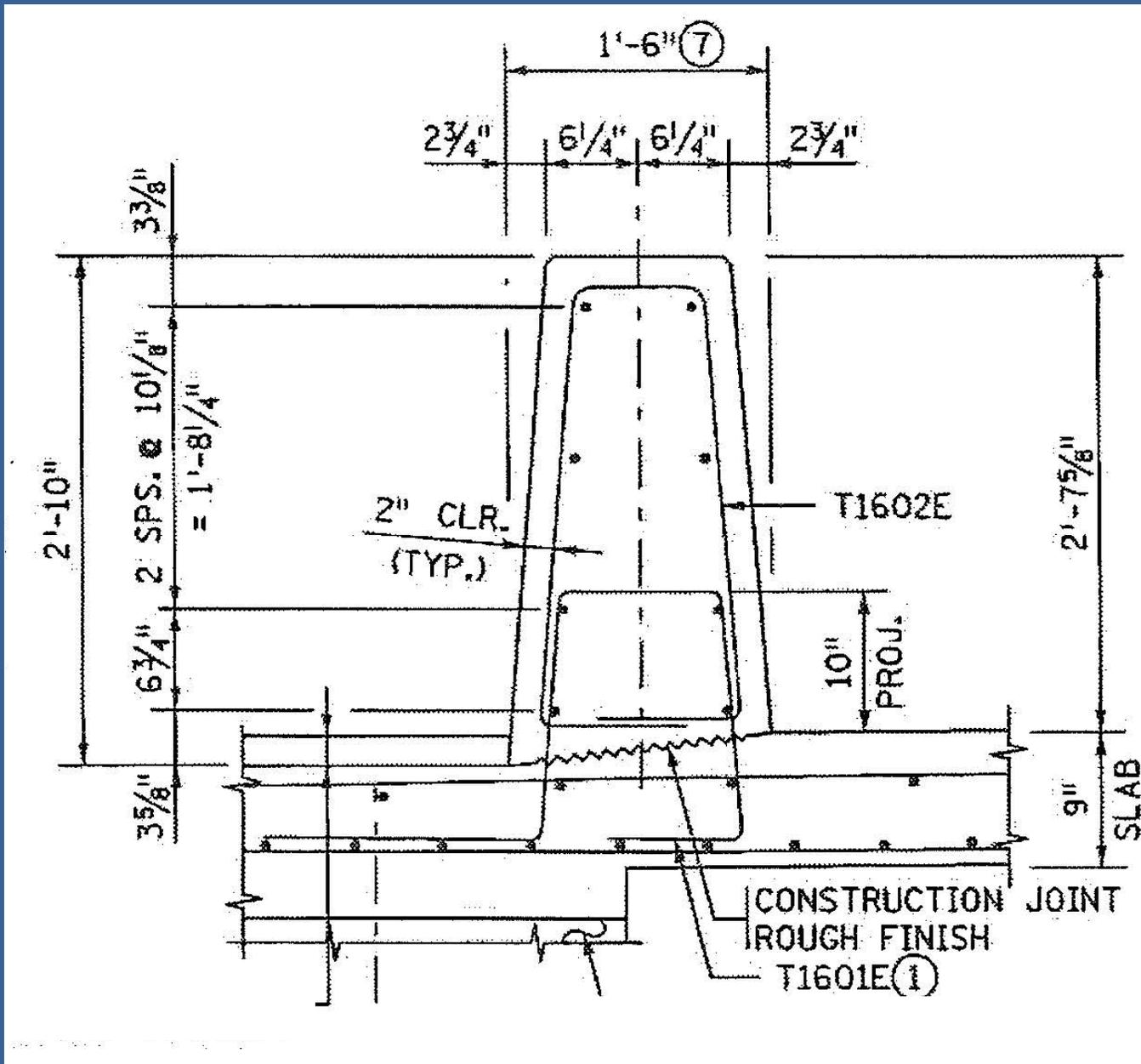
TITLE
CONCRETE CURB

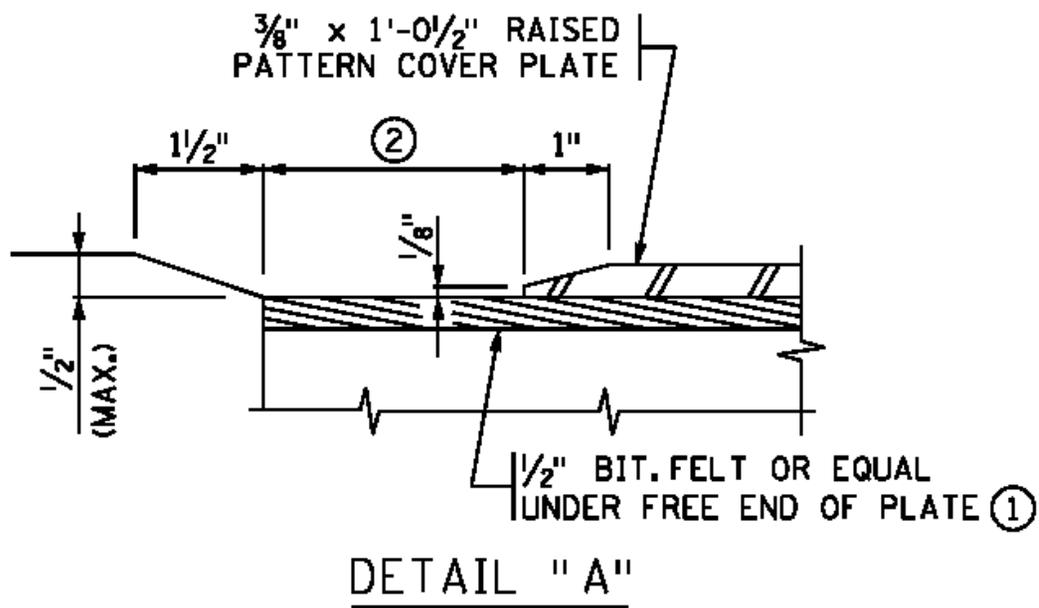
DES: _____ DR: _____
CHK: _____ CHK: _____

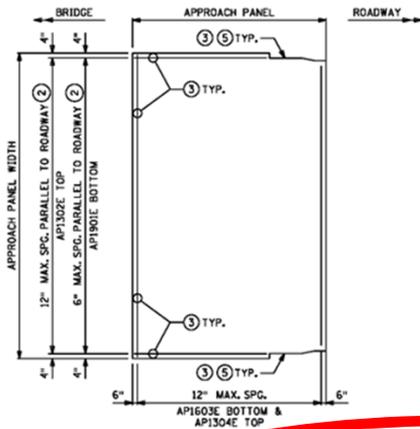
APPROVED: _____
BRIDGE NO. _____
SHEET NO. ___ OF ___ SHEETS

FIG. 5-397.167

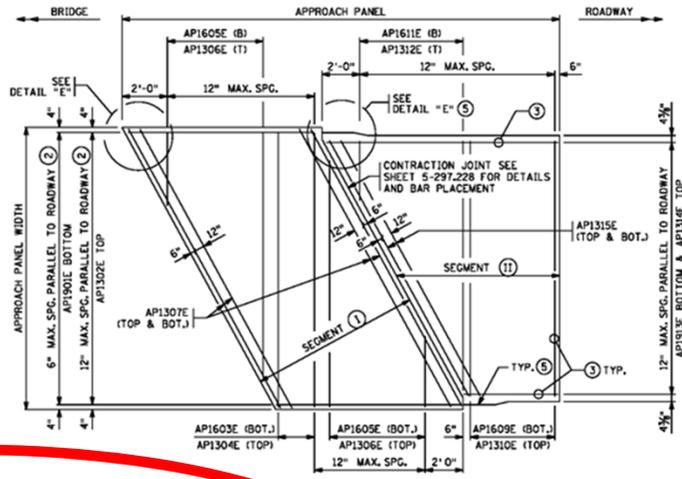




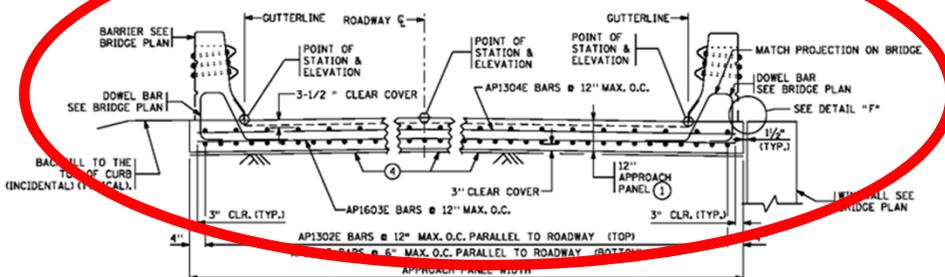




APPROACH PANEL REINFORCEMENT
SQUARE TO 10° SKEWS

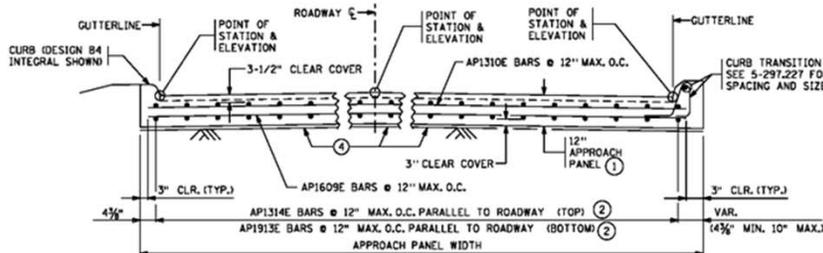


APPROACH PANEL REINFORCEMENT
OVER 10° SKEWS



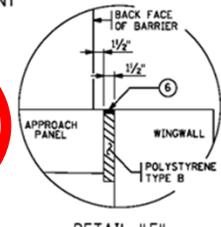
TRANSVERSE SECTION B-B

FROM STANDARD PLAN 5-297.224
CONCRETE BARRIERS ARE SHOWN, BUT MAY NOT BE PRESENT.
REFER TO BRIDGE PLANS FOR END OF BARRIER LOCATIONS.

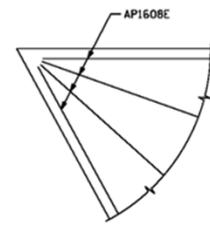


TRANSVERSE SECTION C-C

FROM STANDARD PLAN 5-297.224

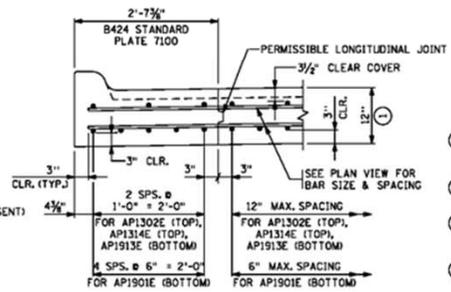


DETAIL "F"



DETAIL "E"

FAN 4-API1608E BARS AS SHOWN
IN ACUTE CORNERS FOR SKEWS OVER 30°.



CURB DETAIL
IB424 CURB AND GUTTER SHOWN

ESTIMATED REINFORCEMENT QUANTITY FOR BRIDGE APPROACH PANELS		
TYPE	LOCATION	ESTIMATED WEIGHT
PANEL (SQ. TO 10°)	BRIDGE TO END OF APPROACH PANEL	48.5 LB./SQ. YD.
PANEL SEGMENT (I)	BRIDGE TO CONTRACTION JOINT	48.5 LB./SQ. YD.
PANEL SEGMENT (II)	CONTRACTION JOINT TO END OF APPROACH PANEL	35.0 LBS./SQ. YD.
CURB	7.0 FT. CURB TRANSITION	19.0 LBS./EA.CH
SILL	SILL (IF REQUIRED)	14.0 LBS./LIN FT.

NOTES:

TRANSVERSE BARS IN BOTH PANEL SEGMENTS ARE PERPENDICULAR TO ROADWAY CENTERLINE EXCEPT API307E ARE PARALLEL TO SKEW IN SEGMENT (I) AND API131E ARE PARALLEL TO SKEW IN SEGMENT (II).
LONGITUDINAL BARS IN BOTH PANEL SEGMENTS ARE PARALLEL TO ROADWAY CENTERLINE.

BILL OF REINFORCEMENT FOR BRIDGE APPROACH PANELS

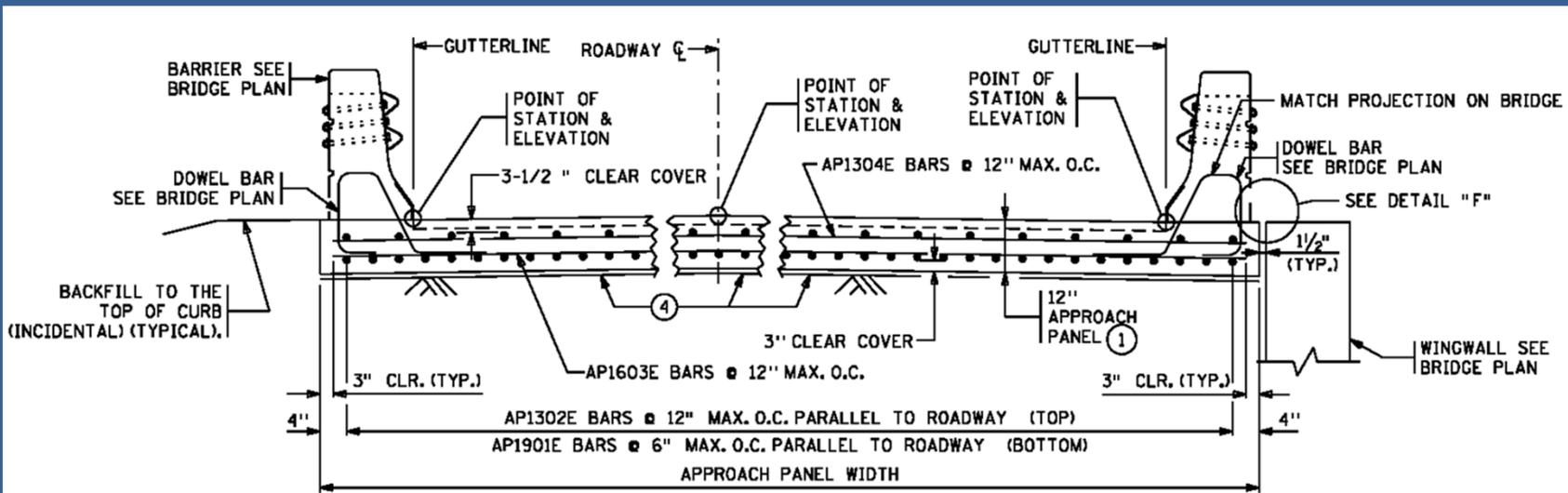
CONTRACTOR IS REQUIRED TO COMPLETE THE BILL OF REINFORCEMENT TABLE AND PREPARE SHOP DRAWINGS AND SUBMIT THEM TO THE PROJECT ENGINEER AT LEAST 3 WEEKS BEFORE REBAR FABRICATION.

BAR	NO.	LENGTH	SHAPE	LOCATION
API1901E	---	---	---	BOTTOM LONGITUDINAL
API1902E	---	---	---	TOP LONGITUDINAL
API1603E	---	---	---	BOTTOM TRANSVERSE
API1304E	---	---	---	TOP TRANSVERSE
API1605E	SER. OF	---	---	BOTTOM TRANSVERSE
API1306E	SER. OF	---	---	TOP TRANSVERSE
API1307E	---	---	---	TOP & BOTTOM EDGE
API1608E	---	---	---	TOP CORNER - FAN
API1609E	---	---	---	BOTTOM TRANSVERSE
API1310E	---	---	---	TOP TRANSVERSE
API1611E	SER. OF	---	---	BOTTOM TRANSVERSE
API1312E	SER. OF	---	---	TOP TRANSVERSE
API1913E	SER. OF	---	---	BOTTOM LONGITUDINAL
API1314E	SER. OF	---	---	TOP LONGITUDINAL
API1315E	---	---	---	TOP & BOTTOM EDGE
API1916E	---	---	---	CURB JOINT

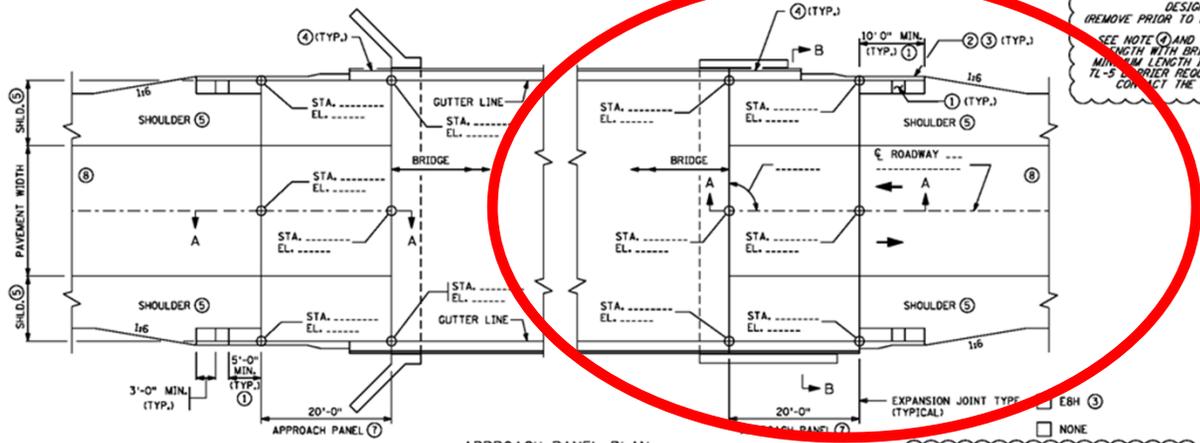
GENERAL NOTES:

- AS PER MDOT SPEC. 3301, USE EPOXY COATED GRADE 60 REINFORCEMENT BARS IN APPROACH PANEL, CONCRETE SILL AND CURB TRANSITION.
- THE FIRST TWO DIGITS OF EACH BAR MARK INDICATE THE BAR NUMBER, WHICH APPROXIMATES THE NOMINAL DIAMETER OF THE BAR IN MILLIMETERS (mm). BARS MARKED WITH THE SUFFIX "E" SHALL BE EPOXY COATED IN ACCORDANCE WITH MDOT SPEC. 3301.
- FOR VARIABLE ROADWAY WIDTHS, VARY THE LAP LENGTH OF THE REINFORCEMENT. MINIMUM REINFORCEMENT LAP LENGTHS ARE AS FOLLOWS: NO. 13 BAR = 1'-8", NO. 16 BAR = 2'-1", NO. 19 BAR = 2'-6".
- ALL LAP SPLICES SHALL BE STAGGERED SUCH THAT NO MORE THAN 50% OF REBAR IS SPLICED AT THE SAME LOCATION.
- APPROACH SLAB THICKNESS IS 12" (12" MONOLITHIC OR 10" SLAB + 2" WEARING COURSE). CHECK BRIDGE PLANS FOR CONCRETE WEARING COURSE, WHICH IS INCLUDED IN BRIDGE PLAN QUANTITIES.
- SPACING ONLY FOR B4 INTEGRAL CURB. SEE CURB DETAIL FOR SPACING FOR USING B424 CURB AND GUTTER.
- EXTEND AND/OR CUT REINFORCING AS NECESSARY TO ACCOMMODATE CURB TRANSITION IF PRESENT. REINFORCEMENT MUST EXTEND INTO CURB AS SHOWN IN TRANSVERSE SECTIONS B-B AND C-C.
- IF THE APPROACH PANEL IS TIED TO THE BRIDGE ABUTMENT WITH REINFORCEMENT BARS, PLACE 12 MIL POLYETHYLENE SHEETING (OR 2 LAYERS OF 6 MIL) UNDER THE LIMITS OF THE APPROACH PANEL TO ALLOW THE PANEL TO MOVE LONGITUDINALLY ON THE GRADE. SHEETING IS INCLUDED IN THE APPROACH PANEL PAY ITEM.
- SEE STANDARD PLAN 5-297.224 FOR CURB TRANSITION LOCATION.
- SEAL WITH SELF-LEVELING SILICONE PER MDOT 3722.

STANDARD PLAN SHEET NO. 5-297.225	TITLE BRIDGE APPROACH PANEL REINFORCEMENT DETAILS (CONCRETE BARRIER ON APPROACH PANEL)
STANDARD APPROVED DECEMBER 20, 2011	
STATE PROJ. NO. _____ (TH _____) SHEET NO. ____ OF ____ SHEETS	



TRANSVERSE SECTION B-B
 FROM STANDARD PLAN 5-297.224
 CONCRETE BARRIERS ARE SHOWN, BUT MAY NOT BE PRESENT.
 REFER TO BRIDGE PLANS FOR END OF BARRIER LOCATIONS.



APPROACH PANEL PLAN
SQUARE TO 10° SKEW, BARRIER ON APPROACH PANEL

DESIGNER NOTE
REMOVE PRIOR TO PLOTTING FINAL PLAN:
SEE NOTE ④ AND COORDINATE BARRIER LENGTH WITH BRIDGE DESIGNER. 7'-0" MINIMUM LENGTH IS FOR TL-4 BARRIER. TL-5 BARRIER REQUIRES SPECIAL DESIGN. CONTACT THE BRIDGE DESIGNER.

NOTES:

- ① SEE STANDARD PLAN 5-297.231 FOR DRAINAGE DETAILS AND ADDITIONAL REQUIREMENTS.
- ② B4 CURB DESIGN SHOWN. SEE STANDARD PLATES FOR CURB DETAILS.
- ③ EBH QUANTITY SHALL BE PAID FOR SEPARATELY, MEASURED FROM BACK OF CURB TO BACK OF CURB.
- ④ TO ACCOMMODATE GUARDRAIL CONNECTION AND CRASH TEST REQUIREMENTS THE CONCRETE BARRIER MUST EXTEND 7'-0" MINIMUM ONTO THE APPROACH PANEL. FOR PARALLEL WINGWALLS THE BARRIER MUST EXTEND 7'-0" MINIMUM ON TO THE APPROACH PANEL OR TO THE END OF THE WINGWALL WHICH EVER IS LONGER. REFER TO BRIDGE PLAN FOR BARRIER REINFORCEMENT AND PAYMENT.
- ⑤ SEE GRADING PLANS FOR PAVEMENT AND SHOULDER WIDTHS AND CONFIGURATION.
- ⑥ WHEN SKEW IS OVER 45°, THE JOINT SHALL BE PERPENDICULAR TO GUTTER FOR 1' (TYP.).
- ⑦ PANEL SIZE AND REQUIREMENTS FOR TRANSVERSE AND LONGITUDINAL JOINTS ARE SHOWN ON STANDARD PLANS 5-297.228 AND 5-297.229.
- ⑧ FOR CONCRETE PAVEMENT, SEE STANDARD PLAN 5-297.227 FOR LUG REQUIREMENTS.

GENERAL NOTES:

SECTION A-A IS SHOWN ON STANDARD PLAN 5-297.227. SECTIONS B-B AND C-C ARE SHOWN ON STANDARD PLAN 5-297.225 AND SHOW THE STATION AND ELEVATION AT END LOCATIONS ON THE APPROACH PANEL.

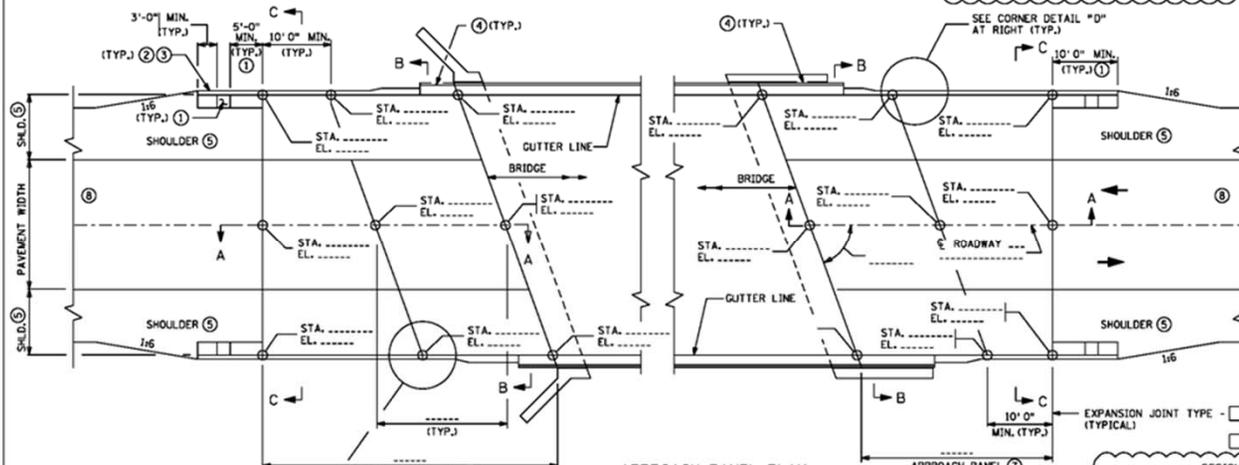
A CONCRETE SILL IS REQUIRED BENEATH EXPANSION JOINT TYPE EBH. EXTEND THE EXPANSION JOINT AND THE SILL ALONG THE FULL WIDTH OF THE TRAFFIC LANES, SHOULDERS AND CURB. ENSURE THAT SILL DOES NOT INTERFERE WITH GUARDRAIL POST PLACEMENT. CONCRETE SILL AND CURBING, IF REQUIRED, ARE INCLUDED IN THE APPROACH PANEL PAY ITEM.

AT THE END OF THE CONCRETE BARRIER, TRANSITION FACE OF 4-INCH CURB INTO PROFILE OF CONCRETE BARRIER. SEE CURB TRANSITION DETAILS ON STANDARD PLAN 5-297.227 IF THERE IS NO ROADWAY CURB AT THE END OF THE APPROACH PANEL, APPROACH PANEL CURB HEIGHT FROM 4 INCH TO 0 INCH IN THE LAST 3'-4" SECTION (1:10 OR FLATTER SLOPE).

GENERAL DRAINAGE DETAILS ARE SHOWN ON BRIDGE APPROACH PANEL DRAINAGE DETAILS, STANDARD PLAN 5-297.231. ADDITIONAL CATCH BASIN DETAILS ARE SHOWN ON DRAINAGE PLAN SHEETS.

CONCRETE MIX SHALL BE 3A42 FOR APPROACH PANEL AND SILL. REFER TO MNDOT SPEC.2406 FOR ADDITIONAL INFORMATION.

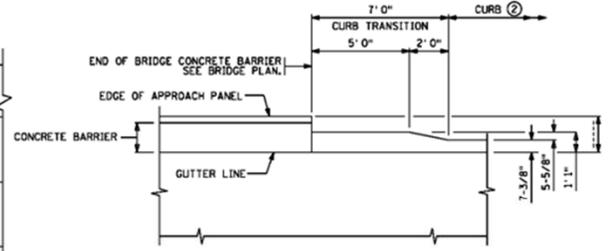
DESIGNER NOTE
REMOVE PRIOR TO PLOTTING FINAL PLAN:
PLACE AN "X" IN THE APPROPRIATE BOX TO INDICATE THE EXPANSION JOINT TYPE.



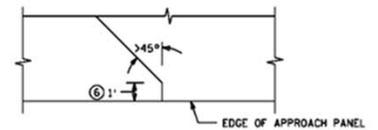
APPROACH PANEL PLAN
OVER 10° SKEW, BARRIER ON APPROACH PANEL

DESIGNER NOTE
REMOVE PRIOR TO PLOTTING FINAL PLAN:
APPROACH PANEL PLAN VIEW SHOULD BE MODIFIED/MIRRORED TO SHOW ACTUAL SKEW ORIENTATION, BARRIER LENGTH, WINGWALL AND CURB TRANSITION CONFIGURATION AND TRAFFIC DIRECTION ARROWS.

DESIGNER NOTE
REMOVE PRIOR TO PLOTTING FINAL PLAN:
PLACE AN "X" IN THE APPROPRIATE BOX TO INDICATE THE EXPANSION JOINT TYPE.



CORNER DETAIL "D"
(PLAN VIEW)

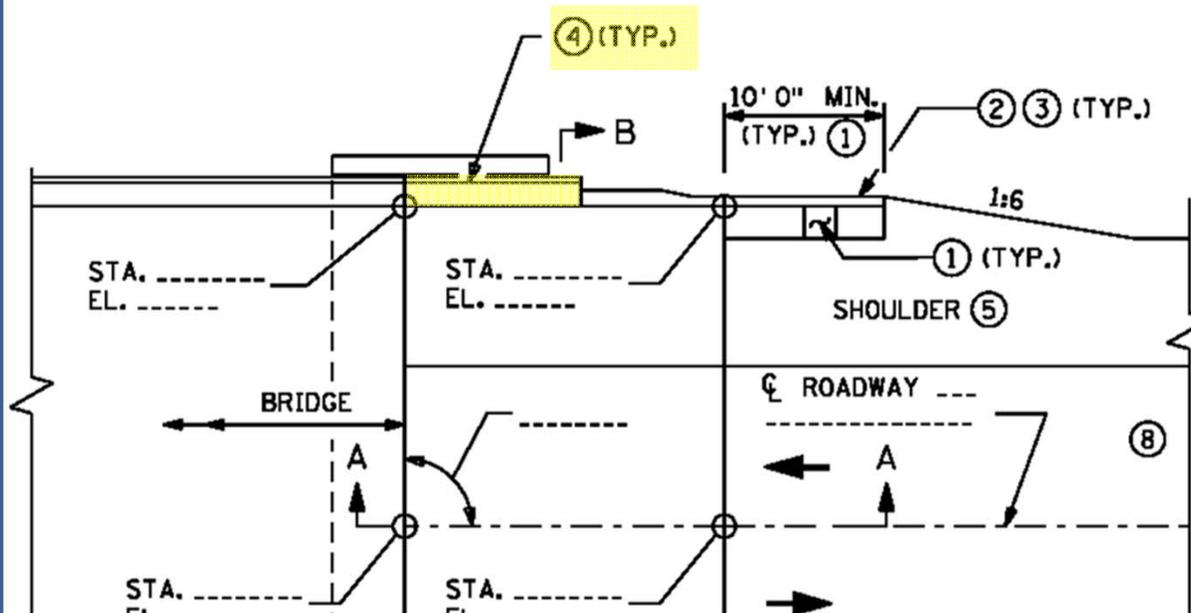


SKEW DETAIL "E"
(PLAN VIEW)

BRIDGE NO. _____

STANDARD PLAN SHEET NO. 5-297.224	TITLE: BRIDGE APPROACH PANEL LAYOUT (CONCRETE BARRIER ON APPROACH PANEL)
STANDARD APPROVED: DECEMBER 20, 2011	
STATE PROJ. NO. _____	(TH _____) SHEET NO. ____ OF ____ SHEETS

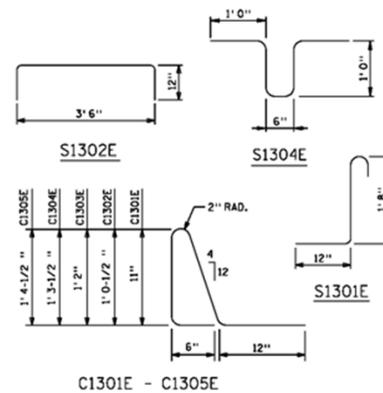
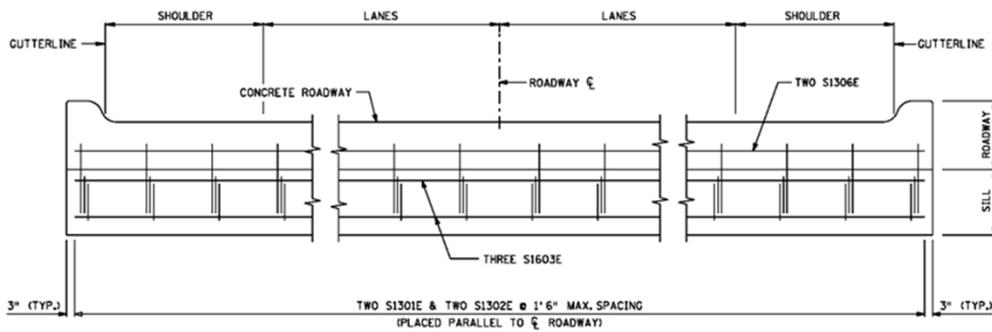
CERTIFIED BY _____ LICENSED PROFESSIONAL ENGINEER DATE _____
PRINTED NAME: _____ LIC. NO. _____



**DESIGNER NOTE
(REMOVE PRIOR TO PLOTTING FINAL PLAN):**

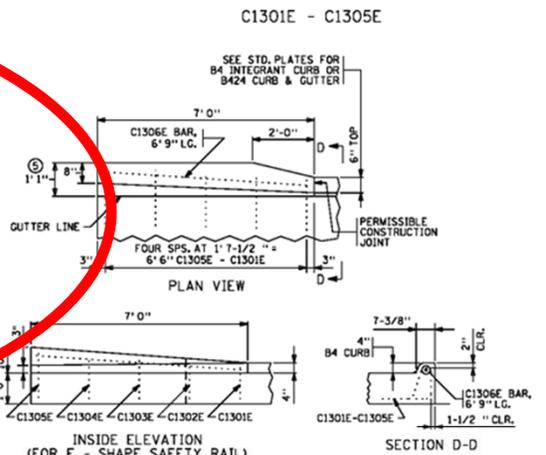
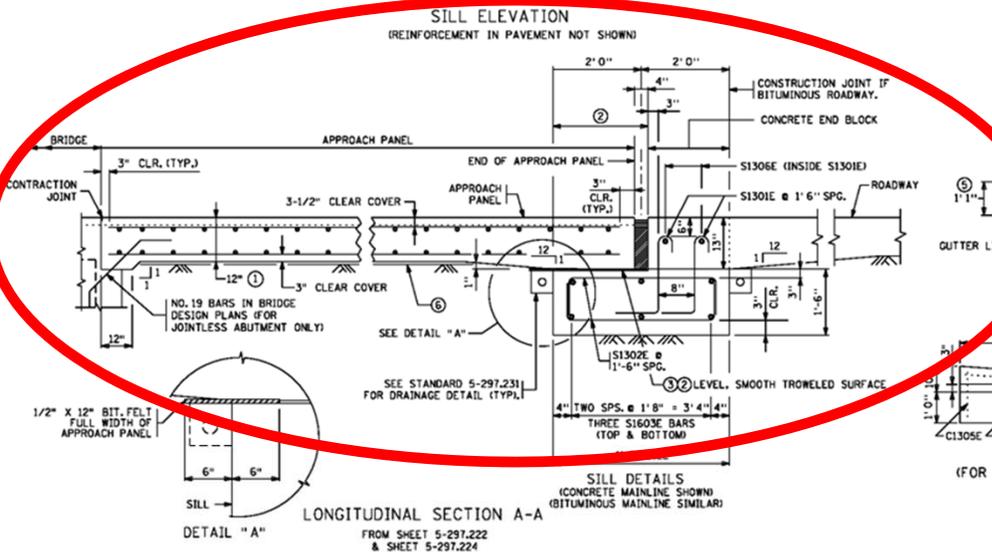
SEE NOTE (4) AND COORDINATE BARRIER LENGTH WITH BRIDGE DESIGNER. 7'-0" MINIMUM LENGTH IS FOR TL-4 BARRIER. TL-5 BARRIER REQUIRES SPECIAL DESIGN, CONTACT THE BRIDGE DESIGNER.

- (4) TO ACCOMMODATE GUARDRAIL CONNECTION AND CRASH TEST REQUIREMENTS THE CONCRETE BARRIER MUST EXTEND 7'-0" MINIMUM ONTO THE APPROACH PANEL. FOR PARALLEL WINGWALLS THE BARRIER MUST EXTEND 7'-0" MINIMUM ON TO THE APPROACH PANEL OR TO THE END OF THE WINGWALL, WHICH EVER IS LONGER. REFER TO BRIDGE PLAN FOR BARRIER REINFORCEMENT AND PAYMENT.**

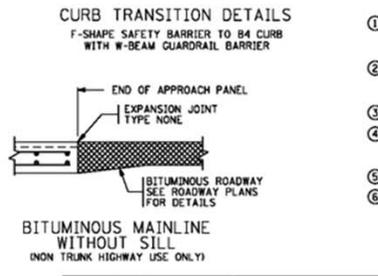
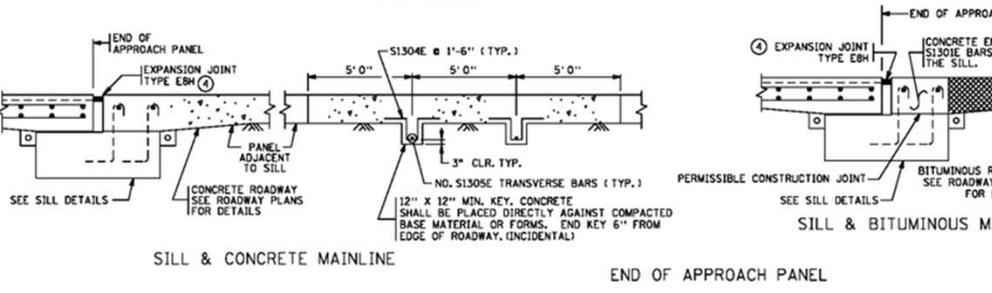
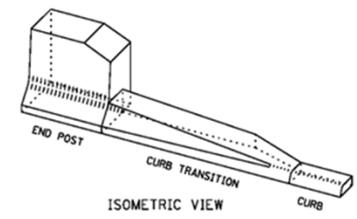


BILL OF REINFORCEMENT FOR CONCRETE SILL				
CONTRACTOR IS REQUIRED TO COMPLETE THE BILL OF REINFORCEMENT TABLE AND PREPARE SHOP DRAWINGS AND SUBMIT THEM TO THE PROJECT ENGINEER AT LEAST 3 WEEKS BEFORE REBAR FABRICATION.				
BAR NO.	LENGTH	SHAPE	LOCATION	
S1301E	3'-2"	U	SILL VERTICAL	
S1302E	5'-6"	U	SILL TIE	
S1303E	1'-"	U	SILL HORIZONTAL	
S1304E	4'-6"	U	KEY TIE	
S1305E	1'-"	U	KEY HORIZONTAL	
S1306E	1'-"	U	END BLOCK HORIZONTAL	

* MINIMUM REINFORCEMENT LAP LENGTHS ARE AS FOLLOWS:
NO. 13 BAR = 1'-8", NO. 16 BAR = 2'-1".

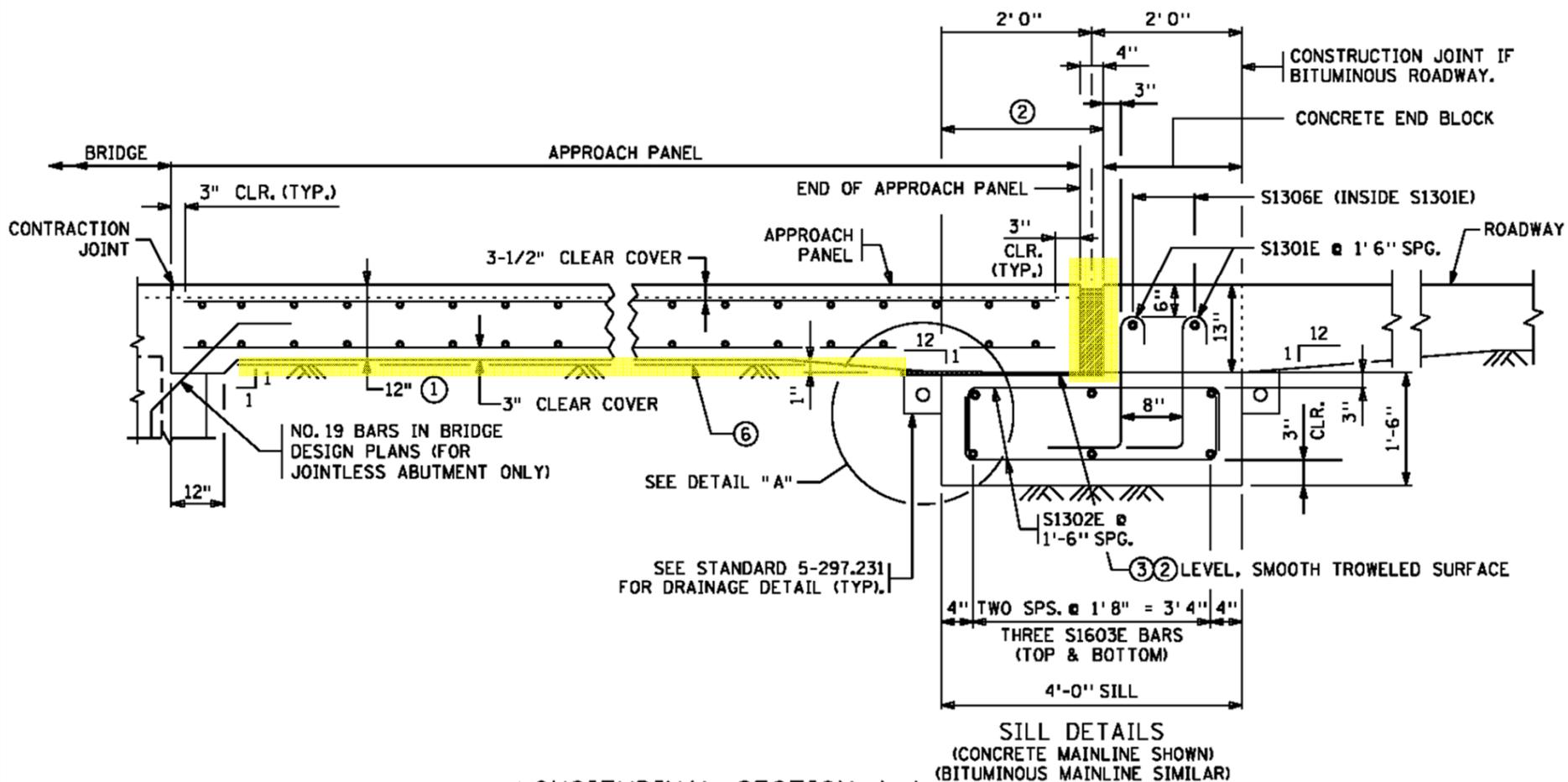


BILL OF REINFORCEMENT FOR CURB TRANSITION				
CONTRACTOR IS REQUIRED TO COMPLETE THE BILL OF REINFORCEMENT TABLE AND PREPARE SHOP DRAWINGS AND SUBMIT THEM TO THE PROJECT ENGINEER AT LEAST 3 WEEKS BEFORE REBAR FABRICATION.				
BAR NO.	LENGTH	SHAPE	LOCATION	
C1301E	3'-6"	U	CURB VERTICAL	
C1302E	3'-9"	U	CURB VERTICAL	
C1303E	4'-0"	U	CURB VERTICAL	
C1304E	4'-3"	U	CURB VERTICAL	
C1305E	4'-5"	U	CURB VERTICAL	
C1306E	6'-9"	U	CURB LONGITUDINAL	



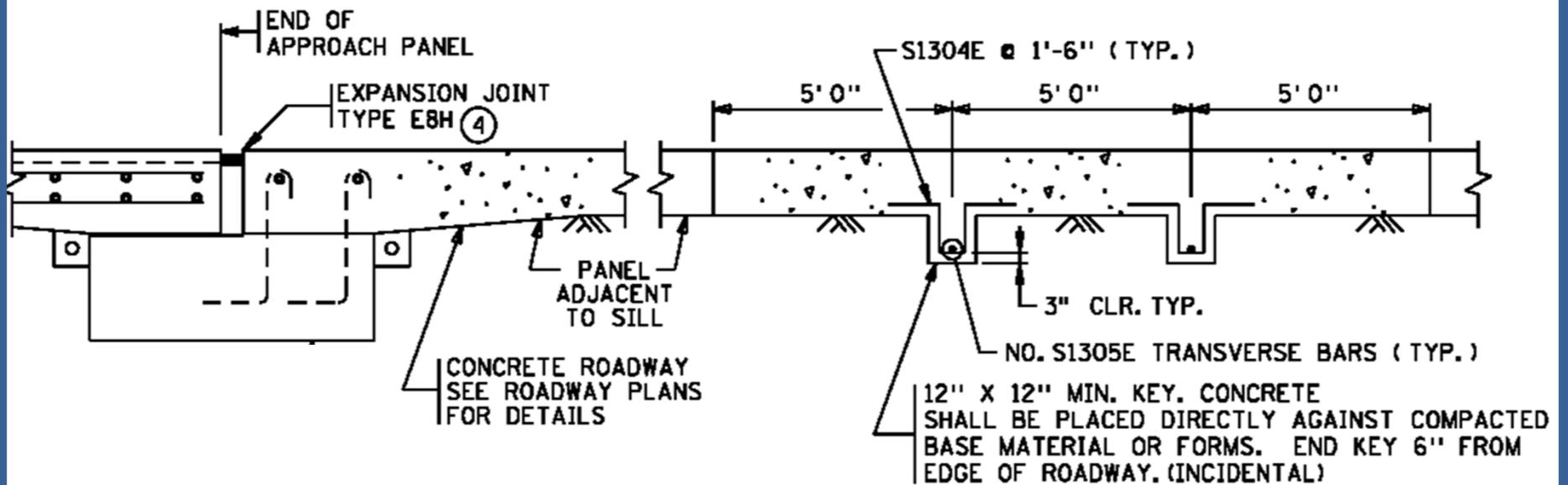
- NOTES:**
- AS PER MNDOT 3301, USE EPOXY COATED GRADE 60 REINFORCEMENT BARS.
 - ENSURE THAT SILL DOES NOT INTERFERE WITH GUARDRAIL POST PLACEMENT.
 - ① APPROACH SLAB THICKNESS IS 12" (12" MONOLITHIC OR 10" SLAB + 2" WEARING COURSE). CHECK BRIDGE PLANS FOR CONCRETE WEARING COURSE, WHICH IS INCLUDED IN BRIDGE PLAN QUANTITIES.
 - ② PLACE PLASTIC SHEETING (MNDOT 3756) AS APPROVED BY THE ENGINEER TO BREAK BOND, COVER AREA SHOWN IN DETAIL. (SHEETING IS INCLUDED IN THE APPROACH PANEL PAY ITEM).
 - ③ REQUIRED CONSTRUCTION JOINT.
 - ④ SEE STANDARD PLANS 5-297.222 & 5-297.224 FOR TYPE OF EXPANSION JOINT. DETAILS OF EXPANSION JOINT TYPE EBH ARE SHOWN ON STANDARD PLAN 5-297.229.
 - ⑤ FROM BACK SIDE OF CURB TRANSITION TO GUTTERLINE.
 - ⑥ IF THE APPROACH PANEL IS TIED TO THE BRIDGE ABUTMENT WITH REINFORCEMENT BARS, PLACE 12 MIL POLYETHYLENE SHEETING (OR 2 LAYERS OF 6 MIL) UNDER THE LIMITS OF THE APPROACH PANEL TO ALLOW THE PANEL TO MOVE LONGITUDINALLY ON THE GRADE. SHEETING IS INCLUDED IN THE APPROACH PANEL PAY ITEM.

STANDARD PLAN SHEET NO. 5-297.227	TITLE: BRIDGE APPROACH PANEL MISCELLANEOUS DETAILS
STANDARD APPROVED: DECEMBER 20, 2011	
STATE PROJ. NO. _____	(TH _____) SHEET NO. ____ OF ____ SHEETS

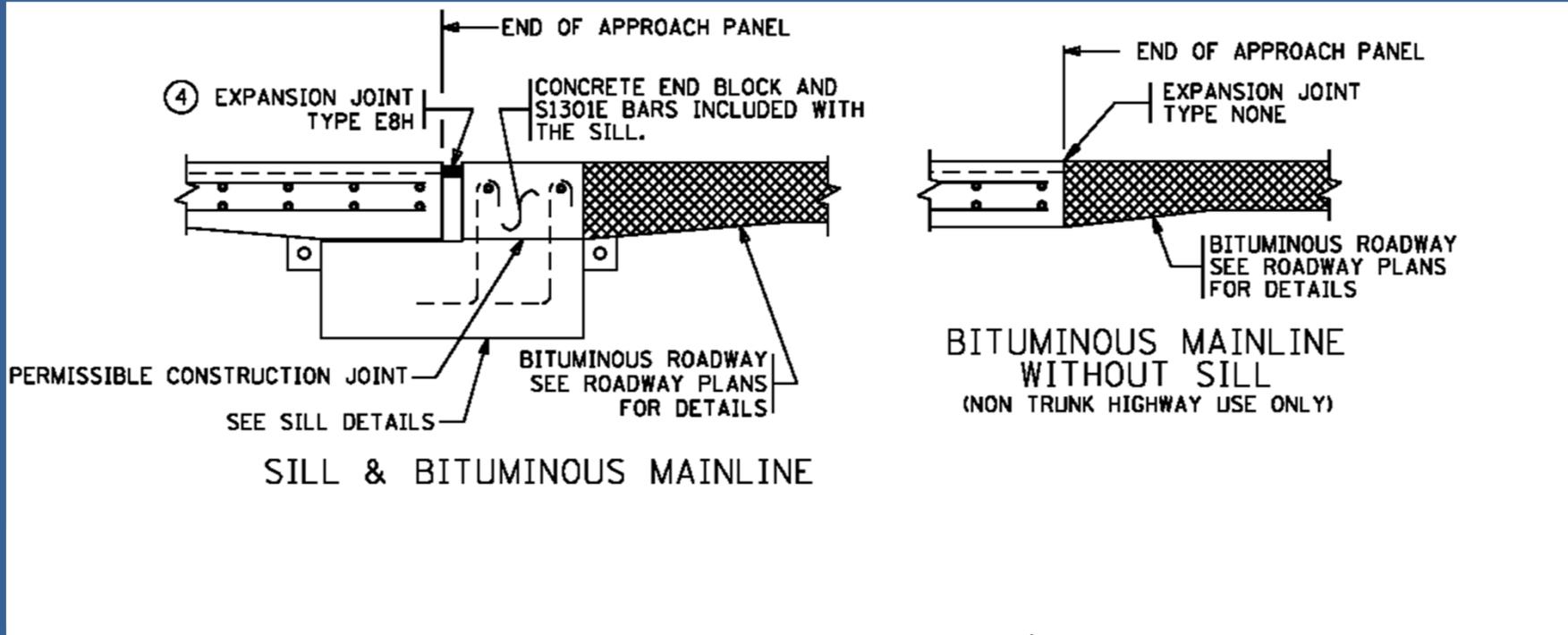


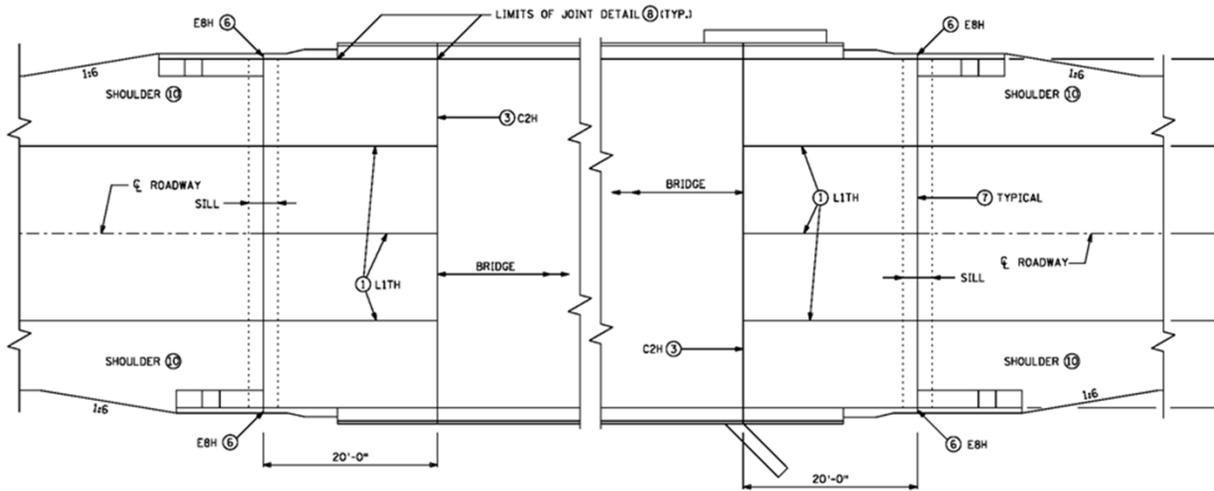
LONGITUDINAL SECTION A-A

FROM SHEET 5-297.222
& SHEET 5-297.224



SILL & CONCRETE MAINLINE



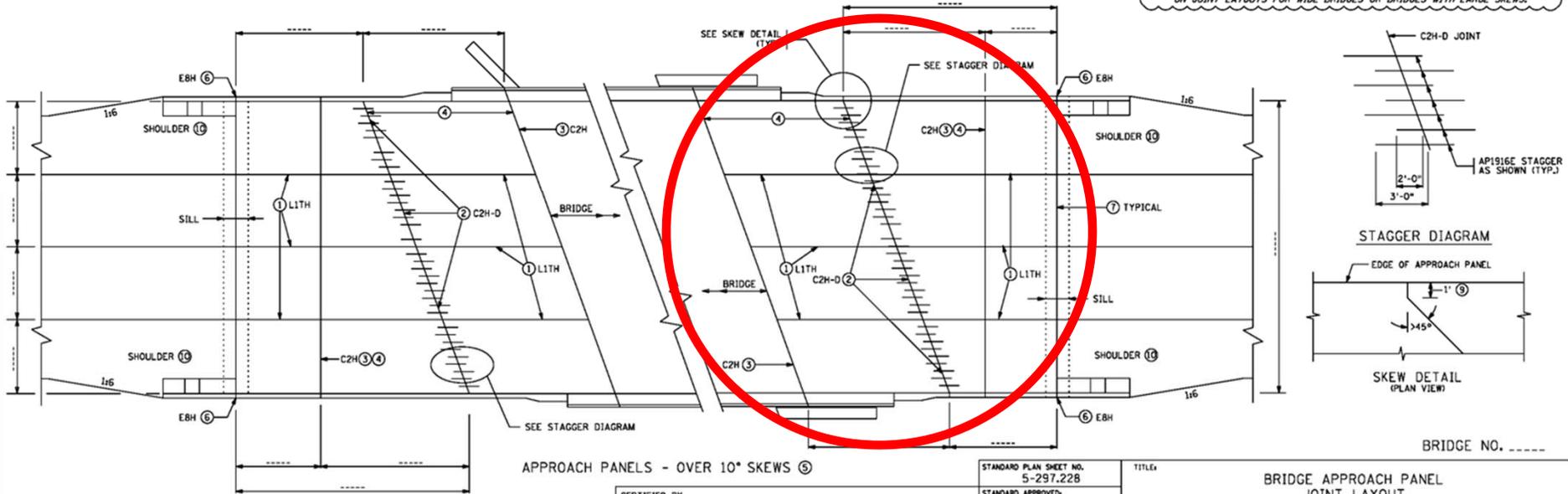


APPROACH PANELS - SQUARE TO 10° SKEWS (5)

APPROACH PANEL JOINT LAYOUT NOTES:

- ① LITH LONGITUDINAL JOINT. SEE STANDARD PLAN 5-297.229 FOR REINFORCEMENT LAP LENGTH REQUIREMENTS FOR STAGED CONSTRUCTION.
- ② PERMISSIBLE CONSTRUCTION JOINT. USE JOINT TYPE C2H-D WITH API916E BARS AT 12-INCH SPACING AT MID DEPTH OF THE SLAB, PARALLEL TO THE CENTERLINE OF THE ROADWAY. API916E BARS ARE 5'-0" LONG. PLACE THE BAR WITH 2'-0" ON ONE SIDE OF THE JOINT AND 3'-0" ON THE OPPOSITE SIDE OF THE JOINT. ALTERNATE THE 2'-0" AND 3'-0" DIMENSIONS AS SHOWN ON THE PLAN. THE C2H-D JOINT AND API916E BARS ARE REQUIRED ON ALL PANELS WITH A SKEW OVER 10 DEGREES.
- ③ C2H CONTRACTION JOINT.
- ④ MAXIMUM PANEL LENGTH OF 20'-0" FOR UP TO 40° SKEWS, 15'-0" FOR SKEWS OVER 40°.
- ⑤ ALL JOINTS SHALL BE SAWCUT. SAWCUTS SHALL BE MADE WHILE THE CONCRETE IS STILL GREEN. WHEN A CONCRETE WEARING COURSE IS SPECIFIED, THE JOINTS SHALL BE SAWN THROUGH BOTH THE WEARING COURSE AND THE UNDERLYING APPROACH SLAB IN A SINGLE OPERATION.
- ⑥ EHB JOINT REQUIRED IN CURB ADJACENT TO EHB JOINT. EHB QUANTITY SHALL BE PAID FOR SEPARATELY, MEASURED FROM BACK OF CURB TO BACK OF CURB.
- ⑦ SEE STANDARD PLANS 5-297.222 OR 5-297.224 FOR TYPE OF EXPANSION JOINT.
- ⑧ SEE STANDARD PLANS 5-297.229 OR 5-297.231 FOR JOINT DETAIL FOR CONCRETE BARRIER ON WINGWALL.
- ⑨ WHEN SKEW IS OVER 45°, THE JOINT SHALL BE PERPENDICULAR TO GUTTER FOR 1' (TYP.).
- ⑩ SEE GRADING PLAN FOR PAVEMENT AND SHOULDER WIDTHS AND CONFIGURATION.

DESIGNER NOTE
 REMOVE PRIOR TO PLOTTING FINAL PLAN:
 THIS SHEET IS INTENDED AS A TEMPLATE FOR APPROACH PANEL JOINT LAYOUT. DESIGNERS SHOULD MAKE CHANGES AS NEEDED TO MATCH THE SKEW DIMENSIONS, ETC. OF A PARTICULAR BRIDGE. THE MAXIMUM SIZE CONCRETE PANEL BETWEEN JOINTS OR SAWCUTS SHOULD BE 12'-4" 20'. CONTACT THE CONCRETE ENGINEERING UNIT FOR ASSISTANCE ON JOINT LAYOUTS FOR WIDE BRIDGES OR BRIDGES WITH LARGE SKEWS.



APPROACH PANELS - OVER 10° SKEWS (5)

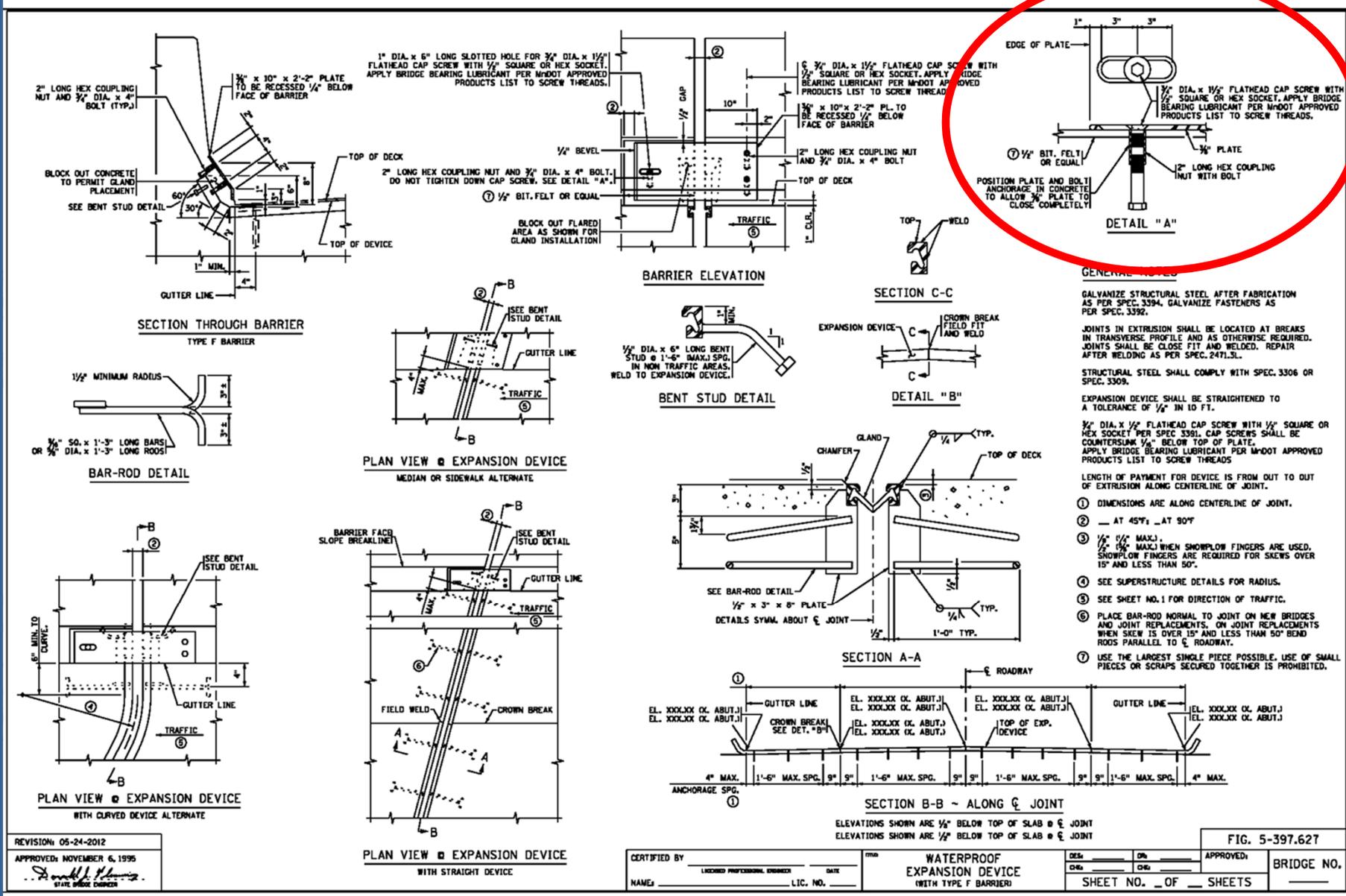
CERTIFIED BY _____ LICENSED PROFESSIONAL ENGINEER DATE _____
 PRINTED NAME: _____ L.I.C. NO. _____

STANDARD PLAN SHEET NO.
5-297.228
 STANDARD APPROVED:
MARCH 23, 2011

STATE PROJ. NO. _____ (TH _____) SHEET NO. ____ OF ____ SHEETS

TITLE: BRIDGE APPROACH PANEL JOINT LAYOUT

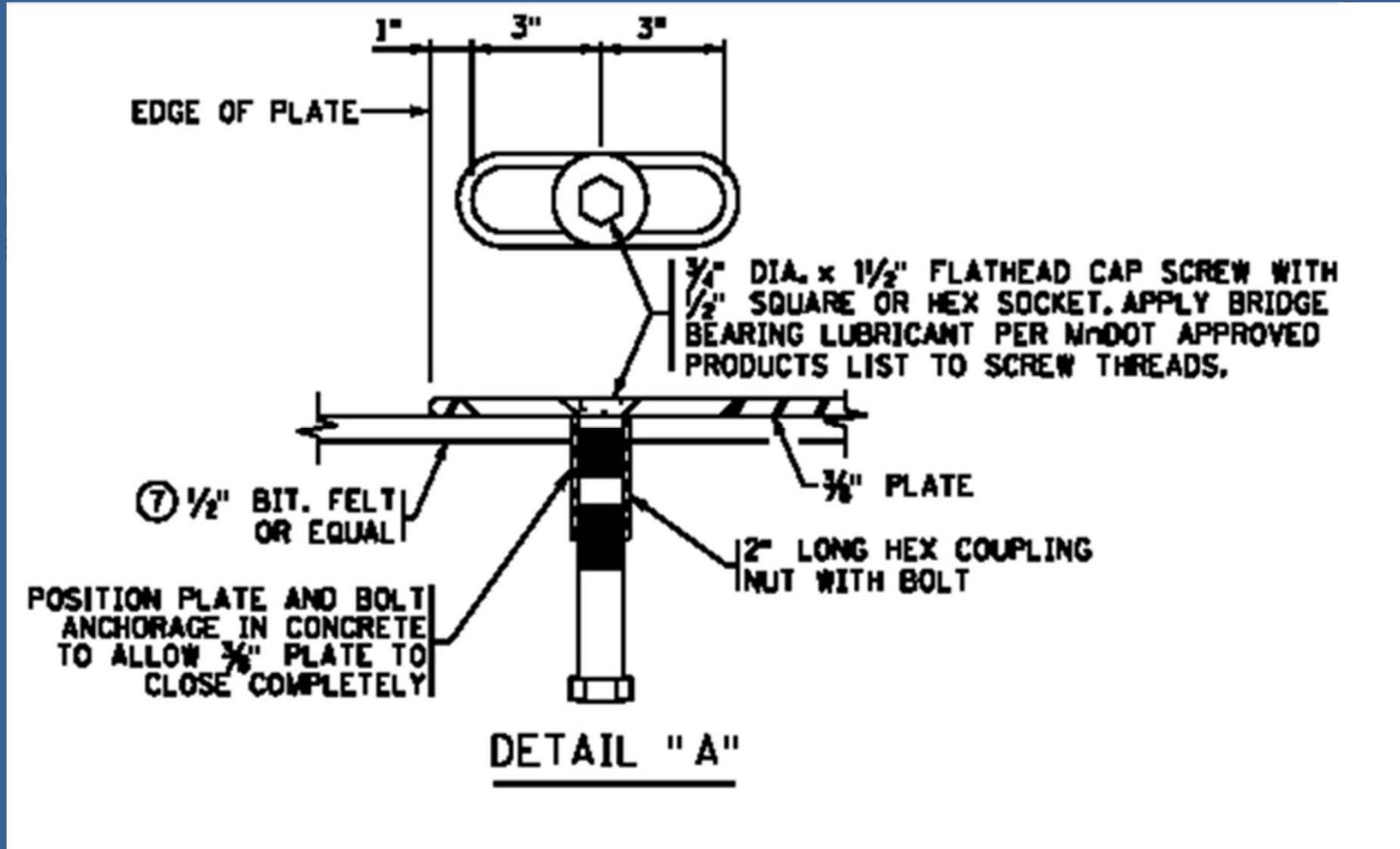
BRIDGE NO. _____

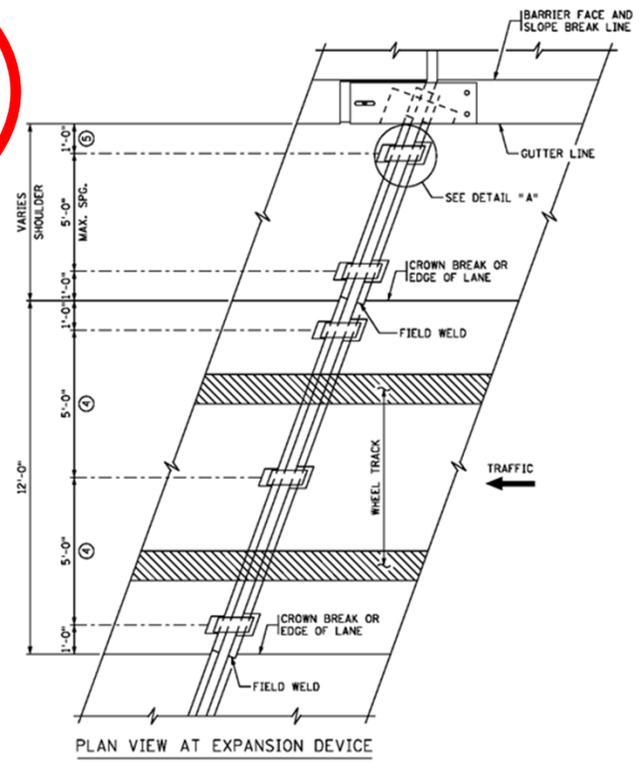
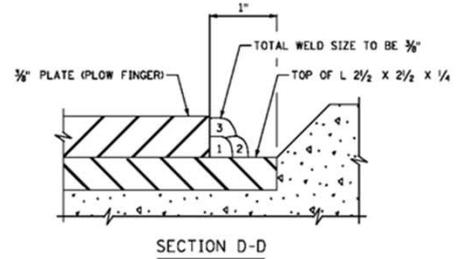
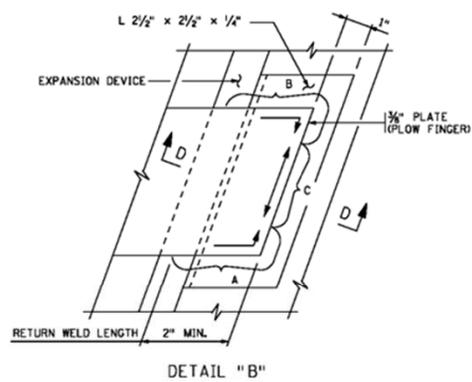
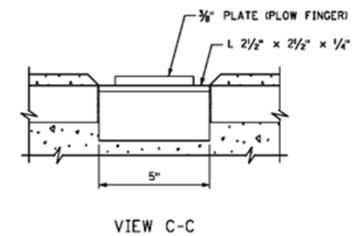
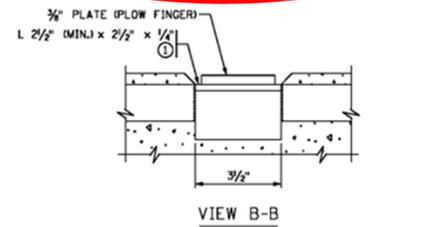
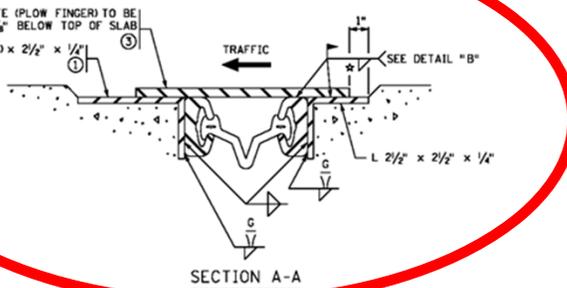
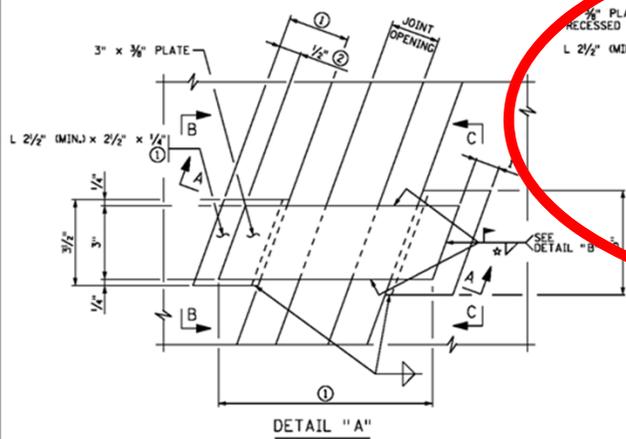


REVISION: 05-24-2012
 APPROVED: NOVEMBER 6, 1995
 [Signature]
 STATE BRIDGE ENGINEER

CERTIFIED BY: _____ LICENSED PROFESSIONAL ENGINEER	DATE: _____	DES: _____ CHK: _____	DR: _____ CHK: _____	APPROVED: _____	BRIDGE NO. _____
NAME: _____ L.I.C. NO. _____		WATERPROOF EXPANSION DEVICE (WITH TYPE F BARRIER)		SHEET NO. ___ OF ___ SHEETS	

FIG. 5-397.627





☆ WELDING PROCEDURE FOR PLOW FINGERS

- I. ALL WELDING SHALL BE DONE WITH 1/8" AWS Mn/DOT SPEC. 5.1 TYPE E7016 OR E7018 ELECTRODE.
- II. WELD PASS 1 IN AREAS A AND B FIRST, THEN AREA C, FOLLOW WITH PASSES 2 AND 3 IN SAME ORDER AS SHOWN IN DETAIL "B".
- III. REMOVE ALL WELD SLAG AND OTHER RESIDUE BETWEEN PASSES.
- IV. ALLOW AT LEAST 5 MINUTES COOLING TIME BETWEEN EACH OF NINE WELD PASSES.

GENERAL NOTES

- DO NOT GALVANIZE PLOW FINGERS.
- ① VARIES WITH SKEW AND EXPANSION OPENING.
 - ② MINIMUM IN CLOSED POSITION.
 - ③ EVERY SNOW PLOW FINGER SHALL HAVE FULL AND DIRECT BEARING ON THE PLATE THAT IS LOCATED UNDER THE MOVEMENT SIDE OF THE FINGER. NO CLICKING NOISE WILL BE ALLOWED.
 - ④ MODIFY IF LANE WIDTH DIFFERS FROM 12 FT.
 - ⑤ OMIT LAST PLOW FINGER ON DEVICE WITH CURVED END.

REVISION: 05-24-2011
 APPROVED: SEPTEMBER 26, 2003
 STATE BRIDGE ENGINEER

CERTIFIED BY _____
 LICENSED PROFESSIONAL ENGINEER DATE _____
 NAME: _____ LIC. NO. _____

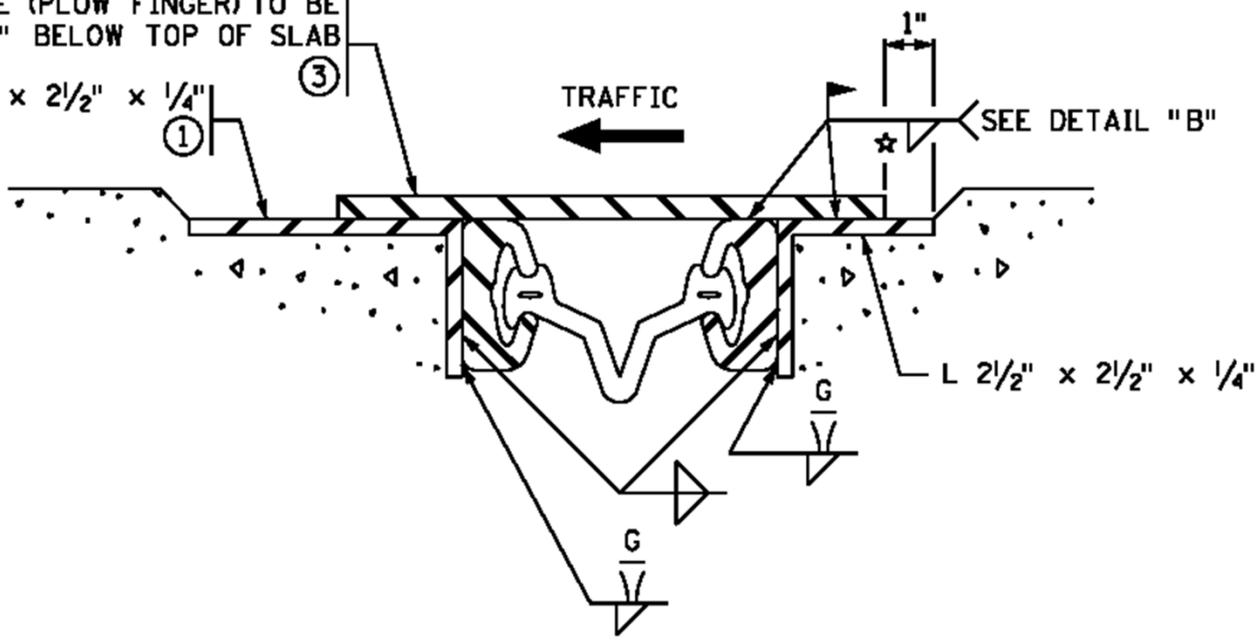
WATERPROOF EXPANSION DEVICE
 SNOW PLOW PROTECTION
 (USE ON SKEWS OVER 15° AND LESS THAN 50°)

DESIGNED BY _____
 CHECKED BY _____
 APPROVED BY _____
 SHEET NO. ___ OF ___ SHEETS

FIG. 5-397.628
 BRIDGE NO. _____

$\frac{3}{8}$ " PLATE (PLOW FINGER) TO BE
RECESSED $\frac{1}{8}$ " BELOW TOP OF SLAB

L $2\frac{1}{2}$ " (MIN.) x $2\frac{1}{2}$ " x $\frac{1}{4}$ "



SECTION A-A



BASIS OF DESIGN

DESIGNED IN ACCORDANCE WITH 2010 AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, FIFTH EDITION AND Mn/DOT BRIDGE DESIGN MANUAL.

MATERIAL PROPERTIES:

WELDED WIRE FABRIC REINFORCEMENT, MINIMUM SPECIFIED YIELD STRESS	65 KSI
REBAR REINFORCEMENT, MINIMUM SPECIFIED YIELD STRESS	60 KSI
CONCRETE, MINIMUM SPECIFIED COMPRESSIVE STRENGTH	5 OR 6 KSI (SEE TABLES)

SOIL DATA:

UNIT WEIGHT	120 lb/ft ³
RATIO OF LATERAL TO VERTICAL PRESSURE FROM WEIGHT OF EARTH	0.50 MAX TO 0.25 MIN
SOIL STRUCTURE INTERACTION FACTOR, F _{so}	F _{so} = 1 + 0.200H/B _c
	B _c = OUTSIDE WIDTH OF CULVERT
	H = FILL HEIGHT, DEFINED AS THE DISTANCE FROM THE TOP OF THE CULVERT TO THE TOP OF THE ROADWAY OR FILL.
	F _{so} max = 1.15

RESISTANCE FACTORS

(FROM AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS):

FLEXURE	1.0
SHEAR	0.90

LOADING DATA:

LOAD MODIFIERS:	
DUCTILE STRUCTURES	γ = 1.0
FOR EARTH FILL: NON-REDUNDANT MEMBER	γ = 1.05
FOR LIVE LOAD: REDUNDANT MEMBER	γ = 1.0
LOAD FACTORS: (STRENGTH)	
DEAD LOAD	MAX DC = 1.25, MIN DC = 0.90
EARTH LOAD (VERTICAL)	MAX EV = 1.30, MIN EV = 0.90
EARTH LOAD (HORIZONTAL)	MAX EH = 1.35, MIN EH = 0.90
LIVE LOAD	LL = 1.75
APPROACHING VEHICLE LOAD	LS = 1.75
WATER	WA = 1.0
LOAD COMBINATIONS	

STRENGTH LIMIT STATE	
MAX V/MAX H	1.25DC + 1.30EV + 1.75LL(IM) + 1.35EHmax + 1.75LS
MAX V/MIN H	1.25DC + 1.30EV + 1.75LL(IM) + 1.00WA + 0.9EHmin
MIN V/MAX H	0.9DC + 0.9EV + 1.35EHmin + 1.75LS

SERVICE LIMIT STATE	
MAX V/MAX H	1.0DC + 1.0EV + 1.0LL(IM) + 1.0EHmax + 1.0LS
MAX V/MIN H	1.0DC + 1.0EV + 1.0LL(IM) + 1.0WA + 1.0EHmin
MIN V/MAX H	1.0DC + 1.0EV + 1.0EHmin + 1.0LS

LIVE LOAD

GREATER OF:	
TRUCK AXLE LOAD	32 kips
TANDEM AXLE LOAD	2 AT 25 kips EACH
LIVE LOAD DISTRIBUTION	
IF DEPTH OF FILL, H _c ≥ 2 FT.	
DIRECTION PERPENDICULAR TO SPAN	E = 96 (ln) + 1.44SPAN (ft.)
DIRECTION PARALLEL TO SPAN	Espan = 10 (ln) + 1.15H (ft.)
IF DEPTH OF FILL, H _c < 2 FT.	
DIRECTION PERPENDICULAR TO SPAN	W = 20 (ln) + 1.15H (ft.)
DIRECTION PARALLEL TO SPAN	L = 10 (ln) + 1.15H (ft.)
CONSTRUCTION COMPACTOR LOAD	55 kips DISTRIBUTED OVER 84 In. X 24 In.
MULTIPLE PRESENCE FACTOR	MPF = 1.2 (FOR ONE LANE)
DYNAMIC LOAD ALLOWANCE (VARIABLE WITH DEPTH)	IM = 0.33(1-0.125H), H ≤ 8, IF H > 8 IM = 0
LANE LOAD (APPLIED TO BOXES WITH SPANS OF 15 FT. OR GREATER)	640 pcf DISTRIBUTED PER AASHTO 3.6.1.2.4
APPROACHING VEHICLE LOAD (PARALLEL TO SPAN) (TRAPEZOIDAL PRESSURE) ②	LS = K * Ys * heq

EQUIVALENT FILL HEIGHT	
ABUTMENT HEIGHT (FT.) ①	heq (ft.)
< 5.0	4.0
5.0 TO 10.0	5 + 0.2*(ABUTMENT HEIGHT)
10.0 TO 20.0	4 + 0.1*(ABUTMENT HEIGHT)
> 20.0	2.0

① THE ABUTMENT HEIGHT CORRESPONDING TO THE LATERAL PRESSURE AT THE TOP OF THE CULVERT IS THE DISTANCE FROM THE TOP OF THE TOP SLAB TO THE TOP OF THE PAVEMENT OR FILL.

THE ABUTMENT HEIGHT CORRESPONDING TO THE LATERAL PRESSURE AT THE BOTTOM OF THE CULVERT IS THE DISTANCE FROM THE BOTTOM OF THE BOTTOM SLAB TO THE TOP OF THE PAVEMENT OR FILL.

② TRAPEZOIDAL LATERAL LIVE LOAD PRESSURE METHODOLOGY WAS USED TO APPROXIMATE A BOUSSINESQ DISTRIBUTION.

WATER

DEPTH OF WATER IN BOX SECTION EQUAL TO INSIDE HEIGHT

STRUCTURAL ARRANGEMENT:

REINFORCEMENT AREAS SHOWN ON FIGURES 5-395.100(B)-(E) ARE IN SQUARE INCHES PER LINEAL FOOT OF BARREL. ALL REINFORCEMENT LENGTHS AND AREAS ARE MINIMUM REQUIREMENTS. REINFORCEMENT REQUIREMENTS AND AREAS ARE FOR WELDED WIRE FABRIC, IF BAR REINFORCEMENT IS SUBSTITUTED FOR WELDED WIRE FABRIC, THE AREAS OF REINFORCEMENT SHALL BE INCREASED BY 8%.

TRANSVERSE REINFORCEMENT IS PARALLEL TO THE CULVERT SPAN.

LONGITUDINAL REINFORCEMENT IS PERPENDICULAR TO THE CULVERT SPAN.

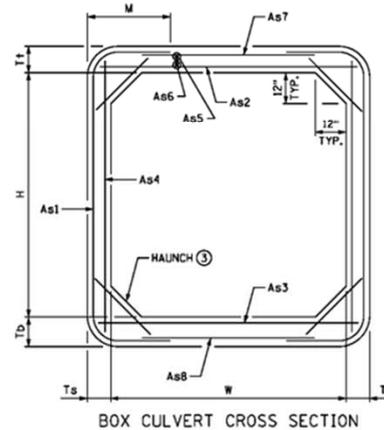
REINFORCEMENT SPACING	4.0 In. MAX.
	THE SPACING CENTER TO CENTER OF THE TRANSVERSE WIRES SHALL NOT BE LESS THAN 2 In. NOR MORE THAN 4 In. THE SPACING CENTER TO CENTER OF THE LONGITUDINAL WIRES SHALL NOT BE MORE THAN 8 In. 1/2 In. MIN., 2 In. MAX.
CONCRETE COVER OVER REINFORCEMENT (ALL FACES)	12 In. VERTICAL, 12 In. HORIZONTAL (ALL SPANS AND RISES)
③ HAUNCH DIMENSIONS	CULVERTS CONSTRUCTED WITHOUT HAUNCHES REQUIRE SPECIAL DESIGN NOT INCLUDED IN THESE STANDARDS.
MINIMUM REINFORCING PARALLEL TO SPAN, INCLUDING As1, As2, As3, As4, As7, As8	0.002 * b * h, (b = THICKNESS OF SLAB, h = 12 In.)
PERPENDICULAR TO SPAN, INCLUDING As5, As6	0.06 ln ² /ft

SKREW BOX CULVERT SECTIONS WERE DESIGNED ASSUMING TRAFFIC TRAVELING PARALLEL TO THE SPAN AND UP TO A SKEW ANGLE OF 45°. IF CULVERT SECTIONS ARE PLACED IN A DIFFERENT ARRANGEMENT, THEY MAY NEED TO BE REDESIGNED. BOX CULVERT END SECTIONS WERE DESIGNED FOR SKEW EFFECTS AND ARE LOCATED ON FIG. 5-395.102 THROUGH 5-395.100(B).

AXIAL THRUST THE BENEFIT OF AXIAL THRUST WAS NOT INCLUDED IN THE BOX CULVERT DESIGN FOR THE STRENGTH LIMIT STATE, HOWEVER WAS INCLUDED IN THE SERVICE LIMIT STATE CRACK CONTROL CHECK.

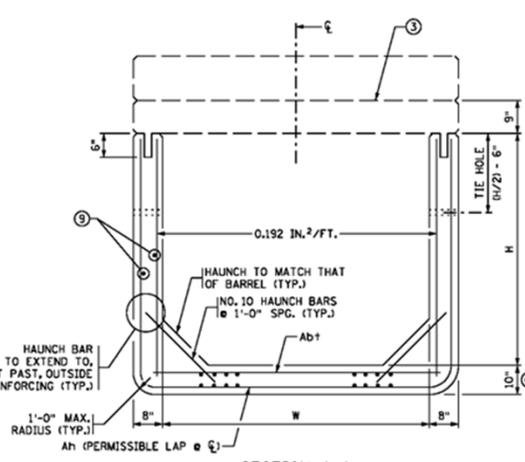
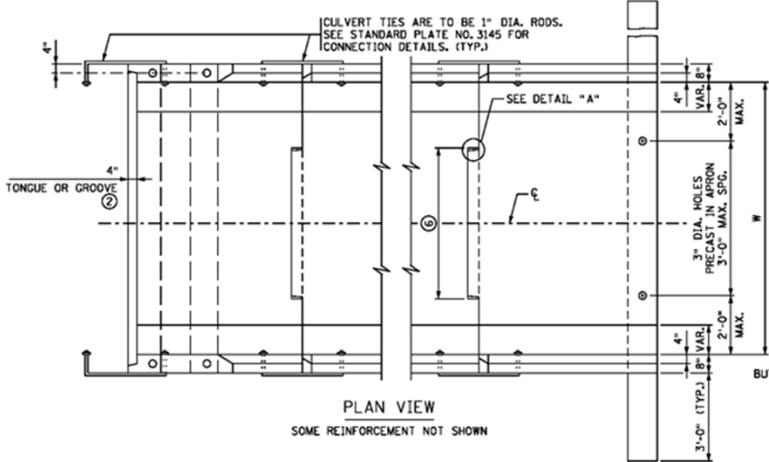
SHEAR SHEAR CHECKED AT 1.0 d_v FROM TIP OF HAUNCH PER AASHTO 5.13.3.6.1. FOR SLABS OF BOXES WITH LESS THAN 2.0 FT. OF FILL AND FOR WALLS OF BOXES OF ALL FILL HEIGHTS SHEAR RESISTANCE CALCULATED PER AASHTO 5.8, SECTIONAL METHOD GENERAL PROCEDURE. FOR SLABS OF BOXES WITH 2 FT. OF FILL OR GREATER THE SHEAR RESISTANCE WAS CALCULATED PER AASHTO 5.14.5.3, UP TO A MAXIMUM THICKNESS OF 12 INCHES. FOR SUCH SLABS WITH THICKNESSES EXCEEDING 12 IN., CONTACT THE BRIDGE STANDARDS UNIT FOR SHEAR PROVISIONS.

CRACK CONTROL CRACK CONTROL CHECK PER AASHTO 5.7.3.4 ASSUMING CLASS 2 EXPOSURE CONDITIONS. THE STRESS IN THE STEEL REINFORCEMENT CALCULATED PER AASHTO C12.11.3 AND LIMITED TO 0.6*fy. INCLUDE AXIAL THRUST IN SERVICE LIMIT STATE ANALYSIS.

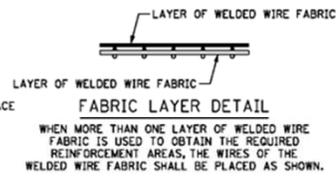
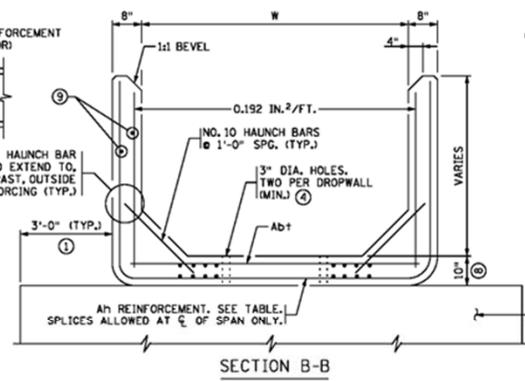
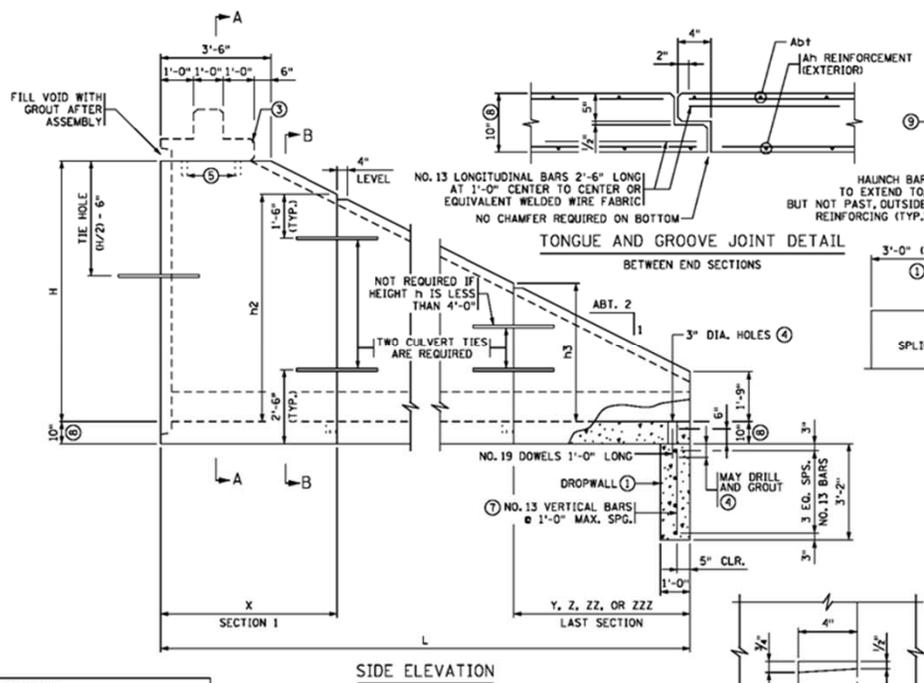


REVISION: 06-06-2011
 APPROVED: MARCH 24, 2011
 Nancy A. Sauter
 STATE BRIDGE ENGINEER

FIG. 5-395.100(A)
 PRECAST CONCRETE BOX CULVERT- BASIS OF DESIGN
 DO NOT INCLUDE WITH PLAN



- CONSTRUCTION NOTES**
- SEE FIG. 5-395.101(A) AND FIG. 5-395.101(B) FOR ADDITIONAL DIMENSIONS AND CONSTRUCTION NOTES.
- ON ALL END SECTIONS FOR WATERWAYS, USE DROPWALLS ON INLET AND OUTLET ENDS.
- SEE 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.
- WITH DOUBLE BOXES LOCATE DROPWALL JOINTS BETWEEN END SECTIONS. SEE FIG. 5-395.111 FOR ALTERNATE DROPWALLS. LIMITS OF EXCAVATION FOR DROPWALL TO BE APPROXIMATELY THE SAME AS DROPWALL DIMENSIONS. DROPWALL TO BE CONCRETE MIX NO. 1A43 OR 3Y43. FURNISHING AND INSTALLATION OF DROPWALL TO BE INCLUDED IN PRICE BID FOR END SECTIONS. DROPWALL NOT REQUIRED FOR NON-WATERWAY USE.
 - CHECK LOCATION TO DETERMINE WHETHER A TONGUE OR A GROOVE IS USED.
 - SEE FIG. 5-395.104(B) FOR LINTEL BEAM DETAILS.
 - FILL HOLE WITH GROUT. GROUT SHALL CONSIST OF 1 PART CEMENT AND 2 PARTS SAND. USE TYPE 1A AIR ENTRAINED PORTLAND CEMENT. GROUT MIX SHALL HAVE A MAXIMUM SLUMP OF 4".
 - 2" DIAMETER HOLE, 6" DEEP IN TOP OF THE SECTION WALL.
 - 3'-6" TONGUE AND 3'-7" GROOVE FOR 6'-0" WIDE CULVERTS. 5'-0" TONGUE AND 5'-1" GROOVE FOR CULVERTS OVER 6'-0" WIDE. CENTER TONGUE AND GROOVE ON $\frac{1}{2}$ OF EACH APRON JOINT.
 - AS AN ALTERNATE TO THE ONE LAYER WELDED WIRE FABRIC, PROVIDE TWO LAYERS OF REBAR OR WELDED WIRE FABRIC WITH THE STEEL AREA EQUAL TO HALF OF THE TEMPERATURE STEEL PER CODE REQUIREMENTS IN EACH FACE OF THE DROPWALL.
 - APRON BOTTOM SLAB THICKNESS MAY BE 8" FOR CULVERTS WITH 6' SPANS ONLY. THE SLAB MAY BE THICKENED AT CONTRACTOR/FABRICATOR REQUEST.
 - LONGITUDINAL REINFORCEMENT PERPENDICULAR TO THE CULVERT SPAN SHALL HAVE A MINIMUM OF 0.06 SQUARE INCHES PER PERIPHERAL FOOT ON ALL FACES OF THE BARREL.



Abt REINFORCEMENT

WIDTH (FT.)	Abt (IN.²/FT.)
6-10	0.20
12	0.30
14	0.39
16	0.39

APRON DIMENSIONS & Abt REINFORCEMENT

H	L	SECTION 1	h2	SECTION 2	h3	SECTION 3	h4	SECTION 4	h5	SECTION 5	h6
FT.	FT.	X	h1	Y	h1	Z	h1	ZZ	h1	ZZZ	h1
4	8	0.192	1'-9"								
5	10	0.192	3'-9"	4'	0.192	1'-9"					
6	12	0.192	4'-9"	6'	0.192	1'-9"					
7	14	0.192	5'-9"	8'	0.192	1'-9"					
8	16	0.20	6'-9"	6'	0.192	3'-9"	4'	0.192	1'-9"		
9	18	0.29	7'-9"	6'	0.20	4'-9"	6'	0.192	1'-9"		
10	20	0.42	8'-9"	6'	0.29	5'-9"	8'	0.192	1'-9"		
11	22	0.60	9'-9"	6'	0.42	6'-9"	6'	0.192	3'-9"	4'	0.192
12	24	0.78	10'-9"	6'	0.60	7'-9"	6'	0.20	4'-9"	6'	0.192
13	26	1.03	11'-9"	6'	0.78	8'-9"	6'	0.28	5'-9"	8'	0.192
14	28	1.38	12'-9"	6'	1.03	9'-9"	6'	0.40	6'-9"	6'	0.192

NOTE: Abt IS AREA OF REINFORCEMENT PER FOOT OF LENGTH (IN.²/FT.)

REVISIONS

APPROVED: MARCH 24, 2011

Nancy A. Subenberger
STATE BRIDGE ENGINEER

STATE PROJ. NO. _____ (T.H.) STA. _____

FIG. 5-395.104(A)

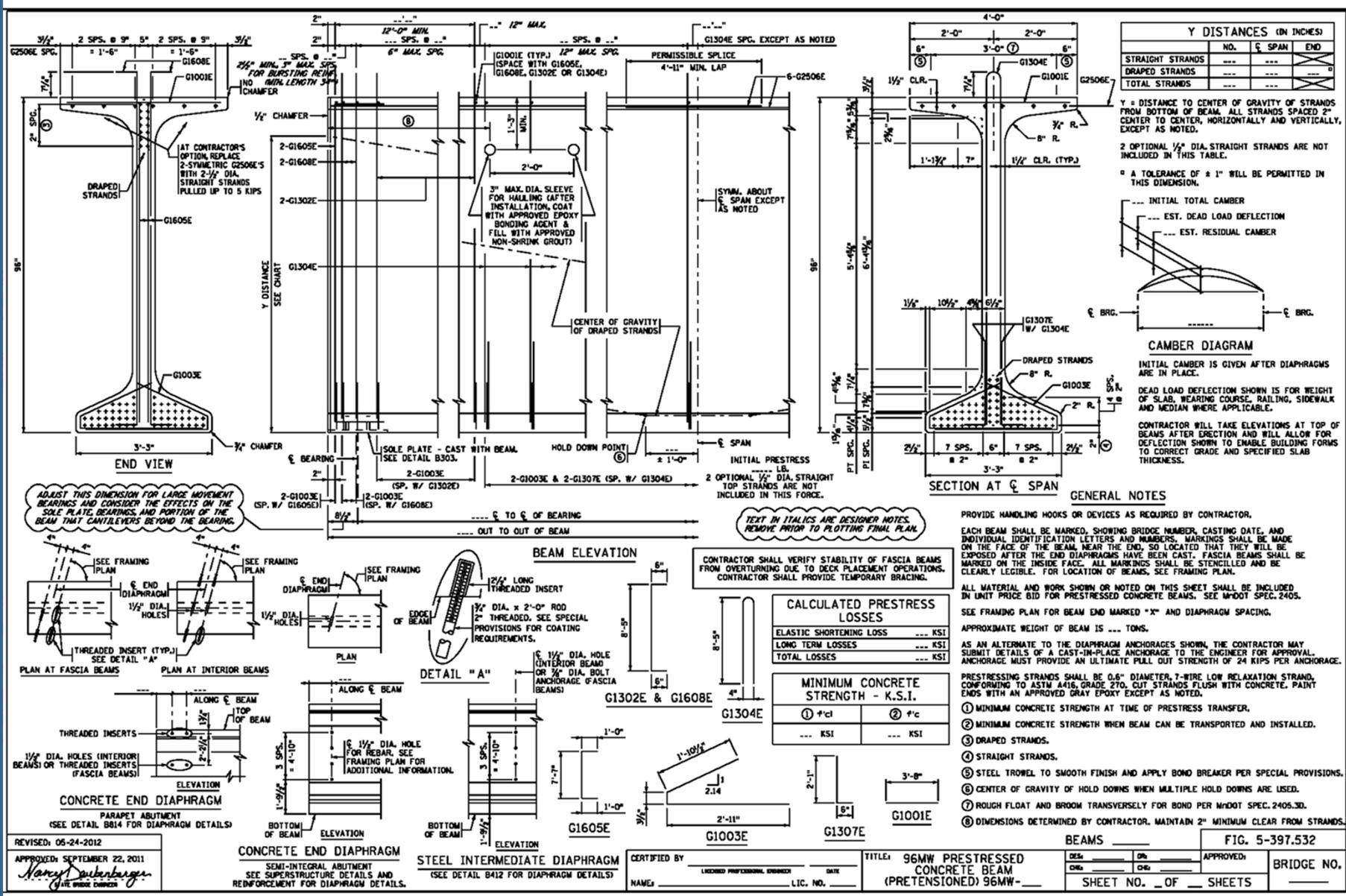
TYPE III - SINGLE OR DOUBLE BARREL FOR SKEWS UP TO 7/2'

DESIGNED BY: _____ DRAWN BY: _____

APPROVED BY: _____

SHEET NO. _____ OF _____ SHEETS

BRIDGE NO. _____



REVISED: 05-24-2012
 APPROVED: SEPTEMBER 22, 2011
Nancy Duberger
 DATE SPEC. CHANGED

CONCRETE END DIAPHRAGM
 SEMI-INTEGRAL ABUTMENT
 SEE SUPERSTRUCTURE DETAILS AND REINFORCEMENT FOR DIAPHRAGM DETAILS.

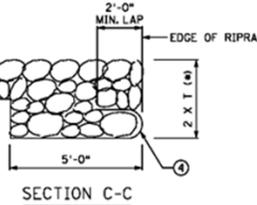
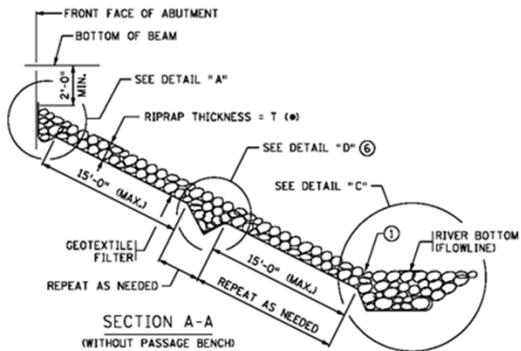
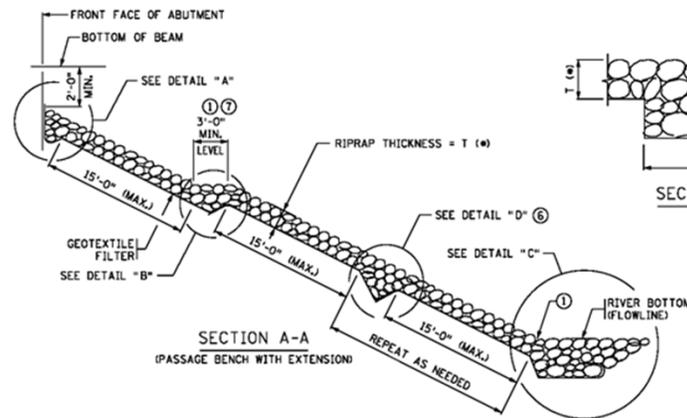
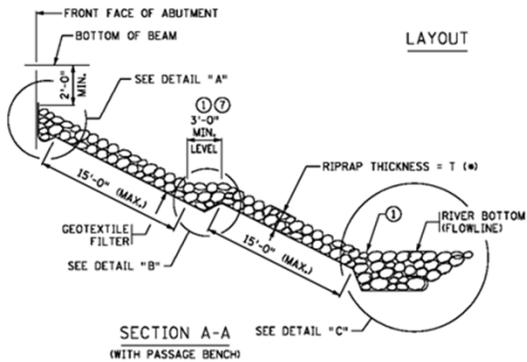
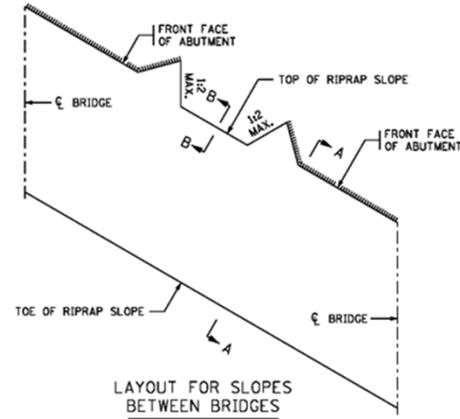
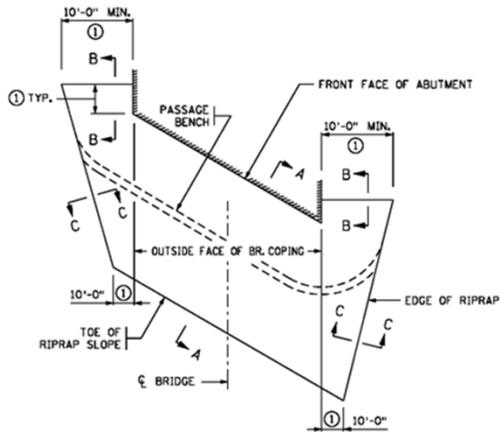
STEEL INTERMEDIATE DIAPHRAGM
 (SEE DETAIL B412 FOR DIAPHRAGM DETAILS)

CERTIFIED BY _____ DATE _____
 LICENSED PROFESSIONAL ENGINEER
 NAME _____ L.I.C. NO. _____

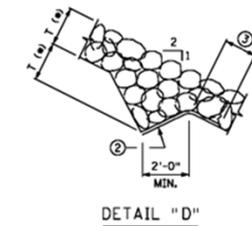
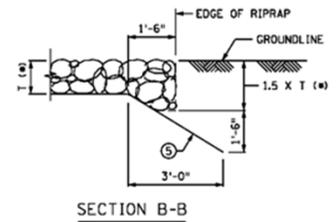
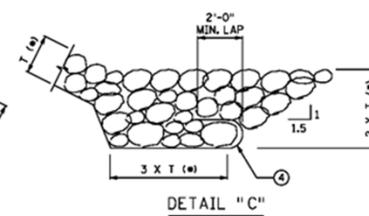
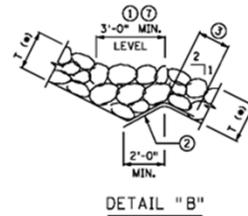
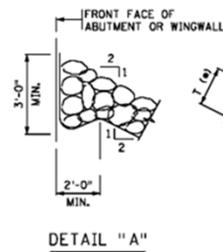
TITLE: 96MW PRESTRESSED CONCRETE BEAM (PRETENSIONED) 96MW-____

BEAMS _____
 DES. _____ DR. _____ APPROVED: _____
 CHK. _____ CH. _____
 SHEET NO. ____ OF ____ SHEETS

FIG. 5-397.532
 BRIDGE NO. _____



* DIMENSION T	
CLASS III	= 1'-6"
CLASS IV	= 2'-0"



GENERAL NOTES

- SEE SPECIAL PROVISIONS FOR MATERIALS, PREPARATION AND PLACEMENT.
- USE GEOTEXTILE FILTER MATERIAL AS PER Mn/DOT SPECIAL PROVISION 2511.
- PAYMENT WILL BE MADE UNDER ITEM 2511.515 GEOTEXTILE FILTER TYPE IV (MODIFIED) BY THE SQ. YD.
- PAYMENT WILL BE MADE UNDER ITEM 2511.501 RANDOM RIPRAP CLASS ... BY THE CU. YD.
- SLOPES ARE EXPRESSED AS A RATIO OF VERTICAL DISTANCE : HORIZONTAL DISTANCE.
- SLOPE BOTTOM OF TRENCHES 1:20 PARALLEL TO ABUTMENT FACE TO PROVIDE POSITIVE DRAINAGE.
- 1 SEE PLAN SHEET NO. ... FOR DIMENSIONS, AND FOR ELEVATIONS OF RIPRAP TOE AND PASSAGE BENCHES.
- 2 PLACE RIPRAP IN TRENCH TO HOLD THE GEOTEXTILE FABRIC IN PLACE BEFORE PLACING THE REST OF THE RIPRAP (FROM THE BOTTOM OF THE SLOPE).
- 3 OVERLAP GEOTEXTILE FILTER 2'-0" MINIMUM.
- 4 WRAP GEOTEXTILE FILTER AROUND TOE, OVERHANG BETWEEN 1ST AND 2ND LAYER OF RIPRAP. USE HAND PLACEMENT OR SIMILAR METHODS TO ESTABLISH PROFILE AND PLACE FABRIC IF UNDER WATER.
- 5 BURY EDGES OF GEOTEXTILE FILTER TO DIRECT WATER FLOW OVER THE FABRIC WITHOUT UNDERMINING.
- 6 OMIT THE TRENCH SHOWN IN DETAIL "D" AND THE 15'-0" MAXIMUM SPACING BETWEEN TRENCHES FOR SLOPES 1:3 OR FLATTER.
- 7 SURFACE BENCHES WITH AGGREGATE CLASS 5 (INCIDENTAL TO RIPRAP). TIE BENCHES TO NATURAL GROUNDLINES OUTSIDE OF BRIDGE.

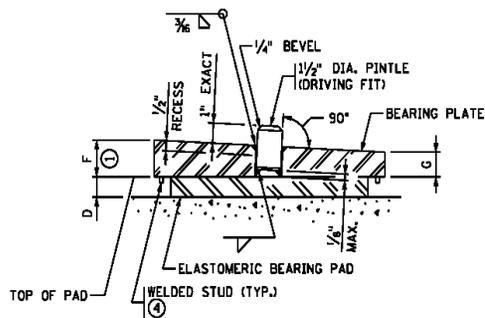
REVISED:
 APPROVED: MAY 24, 2011
 Nancy Dubenberger
 STATE BRIDGE ENGINEER

CERTIFIED BY _____ DATE _____
 LICENSED PROFESSIONAL ENGINEER L.T.C. NO. _____

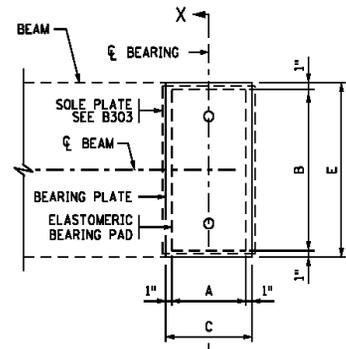
10/16
 RIPRAP SLOPE WITH GEOTEXTILE
 FILTER (SLOPES 1:2 AND FLATTER)

DCS _____ DRB _____ APPROVED: _____
 CHK _____ CHK _____
 SHEET NO. ___ OF ___ SHEETS

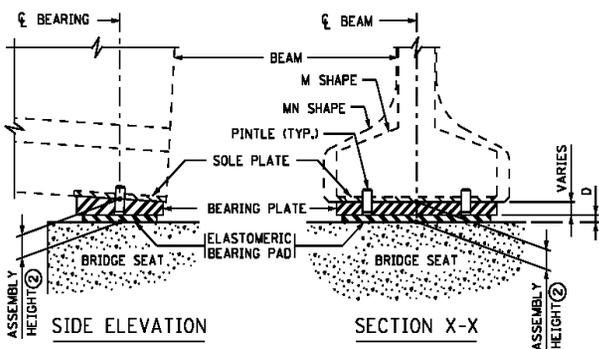
FIG. 5-397.309
 BRIDGE NO. _____



BEARING PLATE DETAIL



PLAN



SIDE ELEVATION

SECTION X-X

DESIGNER NOTE
 (REMOVE DESIGNER NOTE PRIOR TO PLOTTING FINAL PLAN)
 USE TAPERED PLATE FOR GRADES EXCEEDING 3%. MAINTAIN SAME TAPERED PLATE THICKNESS FOR SLOPES IN EACH OF THE FOLLOWING RANGES: 3-5%, 5-7%, 7-9%, >9%.
 MINIMUM THICKNESS OF TAPERED PLATE IS 1/2".
 ROUND ASSEMBLY HEIGHT TO NEAREST 1/8".
 MODIFY FRAMING PLAN PER NOTE 1.
 USE 1/2" UNREINFORCED PAD WITH CONTINUITY DIAPHRAGMS OR INTEGRAL ABUTMENTS.

ASSEMBLY TYPE	LOCATION	BEAM SIZE	BEARING PAD SIZE			SHAPE FACTOR	BEARING PLATE SIZE				ASSEMBLY HEIGHT	
			A	B	D ③		C	E	F	G		HT. ②
			12	24	1/2	8.0	14"	26"				

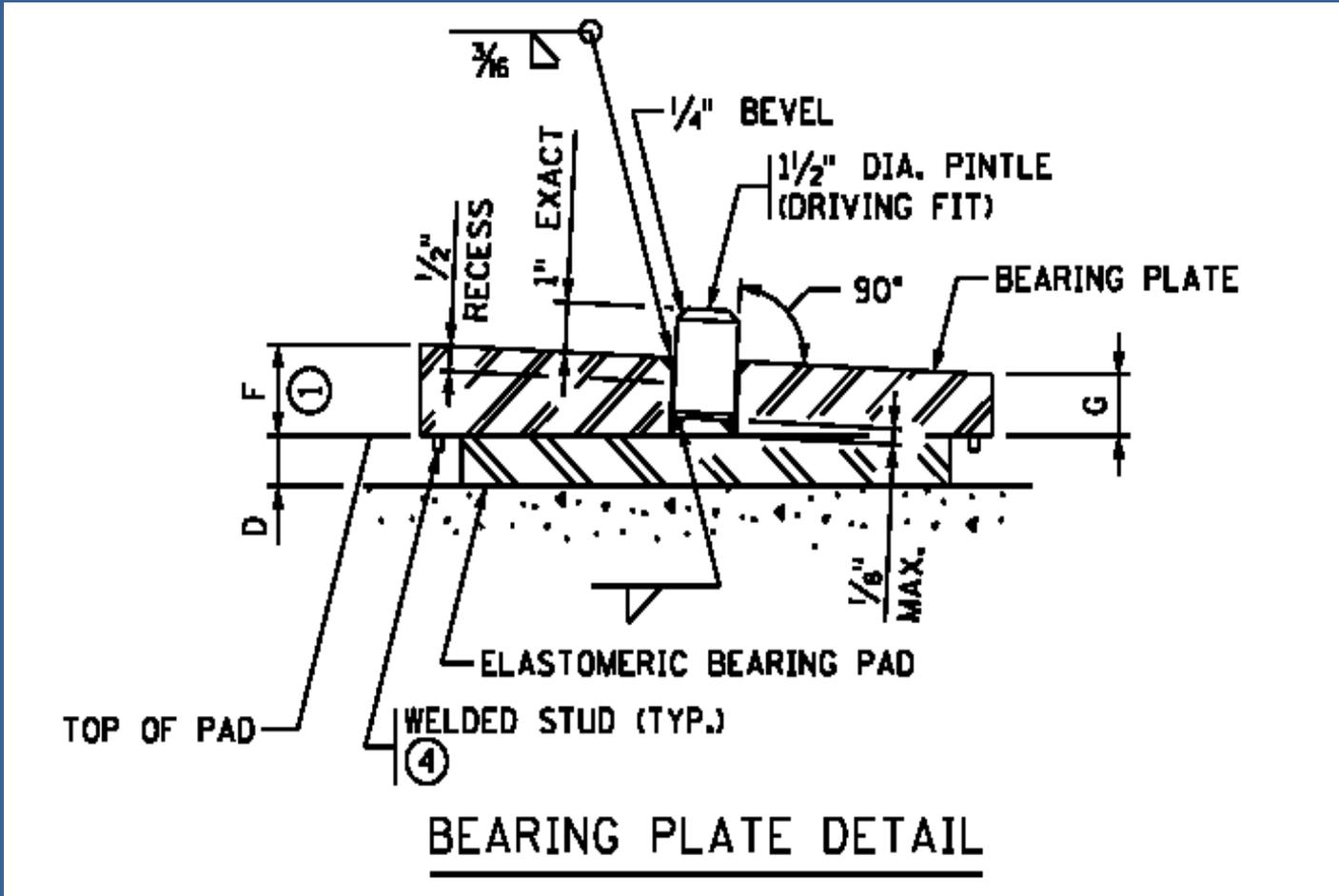
- NOTES:
- ELASTOMERIC MATERIALS AND PAD CONSTRUCTION SHALL COMPLY WITH SPEC. 3741.
 - ALL STEEL PLATES SHALL COMPLY WITH SPEC. 3306.
 - PINTLES SHALL COMPLY WITH SPEC. 3309.
 - GALVANIZE STRUCTURAL STEEL BEARING ASSEMBLY AFTER FABRICATION PER SPEC. 3394. AREAS WELDED SHALL BE REPAIRED PER SPEC. 2471.3L.
 - PAYMENT FOR "TAPERED BEARING PLATE ASSEMBLY" IS PER EACH, AND SHALL INCLUDE ALL MATERIAL ON THIS DETAIL.
 - ① MARK THICKER SIDE OF SLOPED PLATES WITH AN "H" FOR PLACEMENT. SEE FRAMING PLAN SHEET NO. ...
 - ② BEARING PAD AND BEARING PLATE THICKNESS AT BEARING.
 - ③ "D" INDICATES THE THICKNESS OF THE BEARING PAD.
 - ④ 3/4" DIA. x 3/8" KNOCK-OFF WELD STUDS INSTALLED ON BEARING PLATE AROUND PERIMETER OF BEARING PAD. CENTERLINE STUD TO EDGE OF PAD DIMENSION = 1/2", MAX. STUD SPACING = 4", AND MAX. SPACING TO PAD CORNER = 2".

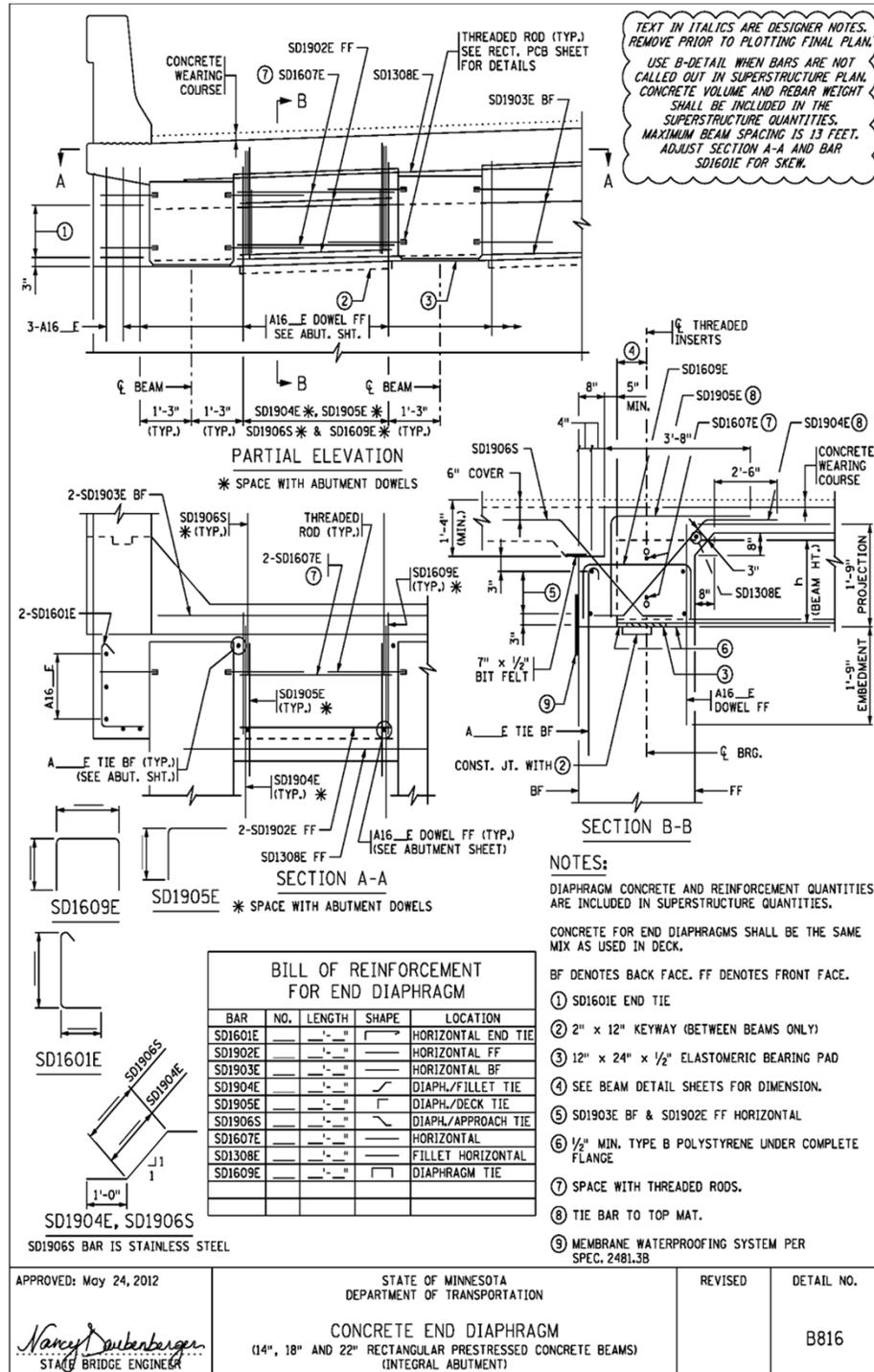
APPROVED: XXXXXXXX XX, XXXX
 STATE BRIDGE ENGINEER

STATE OF MINNESOTA
 DEPARTMENT OF TRANSPORTATION
 TAPERED BEARING PLATE ASSEMBLY
 (FOR INTEGRAL ABUTMENTS OR PIERS WITH CONTINUITY DIAPHRAGMS)

REVISION
 DETAIL NO.
 B309



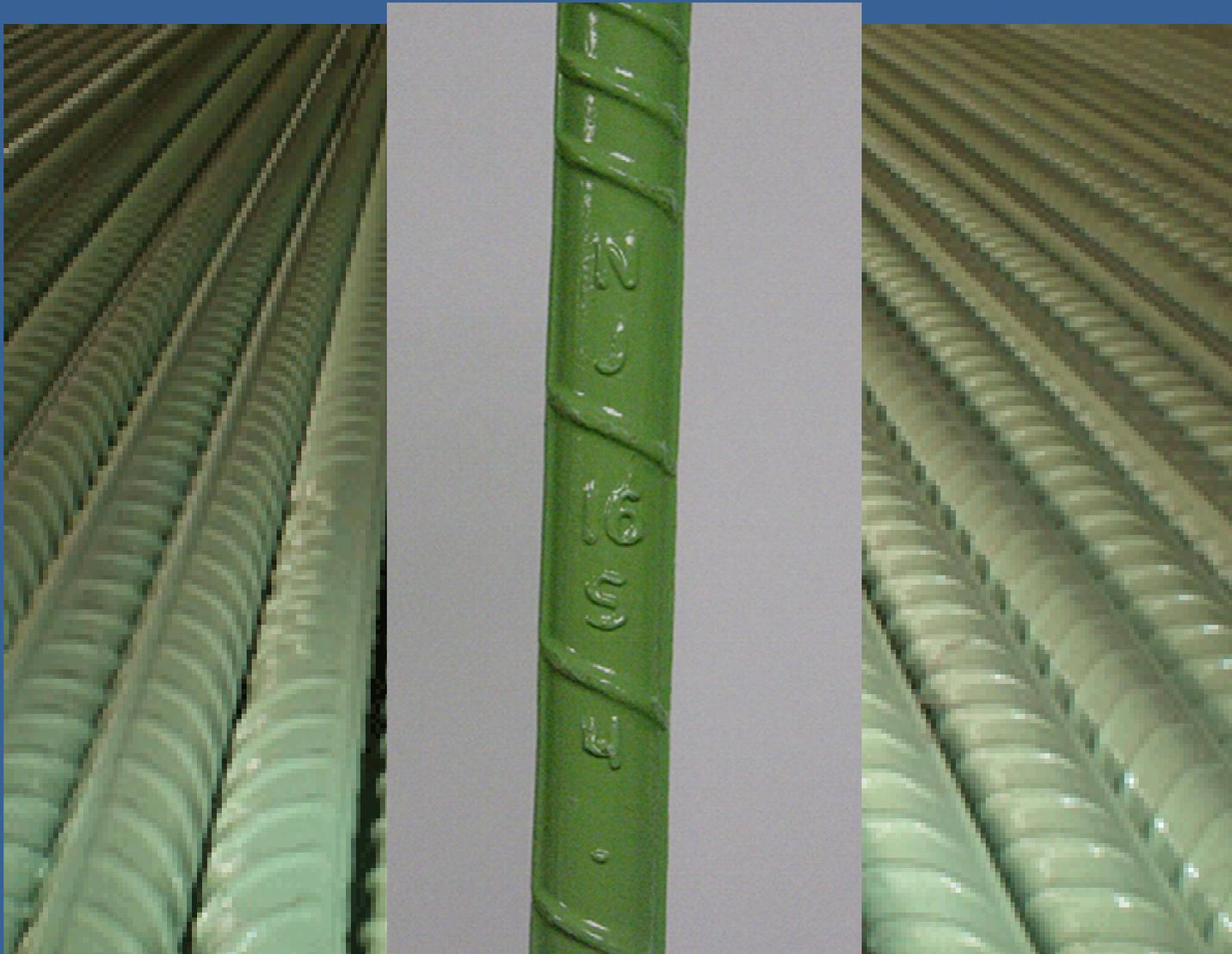




Miscellaneous Issues

- High Performance Concrete Deck Mixes
- Inverted T's
- CIP Retaining Wall Standards
- MSE Walls - Special Provisions & Standards
- Noise Walls - Concrete
- Utility Policy





Inches or Millimeters?

NOTE: CRSI Board of Directors, through the Engineering Practice Committee, is encouraging producer Members to revert to an inch-pound bar marking system for all sizes and grades of deformed reinforcing steel products. The intention of this resolution is to reduce confusion and the chance of errors/delays from the construction supply chain. [Click here to view the full resolution](#). **JANUARY 1st, 2014**

ASTM STANDARD INCH-POUND REINFORCING BARS				ASTM STANDARD METRIC REINFORCING BARS			
BAR SIZE DESIGNATION	NOMINAL DIMENSIONS			BAR SIZE DESIGNATION	NOMINAL DIMENSIONS		
	AREA (in ²)	WEIGHT (lb/ft)	DIAMETER (in.)		AREA (mm ²)	WEIGHT (kg/m)	DIAMETER (mm)
#3	0.11	0.376	0.375	#10	71	0.560	9.5
#4	0.20	0.668	0.500	#13	129	0.994	12.7
#5	0.31	1.043	0.625	#16	199	1.552	15.9
#6	0.44	1.502	0.750	#19	284	2.235	19.1
#7	0.60	2.044	0.875	#22	387	3.042	22.2
#8	0.79	2.670	1.000	#25	510	3.973	25.4
#9	1.00	3.400	1.128	#29	645	5.060	28.7
#10	1.27	4.303	1.270	#32	819	6.404	32.3
#11	1.56	5.313	1.410	#36	1006	7.907	35.8
#14	2.25	7.65	1.693	#43	1452	11.38	43.0
#18	4.00	13.60	2.257	#57	2581	20.24	57.3

The current A615 specification covers bar sizes #14 and #18 in Grade 60, and bar sizes #11, #14 and #18 in Grade 75. The current A706 specification also covers bar sizes #14 and #18. Bar sizes #9 through #18 are not included in the A996 specification.

The current A615M specification covers bar sizes #43 and #57 in Grade 420, and bar sizes #36, #43, and #57 in Grade 520. The current A706 specification also covers bar sizes #43 and #57. Bar sizes #29 through #57 are not included in the A996M specification.

MnDOT Bridge Office LRFD Workshop - June 12, 2012

Bridge Standards Update

Paul Rowekamp
Bridge Standards Engineer

