

This Pier Protection Barrier has been structurally evaluated to be equivalent or greater in strength to other safety shape traffic barriers which have been crash tested to NCHRP Report 350 TL-5 criteria. This barrier meets the requirements of the AASHTO LRFD Bridge Design Specifications for a barrier used for bridge pier protection.

General Notes

- Concrete shall be Class III or IV unless otherwise called for in the plans. Exposed concrete surfaces shall have a Class 3 surface finish in accordance with Section 521 of the Specifications, unless another finish is called for in the plans. The surfaces shall have a Class 5 Applied Finished Coating in accordance with Section 400 only when called for in the plans.
- Construct Pier Protection Barrier continuous without transverse contraction or expansion joints. Transverse construction joints may be used at a spacing greater than or equal to 40'. Provide longitudinal reinforcing steel continuous across construction joints.
- When the Pier Protection Barrier is installed adjacent to Roadway or Shoulder pavement, compact the top 12" of the subgrade to at least 100% of the density as defined in the AASHTO T-99 specifications.
- Isolate Barrier Wall Inlets, Index 218, from Pier Protection Barriers and Footings with 1" expansion material.
- On roadways designated for reverse laning, mark all downstream barrier ends that are not shielded or outside the clear zone with Type 3 Object Markers. Include the cost of the Object Marker in the cost of the Pier Protection Barrier.
- Payment: Pier Protection Barrier and Crash Wall to be paid for under the contract unit price for Shoulder Concrete Barrier Wall (Rigid-Shoulder 42"), LF, or Shoulder Concrete Barrier Wall (Rigid-Shoulder 54"), LF.

INSTRUCTIONS TO DESIGNER:

As used in this standard, setback distance is as defined by LRFD. See PPM and Index 700 for minimum recoverable terrain and horizontal clearance requirements.

Establish the offset from the Pier Protection Barrier to the bridge pier, column or pile bent based on project constraints.

Determine the required Pier Protection Barrier height, i.e. 42" or 54", in accordance with the requirements of the LRFD Bridge Design Specifications and the Structures Design Guidelines.

Determine the appropriate limiting stations of the Pier Protection Barrier and its end treatment(s) using the Pier Protection Barrier Length of Advancement diagrams provided.

- Select Pier Protection Barrier terminal treatment for design speeds greater than or equal to 50 mph:
- Terminated outside of the clear zone of any approach traffic;
 - Terminated within a shielded location;
 - Terminal protection by the use of a crash cushion system; or,
 - Terminated in conjunction with a suitably designed transition to another barrier.

Determine the appropriate footing configuration(s) (T, Front Cantilever or Back Cantilever) for a continuous run of Pier Protection Barrier using the Pier Protection Barrier Footing Layout Schematics. Select the footing configuration(s) based on traffic control needs and locations of piers, pier footings, utilities, drainage structures, etc. as shown. Footing configurations along a continuous run of Pier Protection Barrier may be intermixed as shown.

Designate the Pier Protection Barrier height, footing configuration(s) and limiting stations on the Plan-Profile sheets, e.g.:

Begin 42" Pier Protection Barrier with Front Cantilever Footing, Sta. 100+00.00

Indicate Crash Wall locations (when required) and lengths on the Plan-Profile sheets. Designate Crash Wall height to match height of adjacent Pier Protection Barrier.

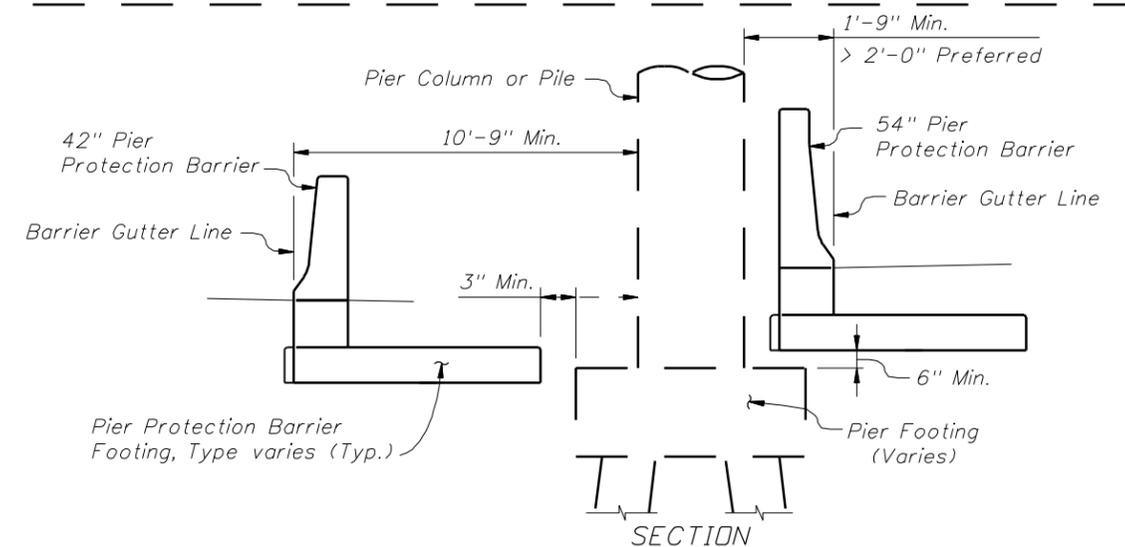
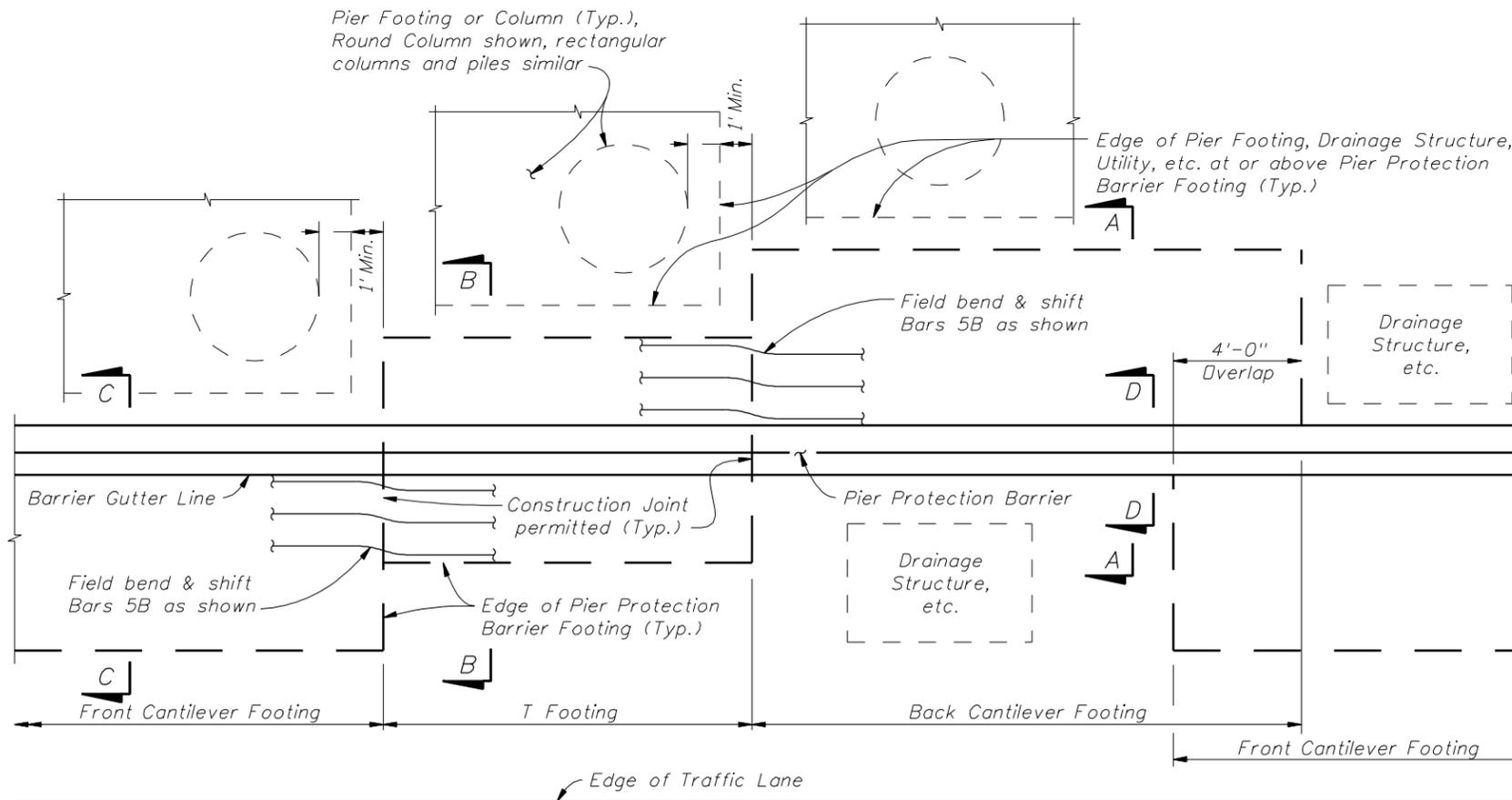
In absence of continuous concrete barrier, determine guardrail requirements in accordance with Indexes 400 and 410.

Show Cross Sections as required to locate Pier Protection Barrier, Crash Wall (when required) and footings adjacent to bridge piers, columns or footings, drainage structures, utilities, etc.

Prepare Traffic Control Plans to accommodate Pier Protection Barrier, Crash Wall (when required) and footing construction.

Include length(s) of Crash Walls (measured along front face) in length of Pier Protection Barrier for payment.

Although intended for shielding bridge piers, the Pier Protection Barrier can be used on a project specific basis to shield other critical roadside objects when deemed necessary or appropriate.



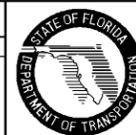
PLAN VIEW

SECTION

PIER PROTECTION BARRIER FOOTING LAYOUT SCHEMATICS

REVISIONS

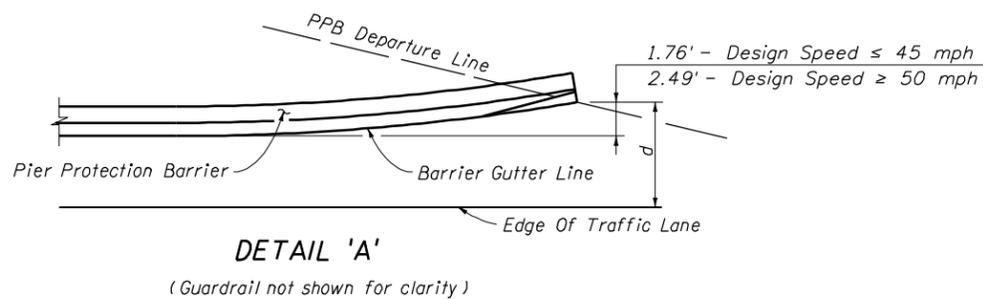
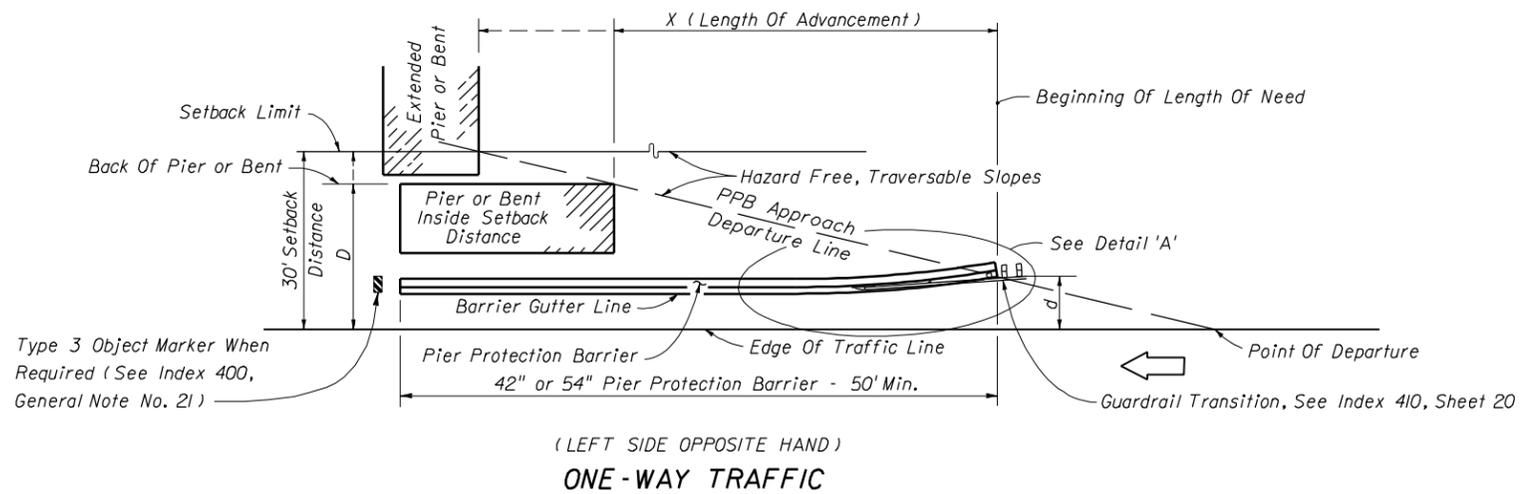
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION
07/01/06	SDD	New Design Standard issued.			



2006 Interim Design Standard

PIER PROTECTION BARRIER

Interim Date	Sheet No.
07/01/06	1 of 10
Index No.	
411	



Design Speed mph	X (Length Of Advancement) Ft.
≤ 45	= 16 (D-d)
≥ 50	= 13 (D-d)

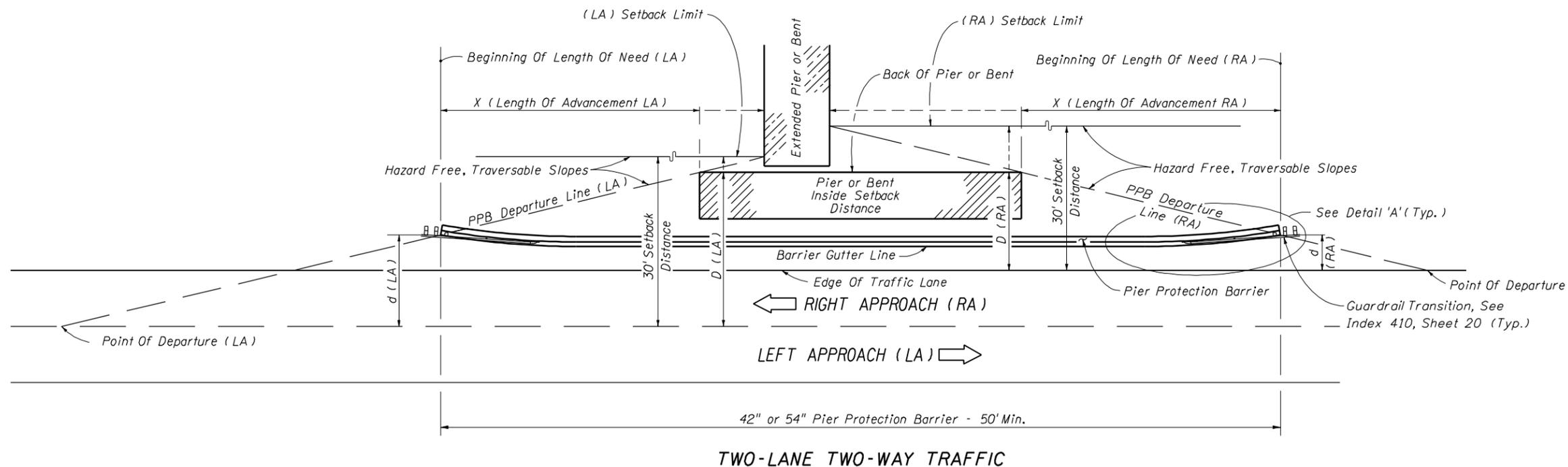
NOTE:

Length of Advancement determined from the diagrams and equations shown establishes the location of the upstream beginning length of need for a Pier Protection Barrier, however, the Length of Advancement for the combination of Pier Protection Barrier and required guardrail can be no less than that required by other details of Index 400.

Equation Variables:

D = Distance in feet from the near edge of the near approach traffic lane to either (a) the back of pier, when the pier is located inside the Setback Distance or (b) the Setback Distance, when the pier extends to or goes beyond the Setback Distance. For left side piers on two-way undivided facilities, D is measured from the inside edge of the near approach traffic lane.

d = Distance in feet from the near edge of the near approach traffic lane to the Pier Protection Barrier gutter line at its intersection with the departure line or the face of guardrail at its intersection with the departure line. For left side hazards on two-way undivided facilities, d is measured from the inside edge of the near approach traffic lane.



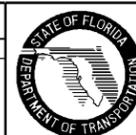
NOTE:
See Index 400 for Clear Zone and Horizontal Clearance Length of Advancement Diagrams.

PPB = Pier Protection Barrier

LENGTH OF ADVANCEMENT DIAGRAMS - PIER PROTECTION BARRIER WITH GUARDRAIL CONTINUATION

REVISIONS

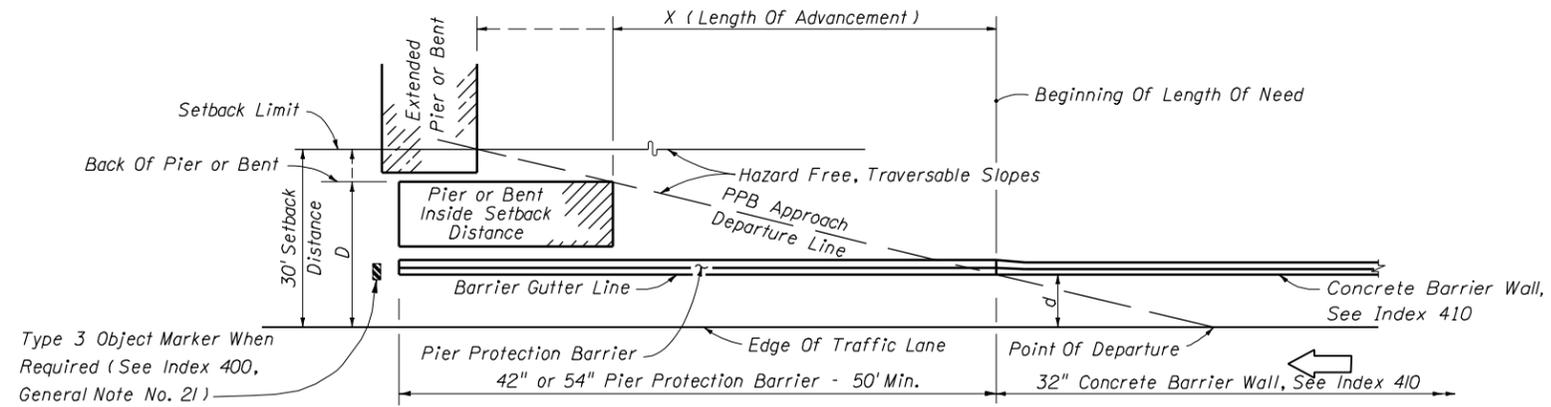
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION
07/01/06	SDO	New Design Standard issued.			



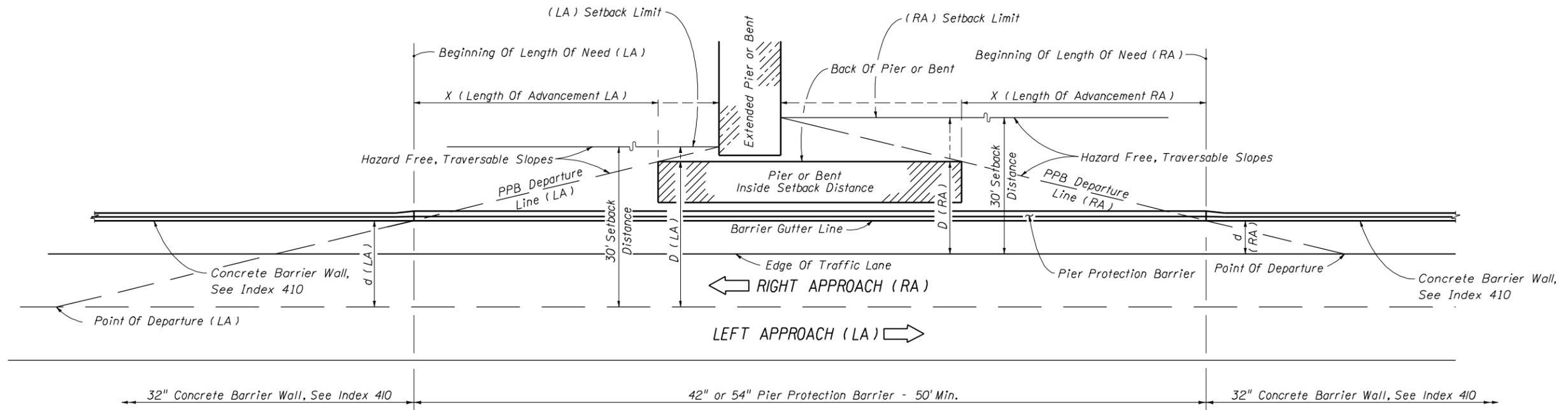
2006 Interim Design Standard

PIER PROTECTION BARRIER

Interim Date	Sheet No.
07/01/06	2 of 10
Index No.	
411	



(LEFT SIDE OPPOSITE HAND)
ONE-WAY TRAFFIC



TWO-LANE TWO-WAY TRAFFIC

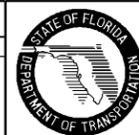
NOTES:
See Index 400 for Clear
Zone and Horizontal Clearance
Length of Advancement Diagrams.
PPB = Pier Protection Barrier

See Notes on Sheet 2.

LENGTH OF ADVANCEMENT DIAGRAMS - PIER PROTECTION BARRIER WITH CONCRETE BARRIER WALL CONTINUATION

REVISIONS

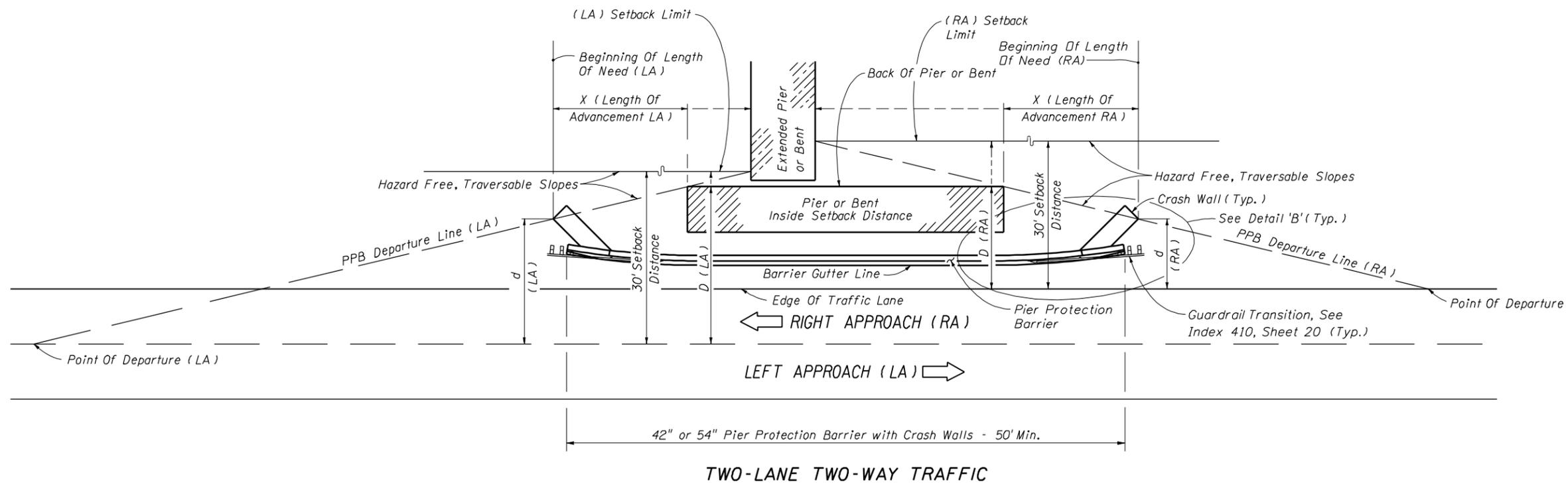
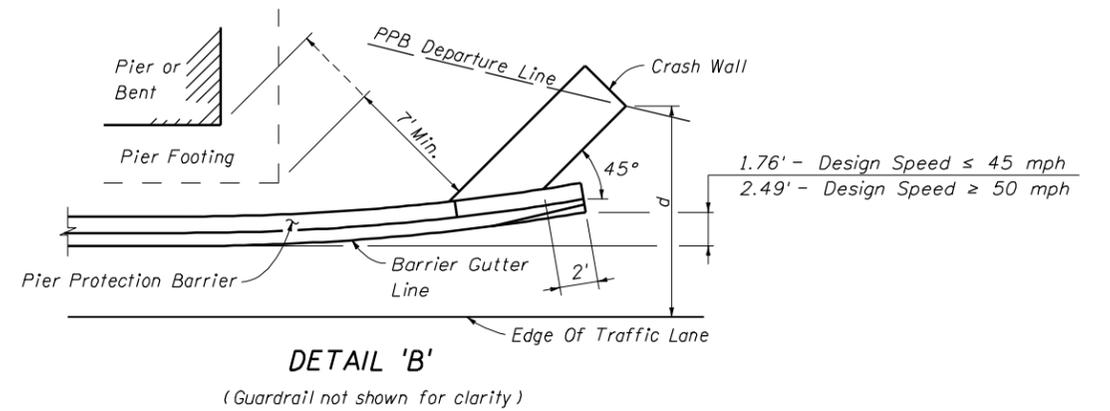
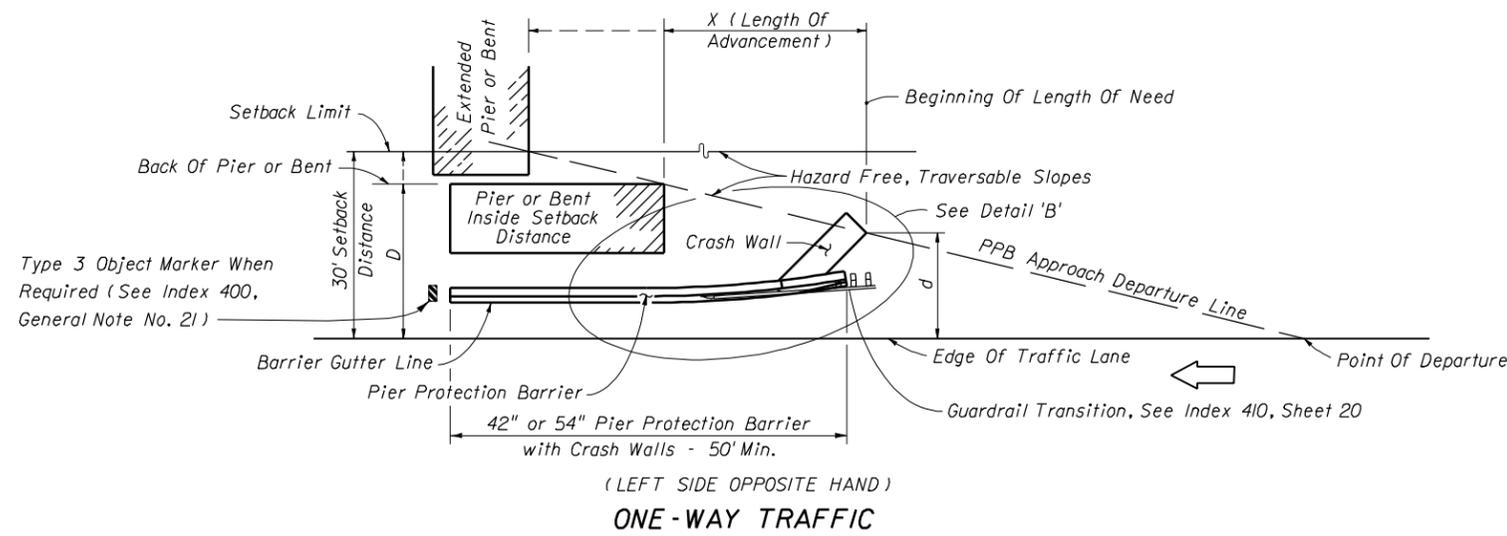
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION
07/01/06	SDO	New Design Standard issued.			



2006 Interim Design Standard

PIER PROTECTION BARRIER

Interim Date	Sheet No.
07/01/06	3 of 10
Index No.	
411	



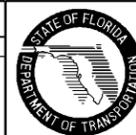
NOTES:
See Index 400 for Clear Zone and Horizontal Clearance Length of Advancement Diagrams.
PPB = Pier Protection Barrier

See Notes on Sheet 2.

LENGTH OF ADVANCEMENT DIAGRAMS - PIER PROTECTION BARRIER WITH CRASH WALL AND GUARDRAIL CONTINUATION

REVISIONS

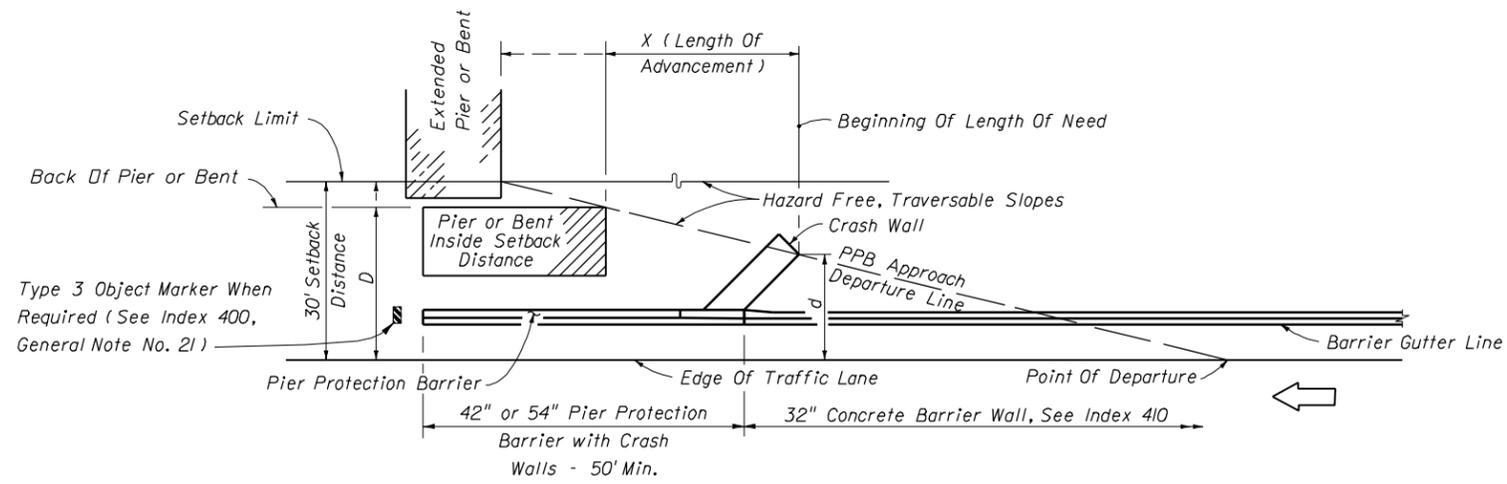
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION
07/01/06	SDO	New Design Standard issued.			



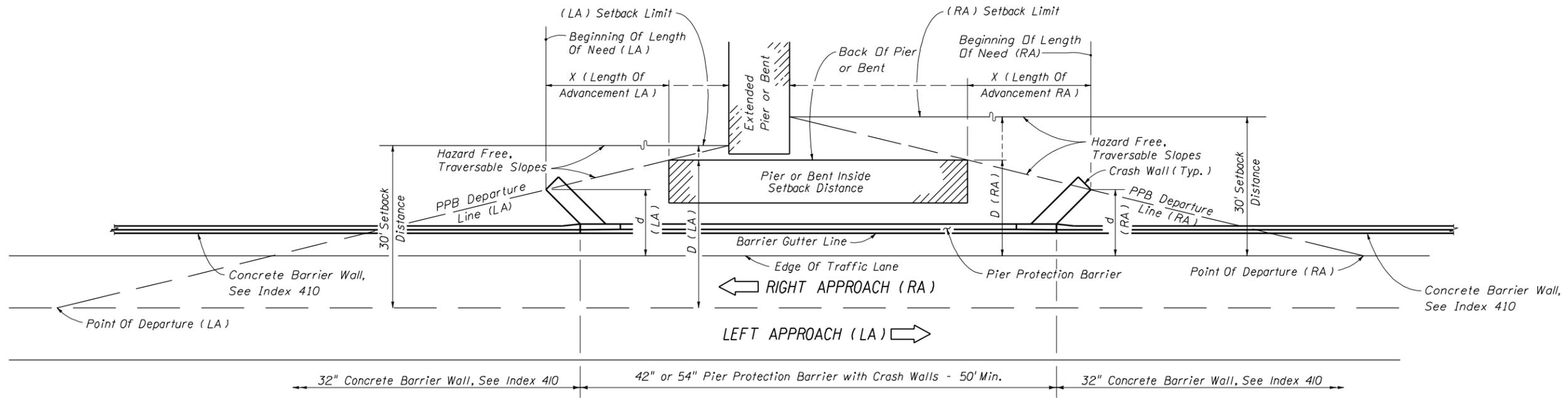
2006 Interim Design Standard

PIER PROTECTION BARRIER

Interim Date	Sheet No.
07/01/06	4 of 10
Index No.	
411	



(LEFT SIDE OPPOSITE HAND)
ONE-WAY TRAFFIC

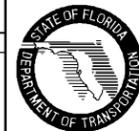


TWO-LANE TWO-WAY TRAFFIC

NOTES:
See Index 400 for Clear Zone and Horizontal Clearance Length of Advancement Diagrams.
PPB = Pier Protection Barrier

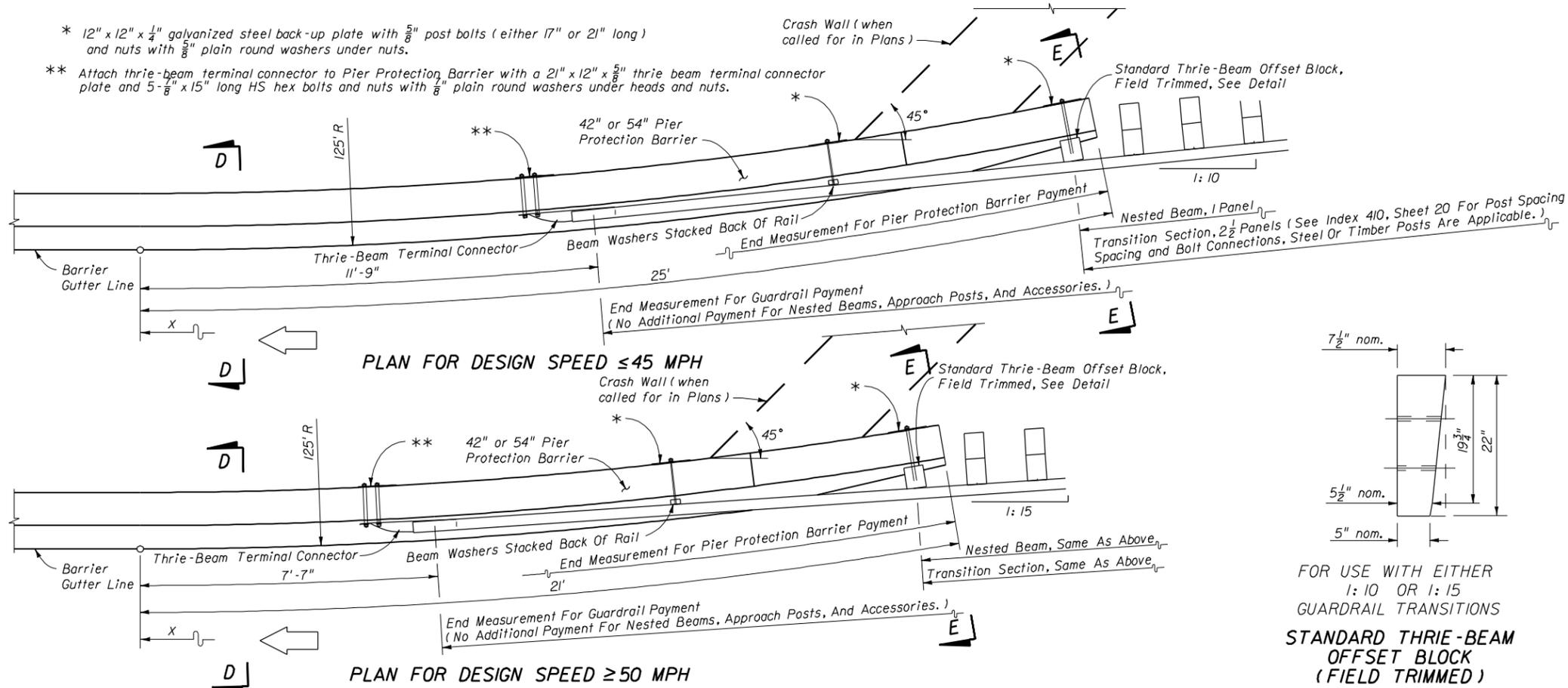
See Notes on Sheet 2.

LENGTH OF ADVANCEMENT DIAGRAMS - PIER PROTECTION BARRIER WITH CRASH WALL AND CONCRETE BARRIER WALL CONTINUATION

REVISIONS							2006 Interim Design Standard		Interim Date	Sheet No.
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION		PIER PROTECTION BARRIER		07/01/06	5 of 10
07/01/06	SDO	New Design Standard issued.							Index No. 411	

* 12" x 12" x 1/4" galvanized steel back-up plate with 5/8" post bolts (either 17" or 21" long) and nuts with 5/8" plain round washers under nuts.

** Attach thrie-beam terminal connector to Pier Protection Barrier with a 21" x 12" x 5/8" thrie beam terminal connector plate and 5-1/8" x 15" long HS hex bolts and nuts with 5/8" plain round washers under heads and nuts.

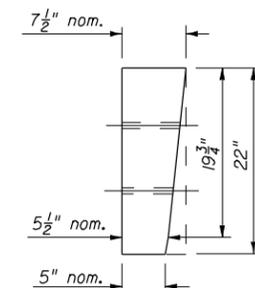


NOTES

1. The Pier Protection Barrier radial segments are intended for use on approach and trailing ends of both one-way and two-way facilities. The guardrail connections shown on this sheet apply to one-way approaches and to the approaching and trailing ends of two-lane two-way facilities. On trailing ends of two-way multilane and one-way facilities the end connection on Index 410, Sheet 2 may be used.

For guardrail connections, see Index 410, Sheet 20.

2. Refer to Index No. 400 Detail J for additional guardrail information.

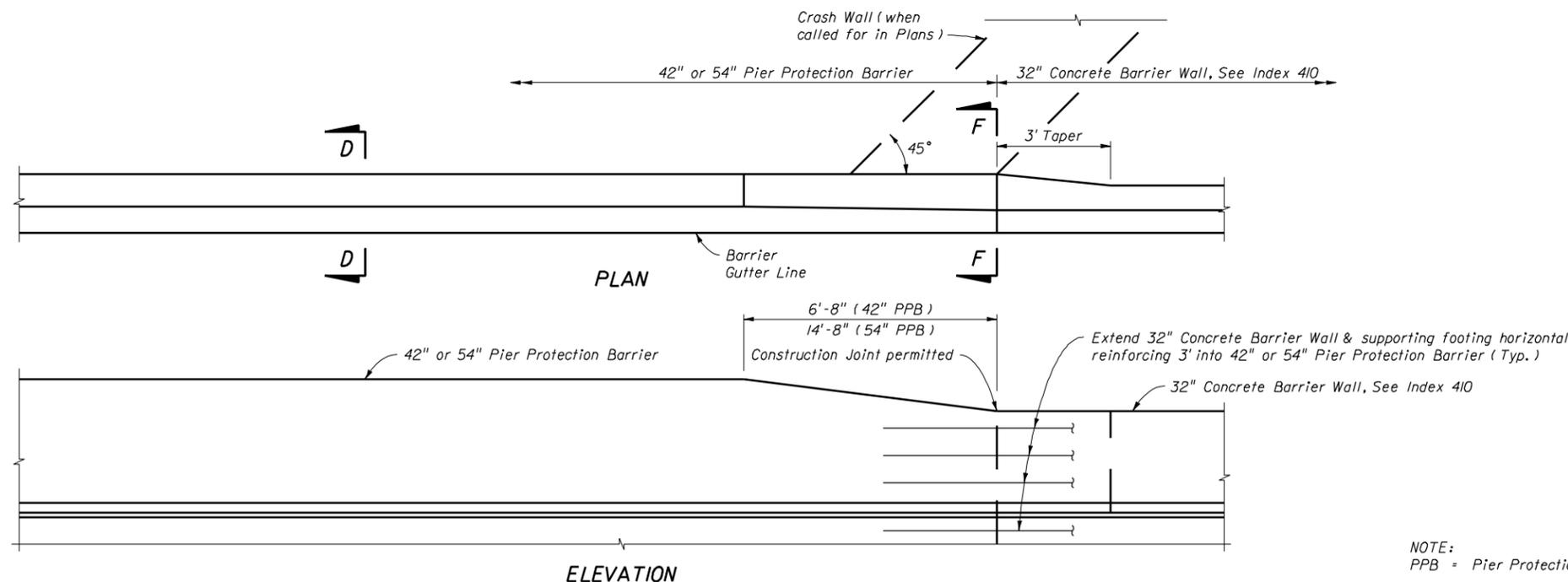


FOR USE WITH EITHER
1:10 OR 1:15
GUARDRAIL TRANSITIONS
STANDARD THRIE-BEAM
OFFSET BLOCK
(FIELD TRIMMED)

ARC LENGTH (FT)	DISTANCE "x" (FT)	OFFSETS "y" "y" (FT)
4	4.00	0.06
8	7.99	0.26
12	11.98	0.58
16	15.96	1.02
20	19.91	1.60
24	23.85	2.30
25	24.83	2.49

Note: Barrier may be constructed in chords having lengths ≤ 4 feet.

FLARED END TREATMENT - PIER PROTECTION BARRIER WITH GUARDRAIL CONTINUATION

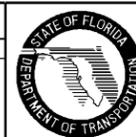


NOTE:
PPB = Pier Protection Barrier.

END TREATMENT - PIER PROTECTION BARRIER WITH CONCRETE BARRIER WALL CONTINUATION

REVISIONS

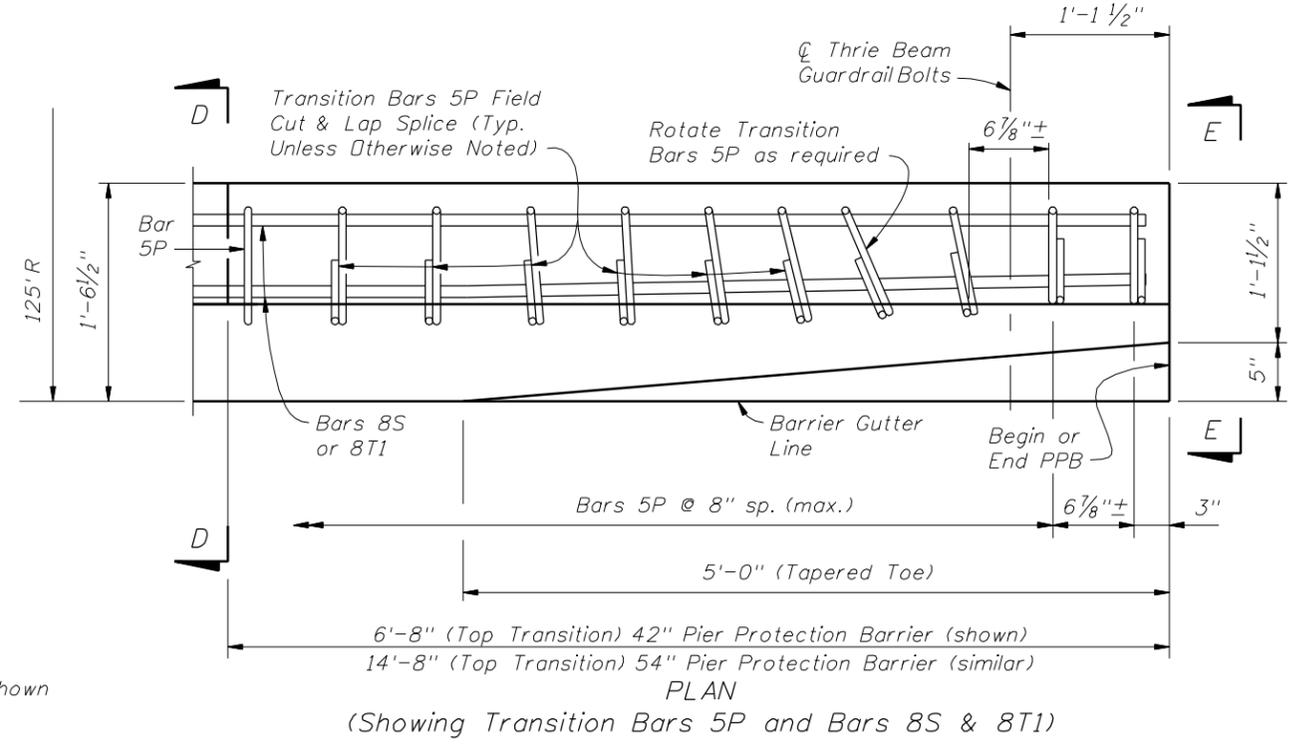
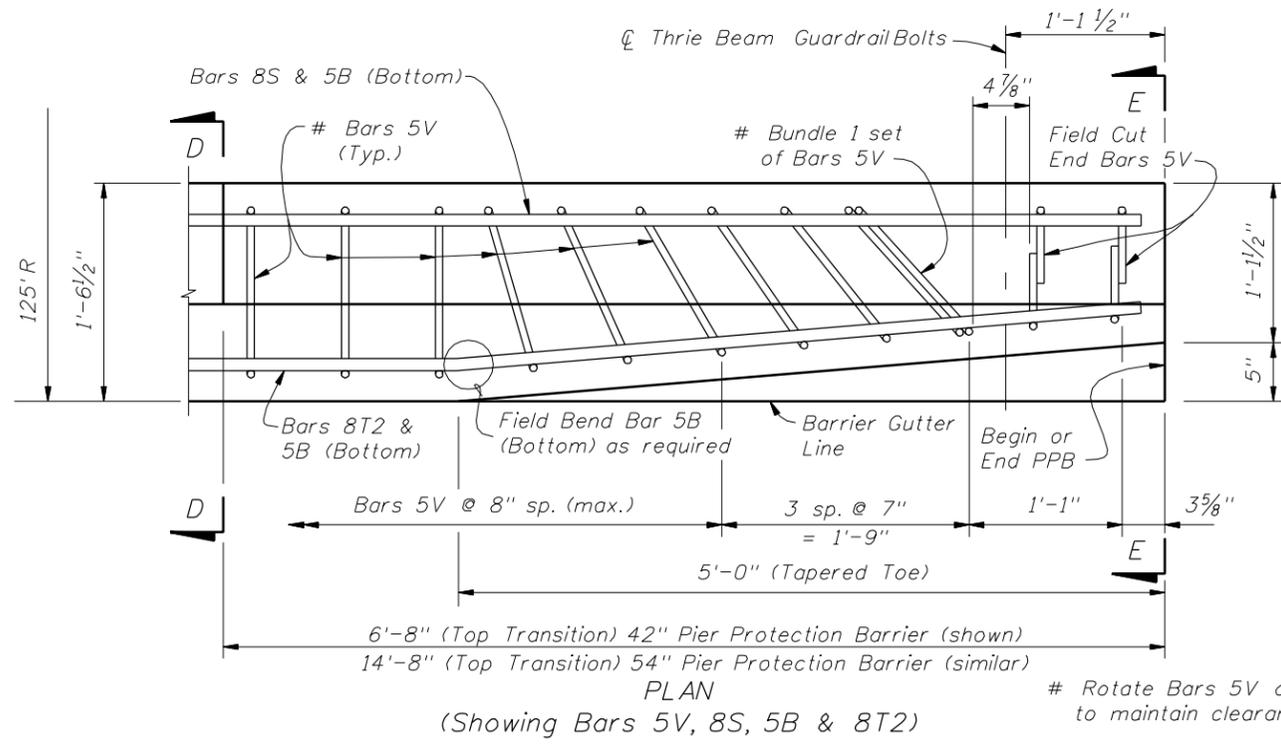
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION
07/01/06	SDO	New Design Standard issued.			



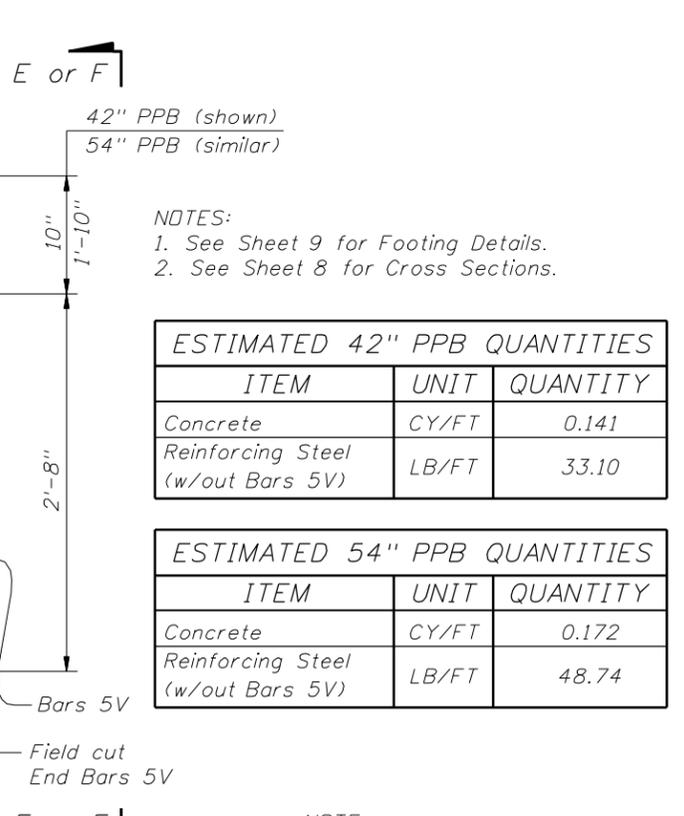
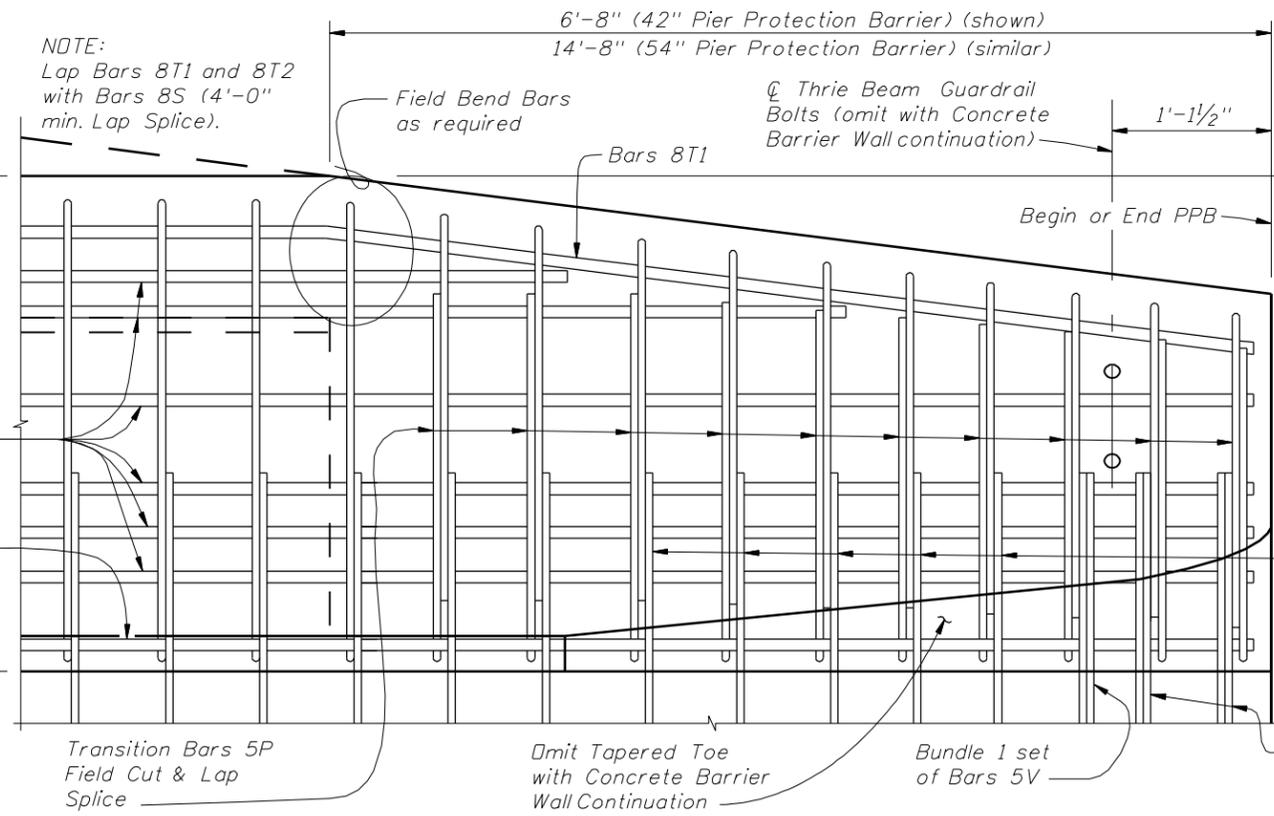
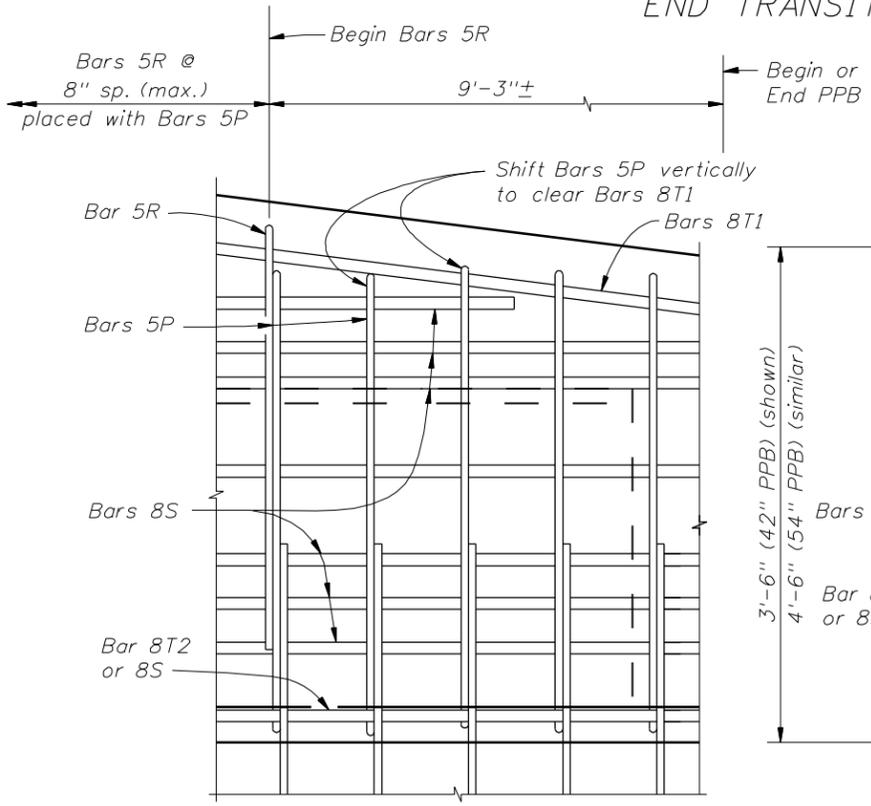
2006 Interim Design Standard

PIER PROTECTION BARRIER

Interim Date	Sheet No.
07/01/06	6 of 10
Index No.	
411	



END TRANSITION AND TAPERED TOE DETAILS - PIER PROTECTION BARRIER WITH GUARDRAIL CONTINUATION



- NOTES:
 1. See Sheet 9 for Footing Details.
 2. See Sheet 8 for Cross Sections.

ESTIMATED 42" PPB QUANTITIES		
ITEM	UNIT	QUANTITY
Concrete	CY/FT	0.141
Reinforcing Steel (w/out Bars 5V)	LB/FT	33.10

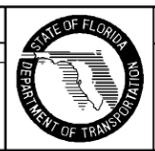
ESTIMATED 54" PPB QUANTITIES		
ITEM	UNIT	QUANTITY
Concrete	CY/FT	0.172
Reinforcing Steel (w/out Bars 5V)	LB/FT	48.74

PARTIAL ELEVATION - 54" PPB DETAIL

ELEVATION - BARRIER END TRANSITION - 42" PPB (shown); 54" PPB (similar)
 (Guardrail and back leg of Stirrups not shown for clarity)

END TRANSITION DETAILS - PIER PROTECTION BARRIER WITH GUARDRAIL OR CONCRETE BARRIER WALL CONTINUATION

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION
07/01/06	SDD	New Design Standard issued.			



2006 Interim Design Standard

PIER PROTECTION BARRIER

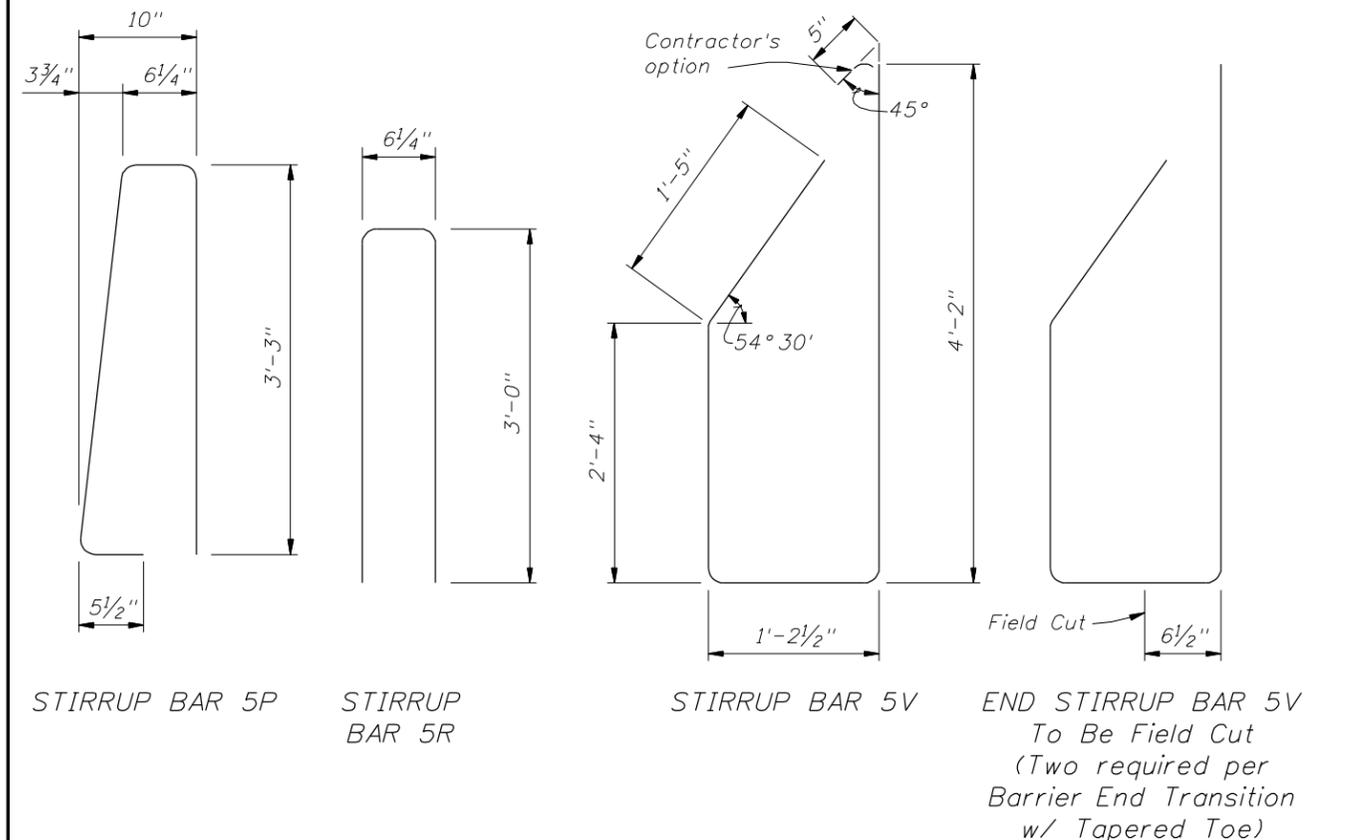
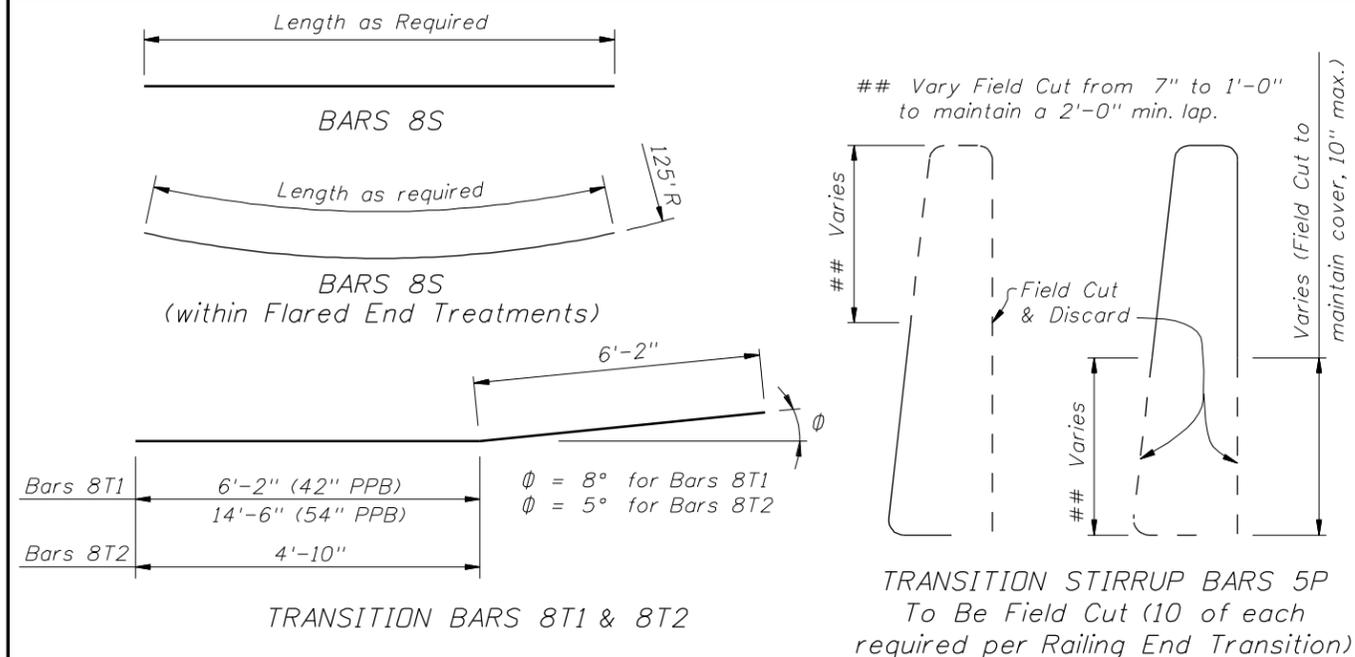
Interim Date: 07/01/06
 Sheet No.: 7 of 10
 Index No.: 411

BILL OF REINFORCING STEEL		
MARK	SIZE	LENGTH
P	5	7'-6"
R	5	6'-7"
S	8	AS REQ'D.
42" PPB T1 & T2	8	13'-0"
54" PPB T1 & T2	8	21'-0"
V	5	9'-2"

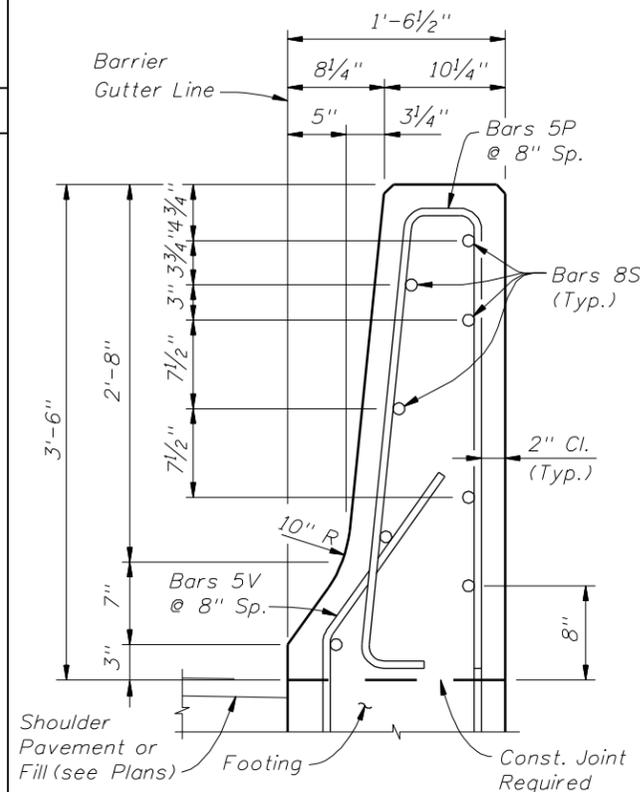
REINFORCING STEEL NOTES:
 1. All bar dimensions in the bending diagrams are out to out.
 2. Bars 8S may be continuous or spliced at the construction joints. Lap splices for Bars 8S shall be a minimum of 4'-0".
 3. The Contractor may utilize Welded Wire Fabric when approved by the Engineer. Welded Wire Fabric shall conform to ASTM A497.

NOTE: PPB = Pier Protection Barrier

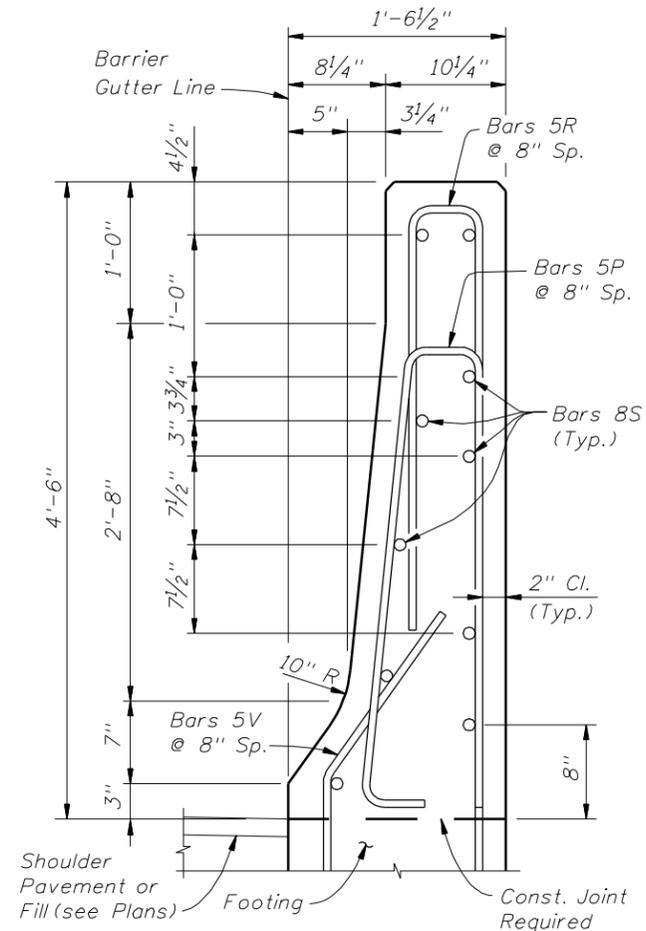
CONVENTIONAL REINFORCING STEEL BENDING DIAGRAMS



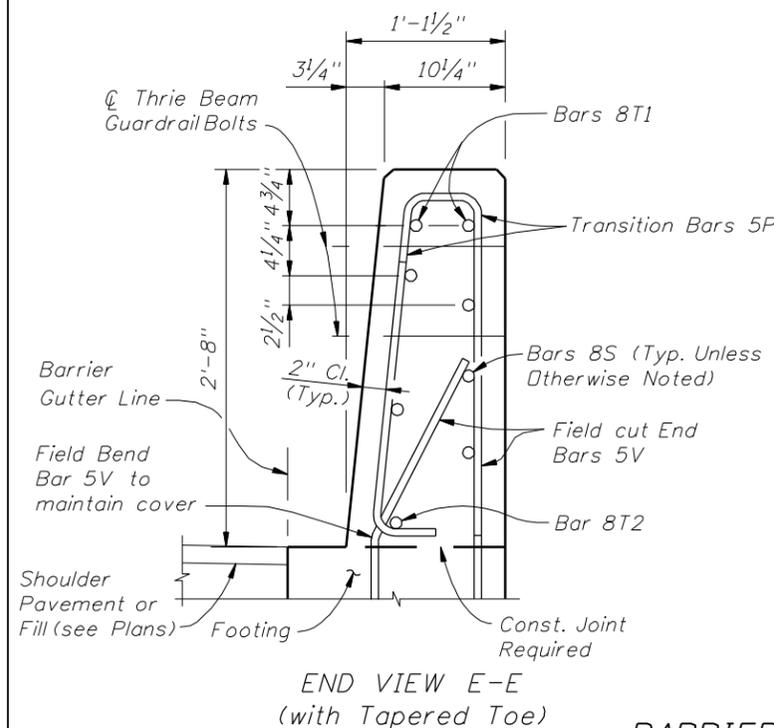
NOTES:
 1. See Sheet 9 for Footing Details.
 2. See Sheet 7 for bar spacings and details within End Transitions.



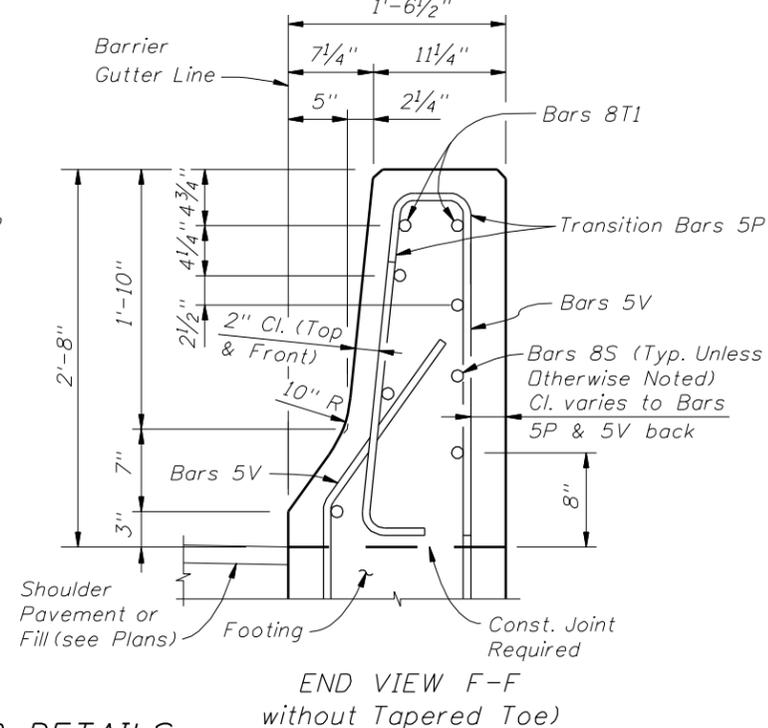
SECTION D-D
 TYPICAL SECTION THRU
 42" PIER PROTECTION BARRIER



SECTION D-D
 TYPICAL SECTION THRU
 54" PIER PROTECTION BARRIER



END VIEW E-E
 (with Tapered Toe)

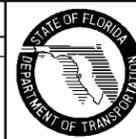


END VIEW F-F
 without Tapered Toe

BARRIER DETAILS

REVISIONS

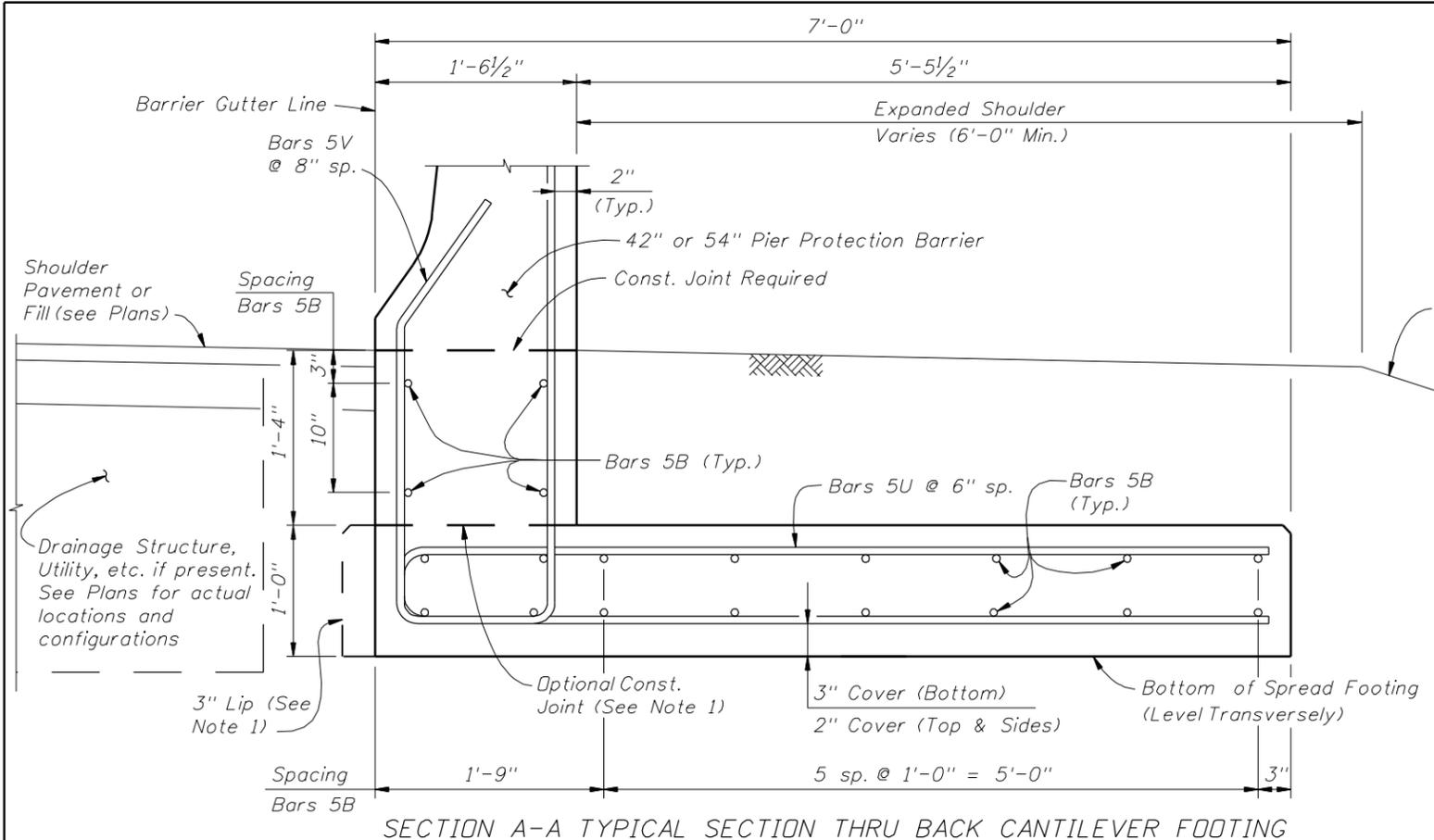
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION
07/01/06	SDD	New Design Standard issued.			



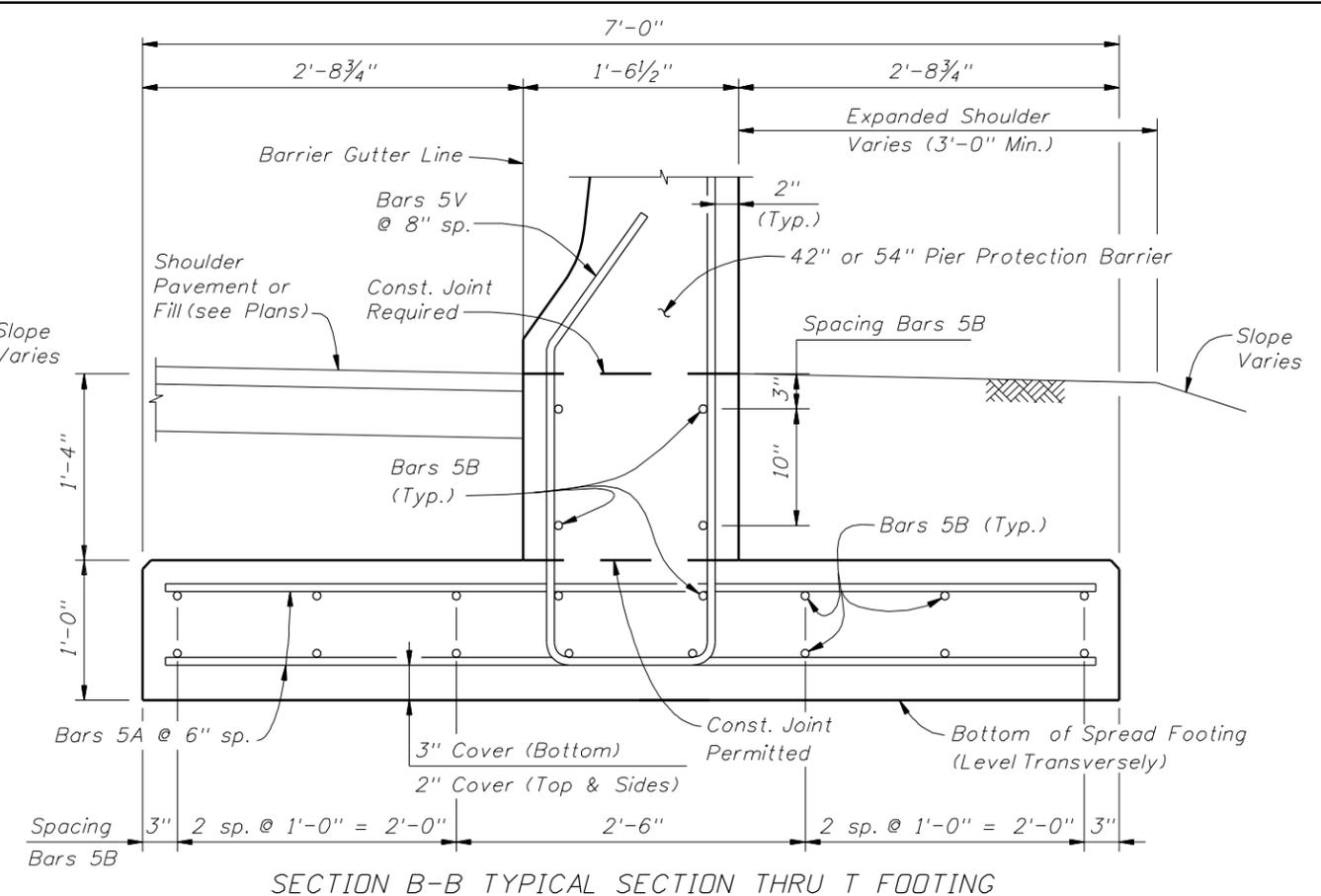
2006 Interim Design Standard

PIER PROTECTION BARRIER

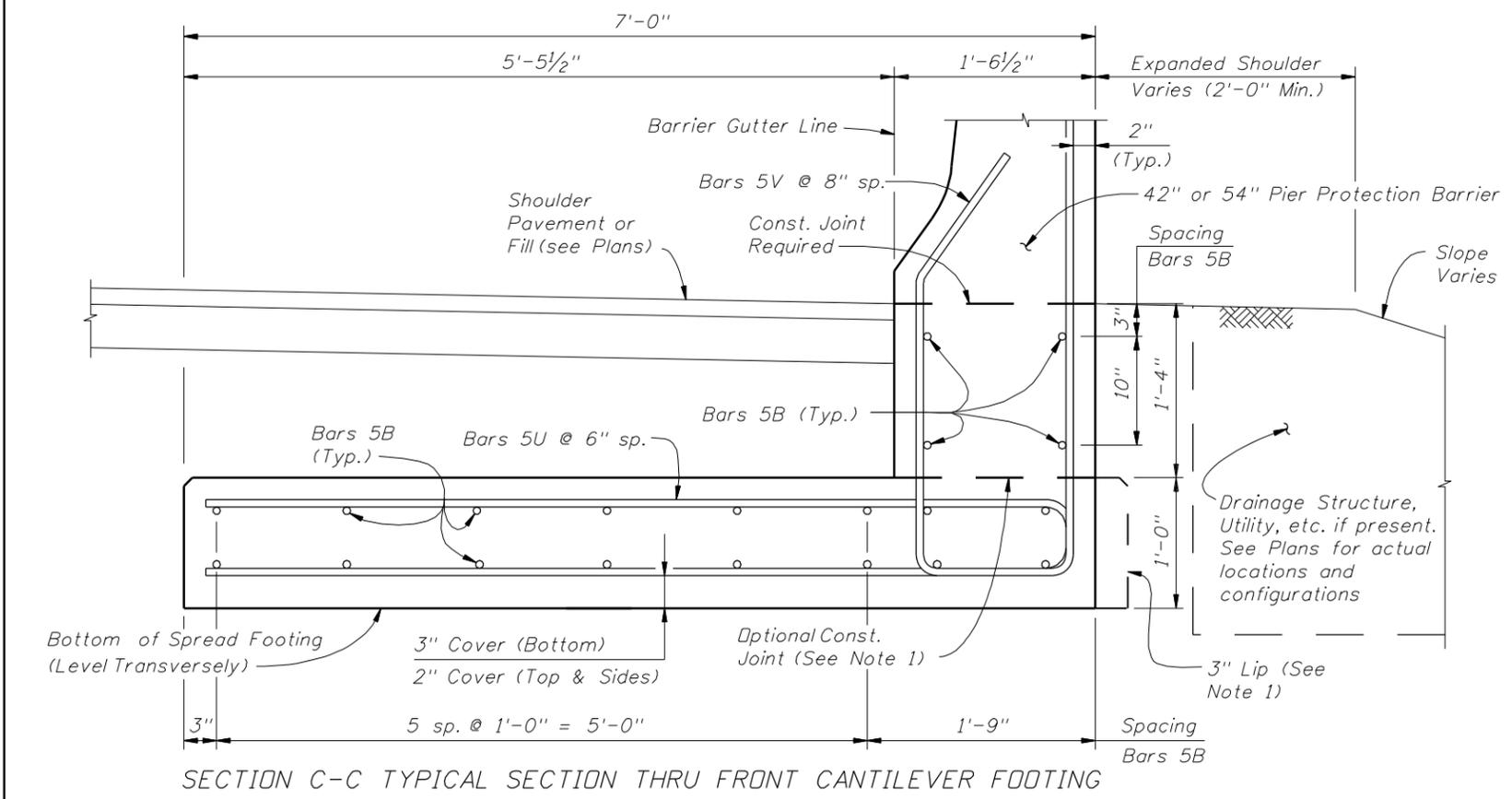
Interim Date 07/01/06	Sheet No. 8 of 10
Index No. 411	



SECTION A-A TYPICAL SECTION THRU BACK CANTILEVER FOOTING

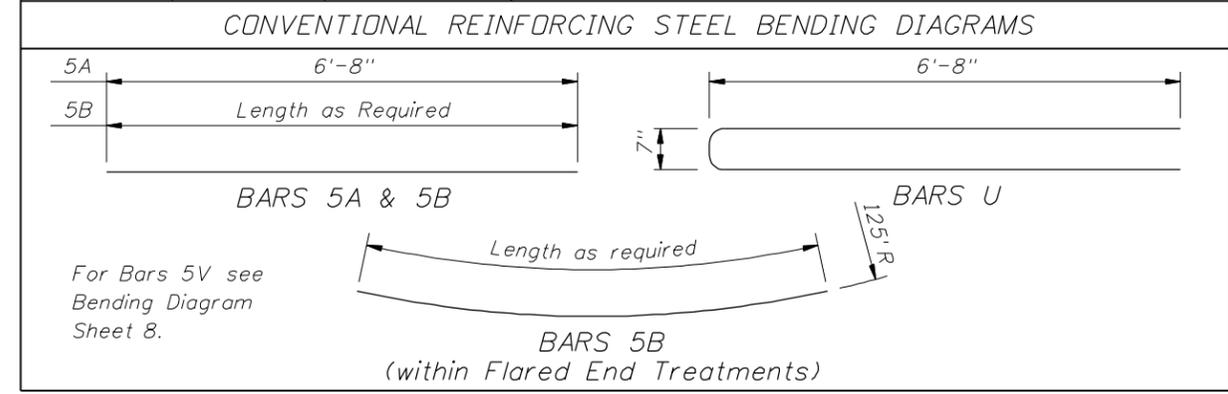


SECTION B-B TYPICAL SECTION THRU T FOOTING



SECTION C-C TYPICAL SECTION THRU FRONT CANTILEVER FOOTING

BILL OF REINFORCING STEEL			REINFORCING STEEL NOTES: 1. All bar dimensions in the bending diagrams are out to out. 2. Lap splices for Bars 5B shall be a minimum of 2'-2". 3. The Contractor may use Welded Wire Fabric when approved by the Engineer. Welded Wire Fabric shall conform to ASTM A 497.
MARK	SIZE	LENGTH	
A	5	6'-8"	
B	5	AS REQ'D.	
U	5	14'-0"	

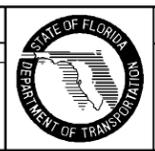


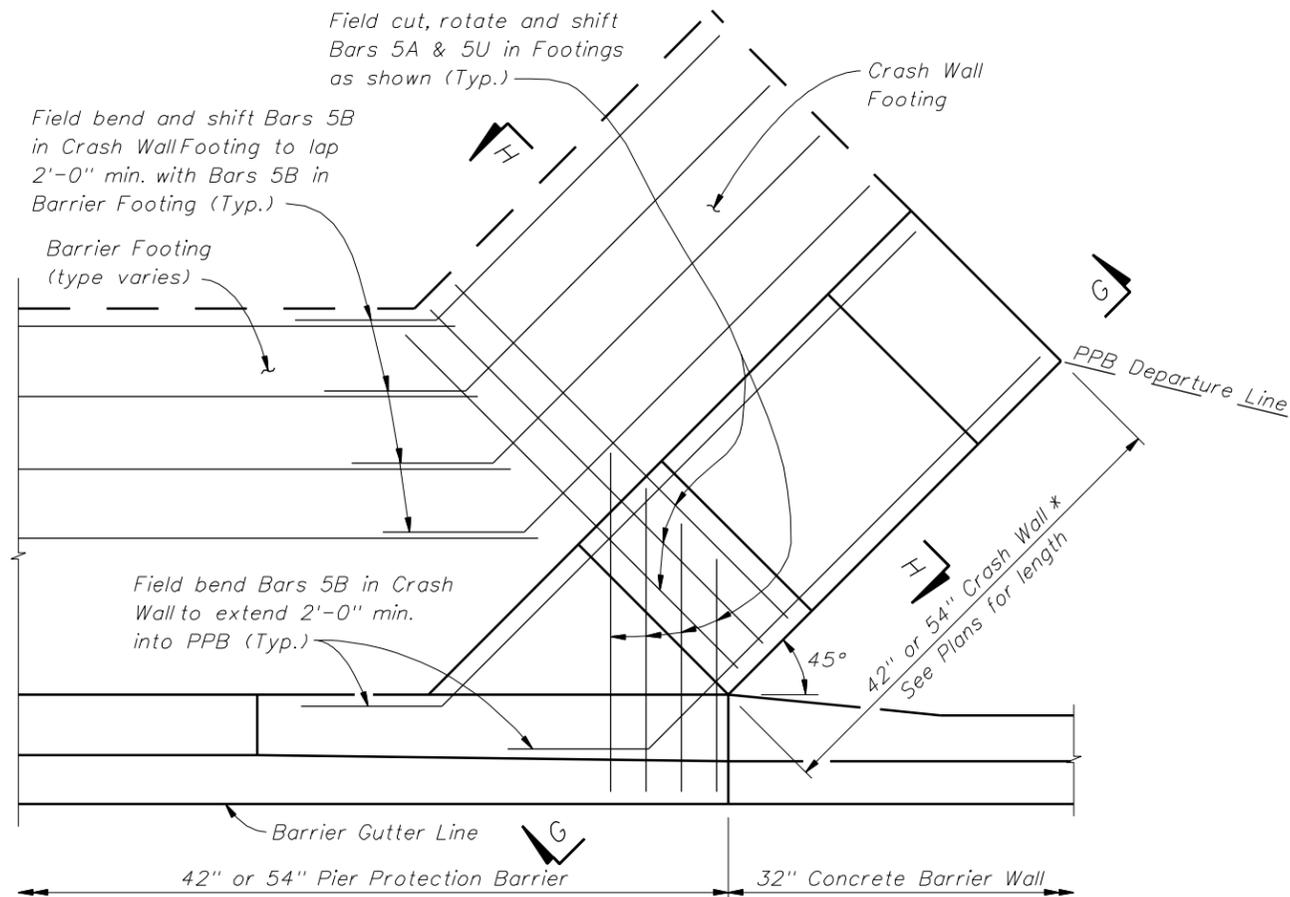
ESTIMATED BARRIER FOOTING QUANTITIES		
ITEM	UNIT	QUANTITY
Concrete	CY/FT	0.335
Reinforcing Steel (w/ Bars 5V) Cantilever Footing	LB/FT	64.32
Reinforcing Steel (w/ Bars 5V) T Footing	LB/FT	63.01

NOTES:
1. Provide 3" lip when optional construction joint is used. Omit 3" lip adjacent to Barrier Wall Inlets and as required to provide 2" min. clear between Cantilever Footing and adjacent Pier Footing or Column.
2. See Sheets 7 & 8 for Barrier Details.

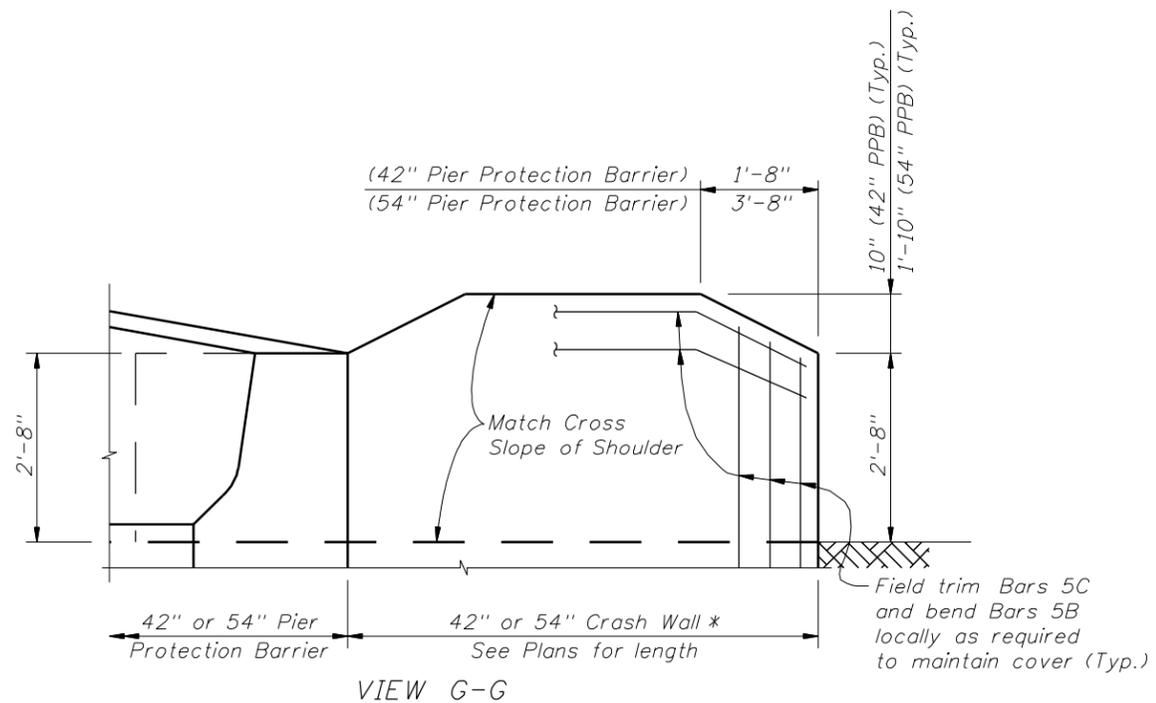
BARRIER FOOTING DETAILS

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION
07/01/06	SDD	New Design Standard issued.			

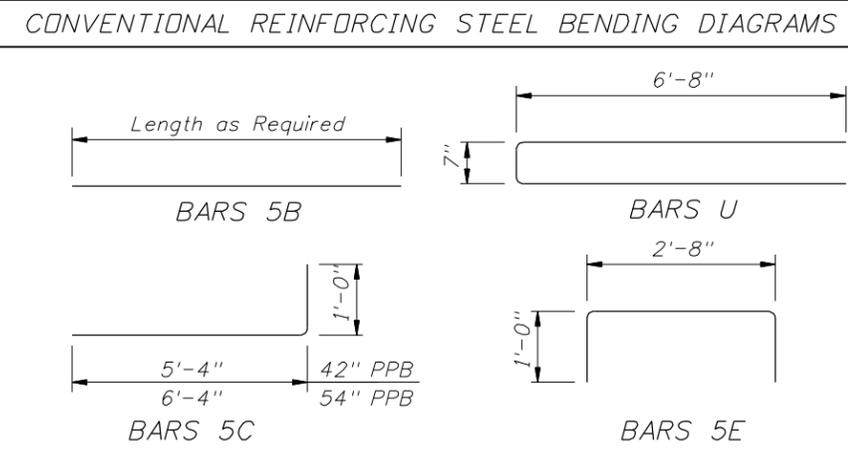




PLAN VIEW
(Concrete Barrier Wall Continuation shown, Guardrail Continuation similar)



* Match height of adjacent Pier Protection Barrier



BILL OF REINFORCING STEEL

MARK	SIZE	LENGTH
B	5	AS REQ'D.
C	5	6'-4" / 7'-4"
E	5	4'-8"
U	5	11'-0"

REINFORCING STEEL NOTES:

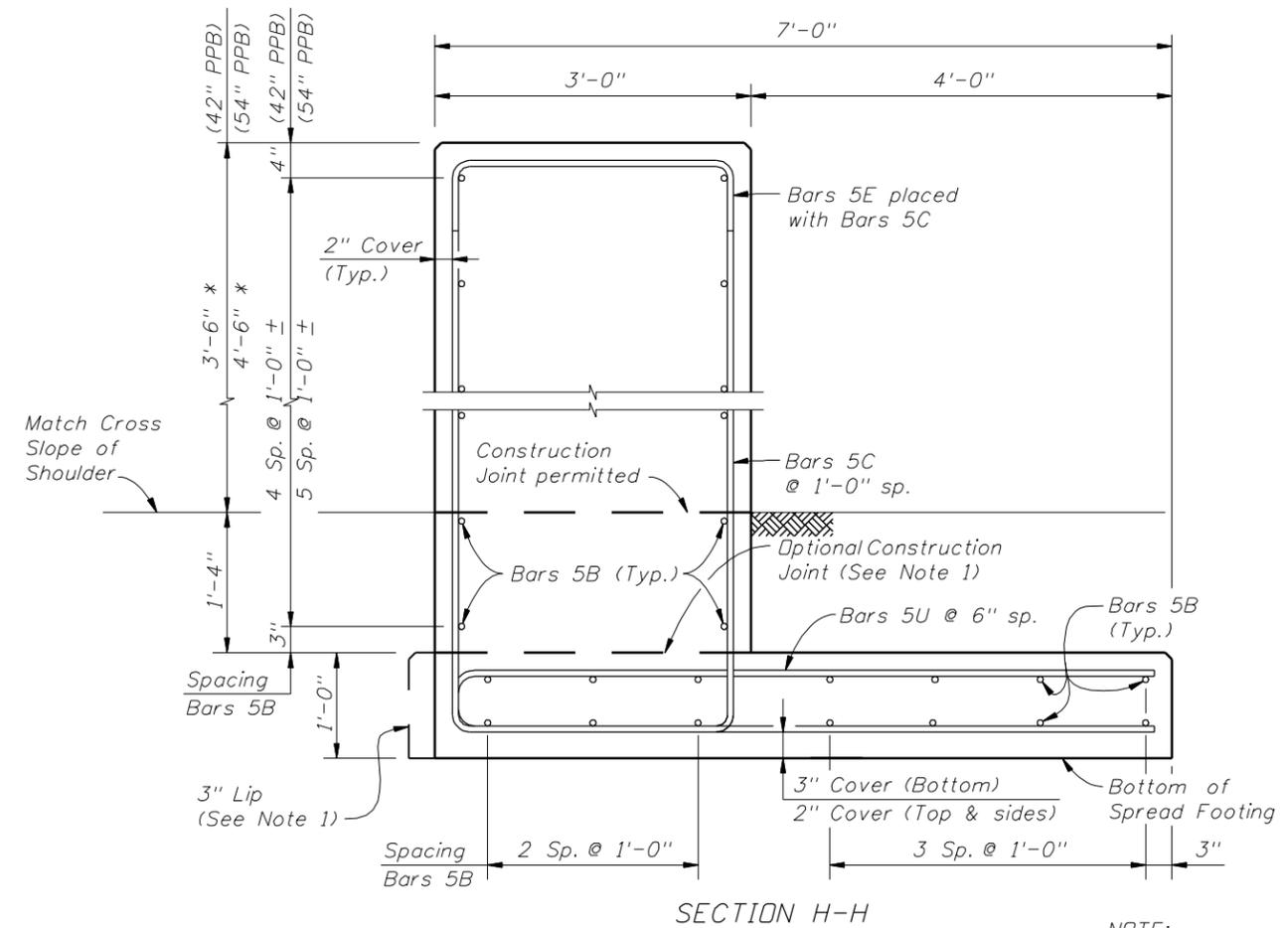
- All bar dimensions in the bending diagrams are out to out.
- Lap splices for Bars 5B shall be a minimum of 2'-2".
- The Contractor may use Welded Wire Fabric when approved by the Engineer. Welded Wire Fabric shall conform to ASTM A 497.

ESTIMATED CRASH WALL & FOOTING QUANTITIES

ITEM	UNIT	QUANTITY
Concrete (Footing)	CY/FT	0.260
Concrete (42" Crash Wall)	CY/FT	0.389
Concrete (54" Crash Wall)	CY/FT	0.500
Reinforcing Steel (42" Crash Wall)	LB/FT	66.06
Reinforcing Steel (54" Crash Wall)	LB/FT	70.23

NOTES:

- Provide 3" lip when optional construction joint is used.
- See Sheet 8 for Barrier Details and Sheet 9 for Barrier Footing details.

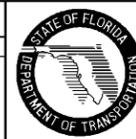


NOTE:
PPB = Pier Protection Barrier

CRASH WALL & FOOTING DETAILS

REVISIONS

DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION
07/01/06	SDD	New Design Standard issued.			



2006 Interim Design Standard

PIER PROTECTION BARRIER

Interim Date 07/01/06 Sheet No. 10 of 10

Index No. 411