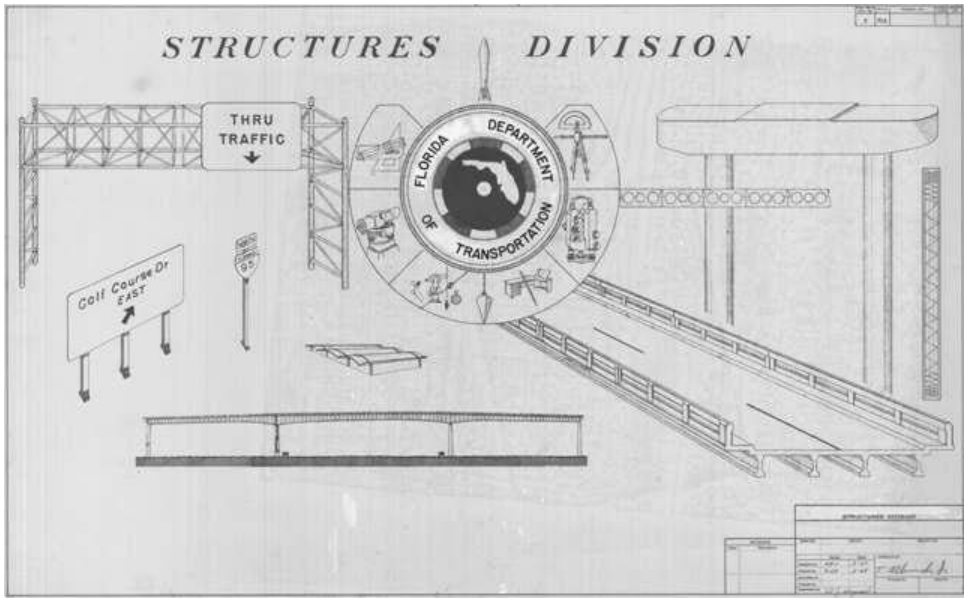
FLORIDA DEPARTMENT OF TRANSPORTATION



INSTRUCTIONS FOR STRUCTURES RELATED DESIGN STANDARDS

FDOT STRUCTURES MANUAL
VOLUME 3
MARCH 2010

Structures Design
Florida's Transportation Engineers

Table of Contents

Introduction

I.1 General

The ***Instructions for Structures Related Design Standards*** provides general instructions to assist the Design Engineer of Record when incorporating these ***Design Standards*** in the Contract Plans. Instructions including design criteria, usage limitations, plan content requirements, pay item information and in some cases examples and sample drawings are provided for bridge component, overhead sign structure, box culvert and mast arm standards.

Instructions are organized by ***Design Standard*** index number. Some structural items are addressed in a series of standard drawings, e.g., prestressed beams and traffic railing retrofits. Instructions for all the standards in each respective series are included in the instructions for the lead standard of the series.

It is the responsibility of the Design Engineer of Record using these instructions to determine the fitness for a particular use of each standard in the design of a project. The inappropriate use of and adherence to these instructions does not exempt the engineer from the professional responsibility of developing an appropriate design.

I.2 Use of Design Standards

The structures related ***Design Standards*** comprise the latest and best practices of the FDOT as follows:

1. Compliance with various design specifications as modified or adopted by FDOT including the ***AASHTO LRFD Bridge Design Specifications***; Florida Building Commission ***Florida Building Code***; National Fire Protection Association (NFPA) 101 ***Life Safety Code***; etc.
2. Compliance with various Federal laws and regulations including U.S. Access Board ADA Accessibility Guidelines; Code of Federal Regulations Title 33, Chapter 1, Part 118 Bridge Lighting and Other Signals; etc.
3. Application of FDOT design criteria, policies and preferences
4. Pay Item, Qualified Products List and Construction Specification consistency and coordination
5. Detail clarity
6. Proven designs for constructability and long term maintenance
7. Reserve structural capacity and / or redundancy of design
8. Material usage
9. Contractor familiarity
10. Formwork availability for concrete components

In this regard, incorporate the structures related ***Design Standards*** as appropriate on all projects unless a need to develop project specific designs can be documented. Examples of where a project specific design might be required include:

1. A reduced height prestressed concrete beam for a bridge widening
2. A standard pedestrian railing modified to include aesthetic enhancements
3. A single modular expansion joint that can accommodate large movements in lieu of multiple strip seal expansion joints

I.3 Data Tables

Many structures related ***Design Standards*** require Data Tables that must be completed by the designer and then included in the Contract Plans. These Data Tables provide critical information to the contractor that supplements or completes individual ***Design Standards***. These Data Tables are presented as CADD Cells and are included with the FDOT CADD Software on the "FDOT Structures Bar Menu." Updates to the Data Tables for Interim Design Standards are available on the Structures Design Office website at:

http://www.dot.state.fl.us/structures/CADD/standards/CurrentStandards/MicrostationDrawings.shtm

Most Data Tables include a “Table Date” in the upper right corner of the table. Do not change the “Table Date” when completing and including the table in the plans. The “Table Date” reflects the latest modification of the CADD cell and is intended to be used in a Quality Control process, in conjunction with these instructions and the CADD cells provided with the Structures Bar Menu and/or available at the website listed above, to confirm that the current Data Table is being used. The “Table Date” will not necessarily be the same as the “Last Revision” date or “Interim Date” shown on the associated ***Design Standard*** or ***Interim Design Standard***, respectively. The current “Table Date” for a given standard will be that shown in these instructions.

Index 289 Concrete Box Culvert Details (LRFD)

Design Criteria

AASHTO LRFD Bridge Design Specifications, 4th Edition; ***Structures Design Guidelines (SDG)***

Design Assumptions and Limitations

Designs for box culverts shown in this Index are to be produced only by computer analysis, utilizing the Department's ***LRFD*** Box Culvert Program. Designs are to be limited to the live loads and dimensional restraints shown in the General Notes of this Index and to the fill on the barrel(s), as shown in the Contract Plans.

Headwalls with skew angles less than -50° or greater than +50° require special design authorization. In these cases, other design options should be considered. Contact the District Drainage Engineer to obtain authorization.

At the contractor's option, Index 292 Standard Precast Concrete Box Culverts may be substituted for Index 289 cast-in-place box culverts unless specifically prohibited by a plan note. See also Instructions for Index 292.

Plan Content Requirements

In the Roadway Plans:

Complete the following "Box Culvert Data Tables" and include them in the plans. See Introduction I.3 for more information regarding use of Data Tables.

Work these data tables with the FDOT MathCAD ***LRFD*** Box Culvert Program and Index 289.

Fill in tables using the “Include” Key-In Utility in MicroStation and line1.prn thru line6.prn files located in the program root directory.

Use Structures Site Menu>Text>Table Data, which uses "Chart" Text Style and font 169 Structures proportional.

Complete Notes 1 thru 7. Delete Note 7 when not applicable.

For box culverts meeting the definition of a bridge structure (See ***PPM***, Volume 1, Chapter 33) include the Bridge Number in the plans and the Load Rating Sheet per ***SDG*** 3.15.14.

BOX CULVERT DATA TABLES

BOX, HEADWALL AND CUTOFF WALL DATA TABLE (inches unless shown otherwise)																				Table Date 7-01-09
LOCATION	STRUCTURE /BRIDGE NUMBER	BOX									HEADWALL AND CUTOFF WALL									
		Wc(ft)	Hc(ft)	Tt	Tw	Tb	Ti	#cells	Lc(ft)	Cover	Blhw	Hlhw	Brhw	Hrhw	Blcw	Hlcw	Brcw	Hrcw	SL(deg)	SR(deg)

LEFT SIDE WINGWALLS DATA TABLE (inches unless shown otherwise)																		Table Date 7-01-09
STRUCTURE /BRIDGE NUMBER	LEFT END WINGWALL									LEFT BEGIN ENDWALL								
	Rt	Rw	Rh	Rd	SW(deg)	β(deg)	He(ft)	Hs(ft)	Lw(ft)	Rt	Rw	Rh	Rd	SW(deg)	β(deg)	He(ft)	Hs(ft)	Lw(ft)

RIGHT SIDE WINGWALLS DATA TABLE (inches unless shown otherwise)																		Table Date 7-01-09
STRUCTURE /BRIDGE NUMBER	RIGHT END WINGWALL									RIGHT BEGIN ENDWALL								
	Rt	Rw	Rh	Rd	SW(deg)	β(deg)	He(ft)	Hs(ft)	Lw(ft)	Rt	Rw	Rh	Rd	SW(deg)	β(deg)	He(ft)	Hs(ft)	Lw(ft)

ESTIMATED CONCRETE QUANTITIES (CY)																					Table Date 7-01-09
STRUCTURE /BRIDGE NUMBER	BOX								LEFT END WINGWALL			LEFT BEGIN WINGWALL			RIGHT END WINGWALL			RIGHT BEGIN WINGWALL			Culvert Total
	Left Cutoff Wall	Right Cutoff Wall	Bottom Slab	Walls	Top Slab	Left Head Wall	Right Head Wall	Sub Total	Footing	Wall	Sub Total	Footing	Wall	Sub Total	Footing	Wall	Sub Total	Footing	Wall	Sub Total	

MAIN STEEL REINFORCEMENT SPACING (inches)																			Table Date 7-01-09
STRUCTURE /BRIDGE NUMBER	BOX															HEADWALLS		CUTOFF WALLS	
	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115, 116...	803	806	809	812

NOTES:

1. Environmental Class -----
2. Reinforcing Steel, Grade -----
3. Concrete Class ----- f'c = ----- ksi
4. Soil Properties:
   Friction Angle -----
   Modulus of Subgrade Reaction -----
   Nominal Bearing Resistance -----
5. Total Estimated Quantity of Reinforcing Steel ----- lbs
6. Work this Drawing with Design Standards Index No. 289 and Sheet Nos. -----
7. Settlement criteria for Precast Box Culvert option (Index No. 291):
   Long Term Differential Settlement (ΔY) = ------ ft.
   Effective Length for Settlement (L) = ------ ft.

WINGWALL STEEL REINFORCEMENT SPACING (inches)																										Table Date 7-01-09
STRUCTURE /BRIDGE NUMBER	LEFT END WINGWALL							LEFT BEGIN WINGWALL							RIGHT END WINGWALL							RIGHT BEGIN WINGWALL						
	401 407(8)	402 (403)	404 (405)	406	409	410	411	501 507(8)	502 (503)	504 (505)	506	509	510	511	601 607(8)	602 (603)	604 (605)	606	609	610	611	701 707(8)	702 (703)	704 (705)	706	709	710	711

WINGWALL NOTE: Bar designations in "( )" are only required for variable height wingwalls.

Payment

Item number	Item description	Unit Measure
400-1-1	Concrete Class I, Culverts	CY
400-2-1	Concrete Class II, Culverts	CY
400-4-1	Concrete Class IV, Culverts	CY
415-1-6	Reinforcing Steel - Miscellaneous	LB

Index 291 Supplemental Details for Precast Concrete Box Culverts

Design Criteria

AASHTO LRFD Bridge Design Specifications, 4th Edition; ***Structures Design Guidelines (SDG)***

Design Assumptions and Limitations

Work this Index with the Cast-In-Place Concrete Box Culvert Details and Data Tables shown in the plans, Indexes 289 and 292, and the Precast Concrete Box Culverts shown in the shop drawings.

Plan Content Requirements

Show Differential Settlement (ΔY) and Effective Length (L) for single curvature deflection in the Contract Plans where significant long-term settlement is anticipated. See Index 291(Sheet 5 of 5) for details.

Payment

Item number	Item description	Unit Measure
400-1-1	Concrete Class I, Culverts	CY
400-2-1	Concrete Class II, Culverts	CY
400-4-1	Concrete Class IV, Culverts	CY
415-1-6	Reinforcing Steel - Miscellaneous	LB

Index 292 Standard Precast Concrete Box Culverts

Design Criteria

AASHTO LRFD Bridge Design Specifications, 4th Edition; ***Structures Design Guidelines (SDG)***

Design Assumptions and Limitations

At the contractor's option, these precast designs may be substituted for cast-in-place box culverts designed to ***AASHTO LRFD Bridge Design Specifications***, 4th Edition. Designs are based on the design criteria shown in the ***SDG***.

Use this standard with Index 291.

This index may be used in lieu of Index 289 when a cast-in-place box culvert is determined to be inappropriate for the project. In such cases, the designer shall show the box culvert Span, Rise and Design Earth Cover in the plans. The designer shall also provide the headwall and wing wall design in the plans by completing the relevant data tables and notes for Index 289 (Box Culvert Data Tables).

Plan Content Requirements

Include references to and completed data tables for Index 289 Concrete Box Culvert Details in the plans. Use of Index 292 in lieu of Index 289 is at the contractor's option unless specifically excluded by plan note.

Payment

Item number	Item description	Unit Measure
400-1-1	Concrete Class I, Culverts	CY
400-2-1	Concrete Class II, Culverts	CY
400-4-1	Concrete Class IV, Culverts	CY
415-1-6	Reinforcing Steel - Miscellaneous	LB

Index 302 Traffic Separators

Design Criteria

AASHTO A Policy on Geometric Design of Highways and Streets, Fourth Edition, 2001 (AASHTO Green Book)

Design Assumptions and Limitations

Bridge mounted Traffic Separators are intended to match up geometrically with adjacent roadway Traffic Separators. They are essentially the same as roadway Traffic Separators but with the addition of reinforcing steel to limit cracking caused by shrinkage and deflection of the bridge deck due to live load.

For treatment of Traffic Separators on skewed bridges see Index 490.

Plan Content Requirements

In the Structures Plans:

In the Materials Note on the General Notes sheet, specify the use of Class I concrete meeting the requirements of ***Specifications*** Section 347.

Show and label the Traffic Separator on the Plan and Elevation, Typical Section and Superstructure sheets, and other sheets as required. Specify the same shape Traffic Separator (Type "E" or "F") as is used on the roadway approach. Include cross references to ***Design Standards*** Index 302.

Estimated concrete quantities and reinforcing steel lists are not required.

Payment

Item number	Item description	Unit Measure
520-5-AB	Concrete Traffic Separator	LF
520-70	Concrete Traffic Separator, Special- Variable Width	SY

Index 402 Guardrail Transitions and Connections for Existing Bridges

Design Criteria

NCHRP Report 350; ***AASHTO LRFD Bridge Design Specifications,*** 4th Edition, Section 13; ***Structures Design Guidelines (SDG)***

Design Assumptions and Limitations

This standard contains details for attaching thrie beam guardrail approach transition retrofits to Index 470 and 480 Series bridge railing retrofits and also to existing safety shape bridge traffic railings. Use this standard with Indexes 410, 470, 471, 472, 473, 474, 475, 476, 480, 481, 482, 483 and 484.

The appropriate Index 402 approach transition retrofit for Index 470 and 480 Series bridge railing retrofits must be selected and specified in the plans based on the shapes and designs of the existing bridge traffic railings, approach slabs and end bent wing walls. See the Instructions for Index 470 and Index 480 and ***SDG*** 6.7 for more information.

The following three sections of instructions address the use of Index 402 with existing safety shape bridge traffic railings:

1. A Historical Compilation of Superseded Florida Department of Transportation "Structures Standard Drawings" for "F" and "New Jersey" Shape Structure Mounted Traffic Railings
2. Guardrail Approach Transition Retrofit Instructions for Existing Flat Slab Bridges
3. Guardrail Approach Transition Retrofit Instructions for Existing Beam/Girder Bridges

Index 402 Thrie-Beam Guardrail transition retrofits are bolted to existing safety shape bridge traffic railings through field drilled holes utilizing the pre-drilled Thrie-Beam Terminal Connector as a template. This method of attachment creates the potential for conflicts between the new attachment bolts and existing utilities and/or conduits. Compare the locations of the new attachment bolts with the positions of any existing utilities and/or conduits. Guidance is provided on Index 402 for selecting a bolt pattern for the Thrie-Beam Terminal Connector that may avoid existing utilities and/or conduits. Existing utilities and/or conduits that conflict with the possible bolt patterns shall be relocated if possible or placed out of service. Include all necessary utility adjustment information in the Roadway Plans

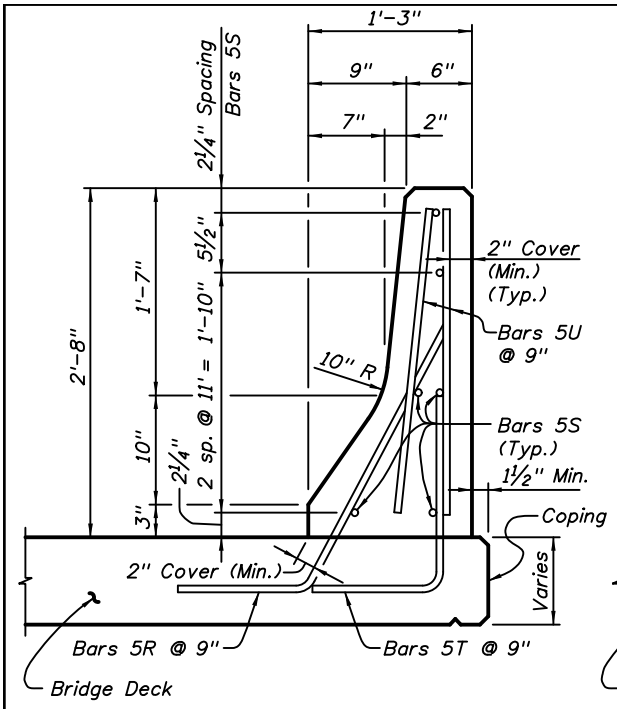
1. A Historical Compilation of Superseded FDOT Structures Standard Drawings for "F" and "New Jersey" Shape Structure Mounted Traffic Railings:

The following list of superseded standard drawings and associated railing typical sections and end transition details are presented as a historical reference for use when evaluating existing safety shape structure mounted traffic railings.

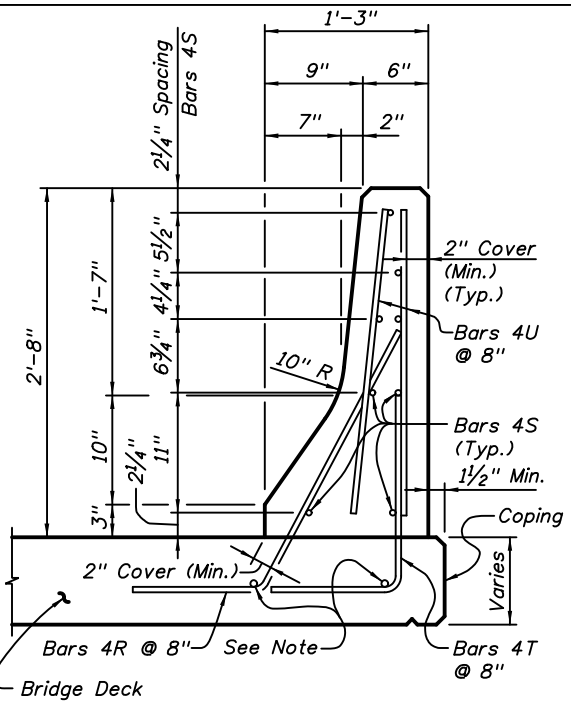
Utilities and/or conduits may exist in or adjacent to existing traffic railings and will vary in size, number and location. Utilities and/or conduits are not shown on these railing typical sections or end transition details.

Welded Wire Reinforcing (WWR) may have been used in place of the conventional reinforcing steel shown on the railing typical sections. Reinforcing steel was not standardized for railing end transitions but was instead included with the end bent reinforcing steel as a project specific design. Thus, some degree of variability can be expected for this reinforcing steel.

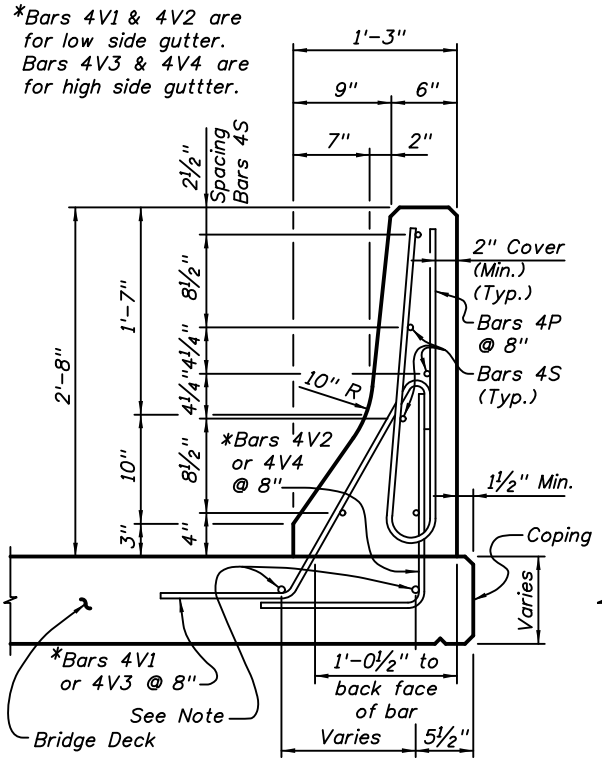
Superseded FDOT Structure Mounted Traffic Railing Standards			
Standard Index No.	**Railing Type**	**Drawing Date**	**Revision Date(s)**
11407	New Jersey	3/74	10/74
11407	New Jersey	3/78	10/77, 1/78, 9/78, 7/80, 3/81 & 8/81
11460	New Jersey	5/74	6/75, 8/75, 10/77, 9/78, 3/80, 7/80, 3/81, 8/81 & 5/82
12670	New Jersey	3/78	1/81 & 8/81
12931	New Jersey	1/79	3/81, 8/81, 10/84 & 11/84
13857	New Jersey	10/83	11/84
14101	New Jersey	1/86	N.A.
14286	F	9/87	10/87, 11/87, 12/87 & 1/88
700 (English Units)	F	2/89	1990, 1992 & 1994
700 (Metric Units)	F	2/89	1994, 1996, 1997 & 1998



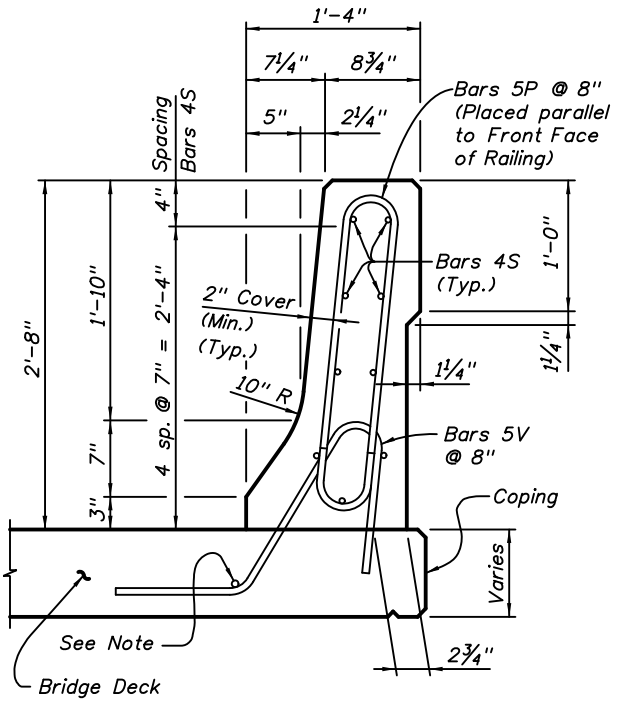
TYPICAL SECTION THRU
NEW JERSEY SHAPE RAILING
INDEX NOS. 11407 & 11460
(Index No. 11407 shown, Index No. 11460 similar)



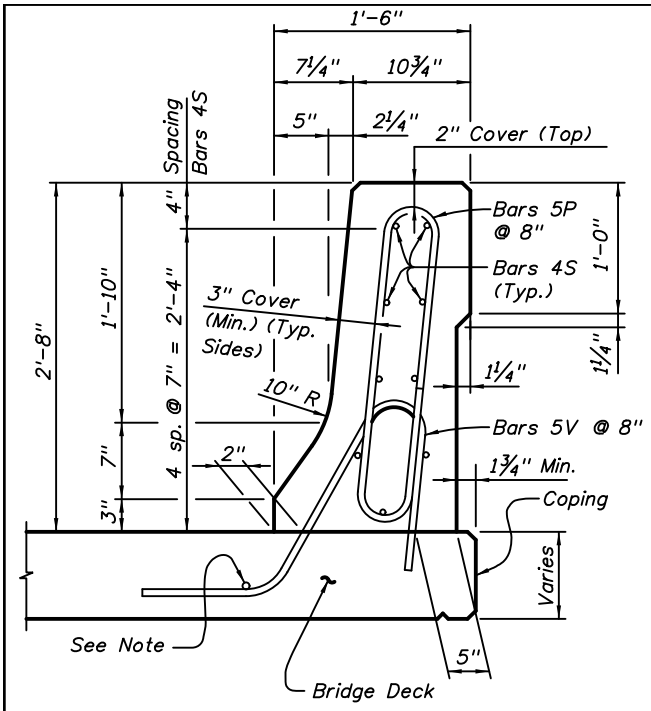
TYPICAL SECTION THRU
NEW JERSEY SHAPE RAILING
INDEX NOS. 11407, 11460, 12670 & 12931
(Index No. 11407 shown, Index Nos. 11460, 12670 & 12931 similar)



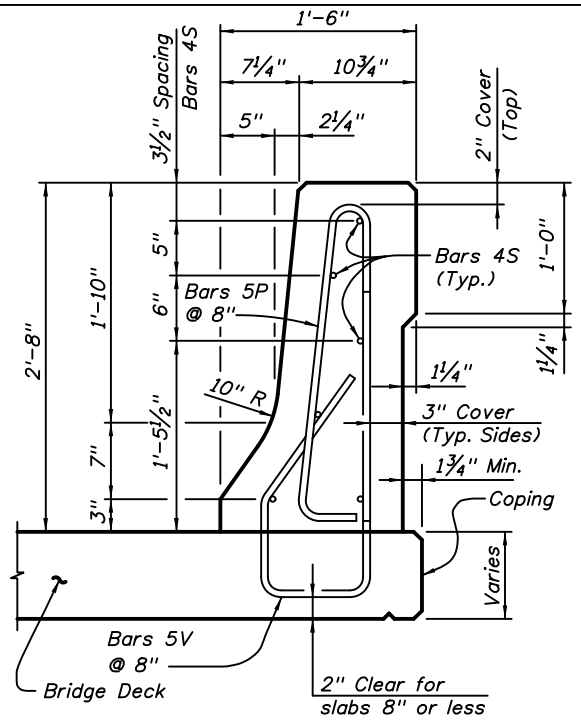
TYPICAL SECTION THRU
NEW JERSEY SHAPE RAILING
INDEX NO. 13857 & 14101



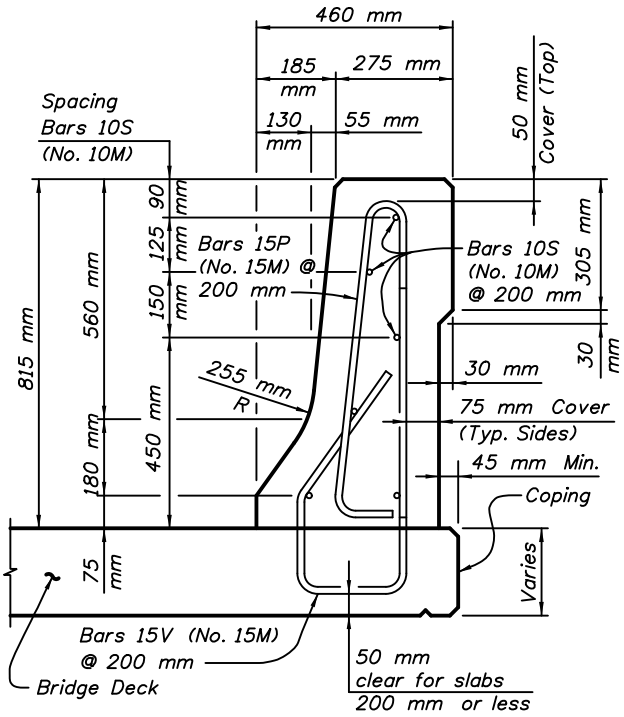
TYPICAL SECTION THRU
F SHAPE RAILING
INDEX NO. 14286



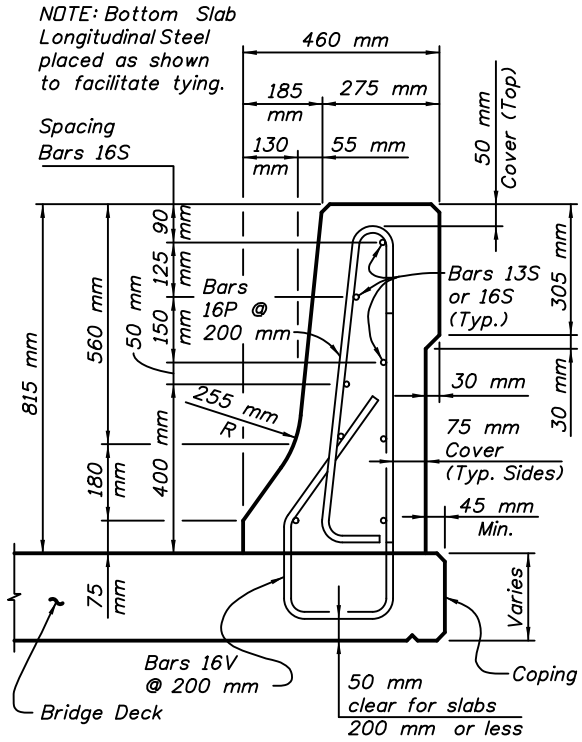
TYPICAL SECTION THRU F SHAPE RAILING INDEX NO. 700



TYPICAL SECTION THRU F SHAPE RAILING INDEX NO. 700

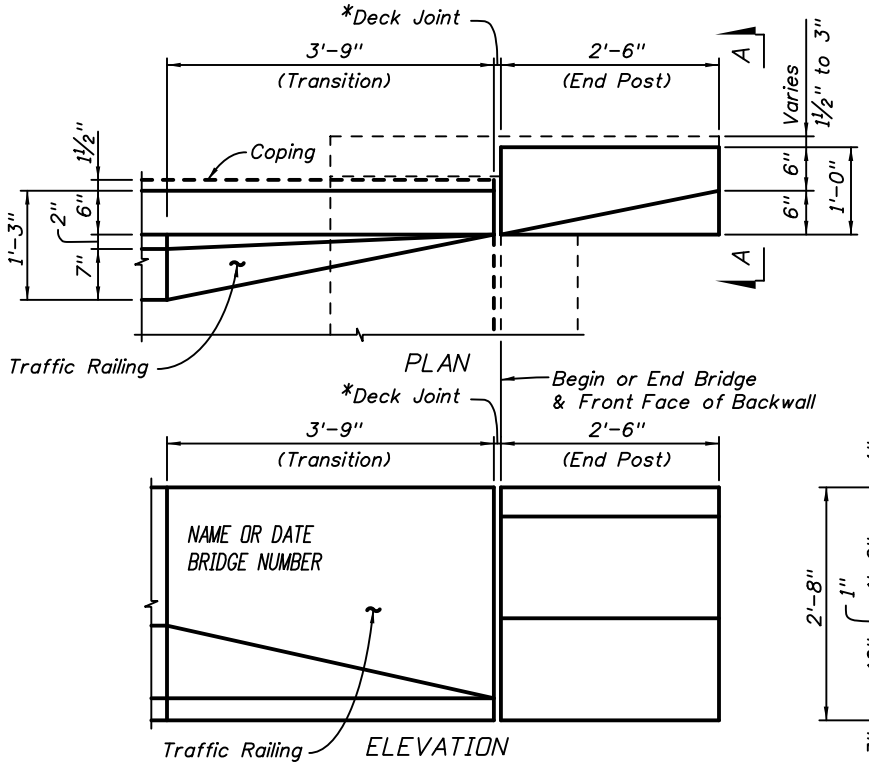


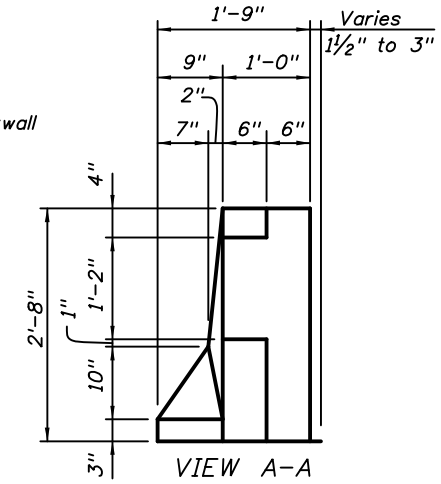
TYPICAL SECTION THRU F SHAPE RAILING (Metric with hard converted rebar) INDEX NO. 700



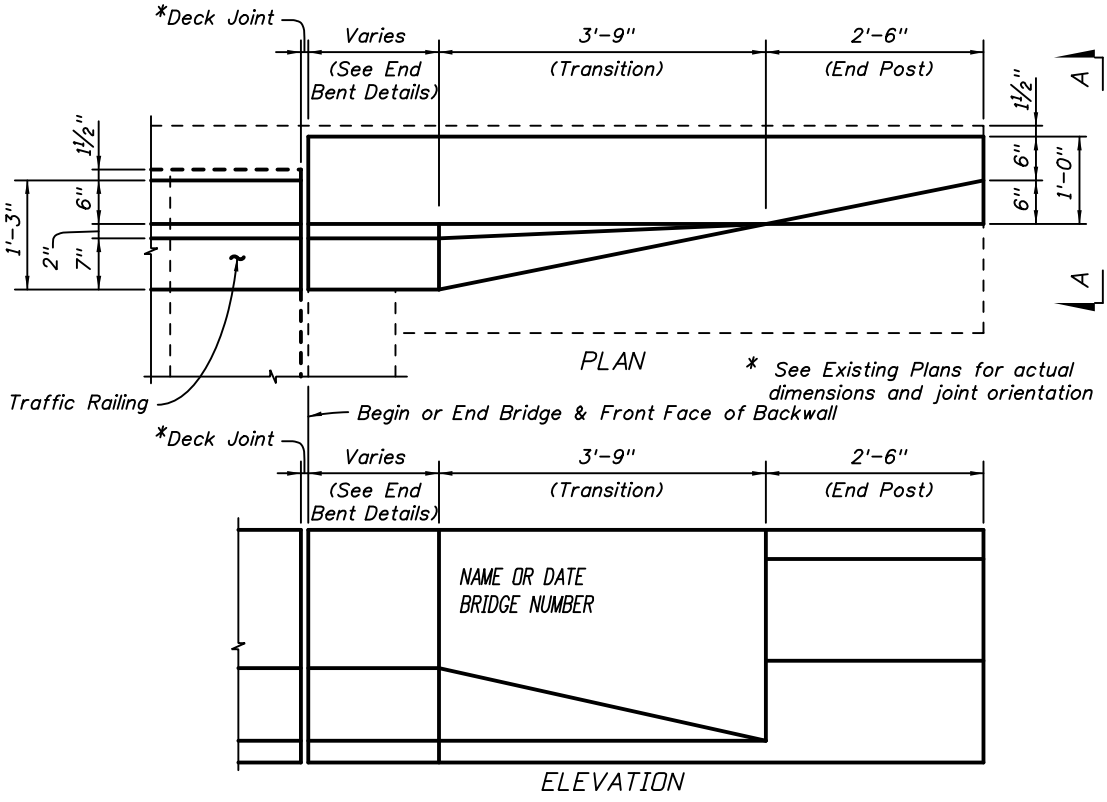
TYPICAL SECTION THRU F SHAPE RAILING (Metric with soft converted rebar) INDEX NO. 700

RAILING END TRANSITION FOR NEW JERSEY SHAPES
INDEX NOS. 11407, 11460, 12670, 12931, 13857 & 14101



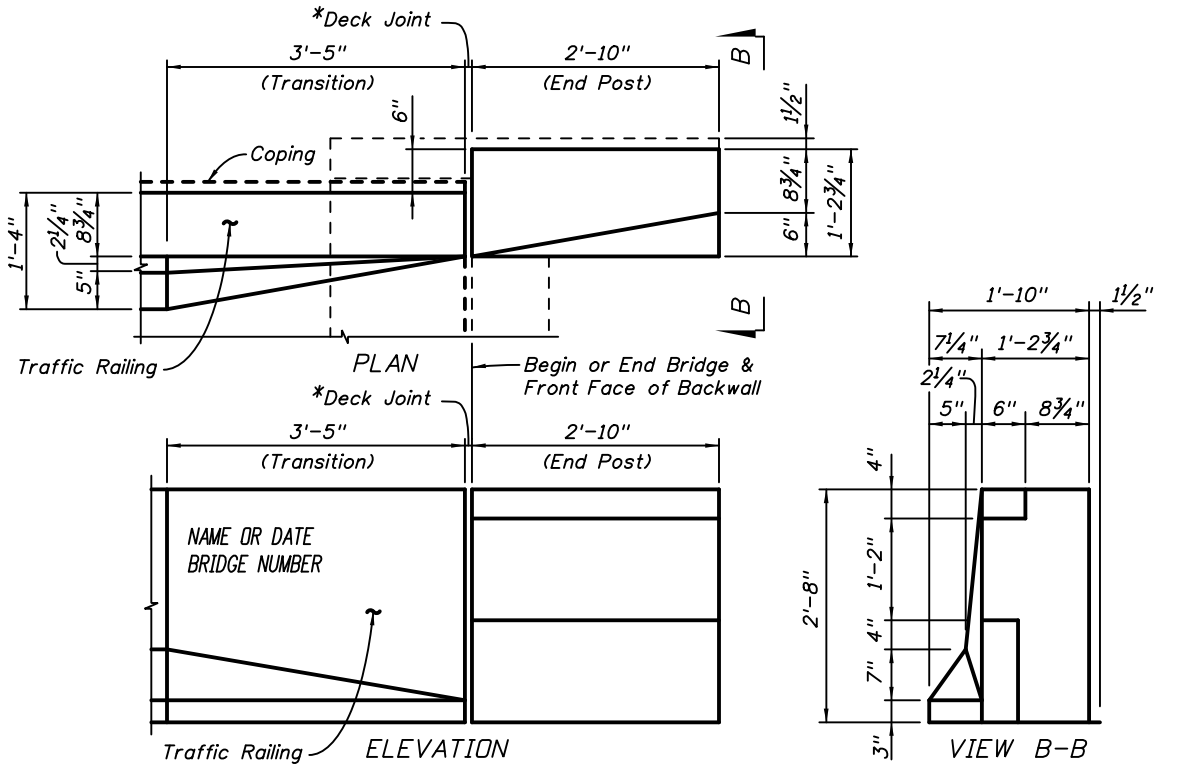


FLAT SLAB TYPE BRIDGES — **TYPICAL END VIEW**

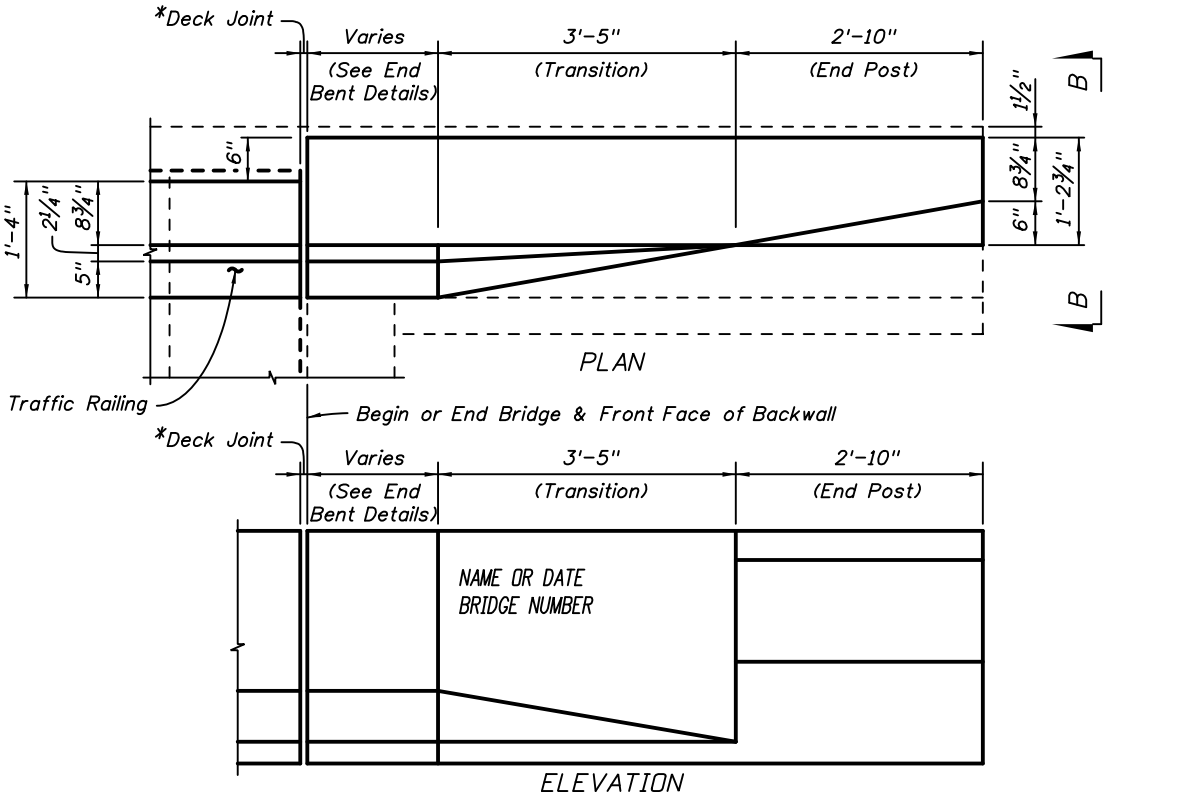


BEAM OR GIRDER TYPE BRIDGES

RAILING END TRANSITION FOR F SHAPES - INDEX NO. 14286

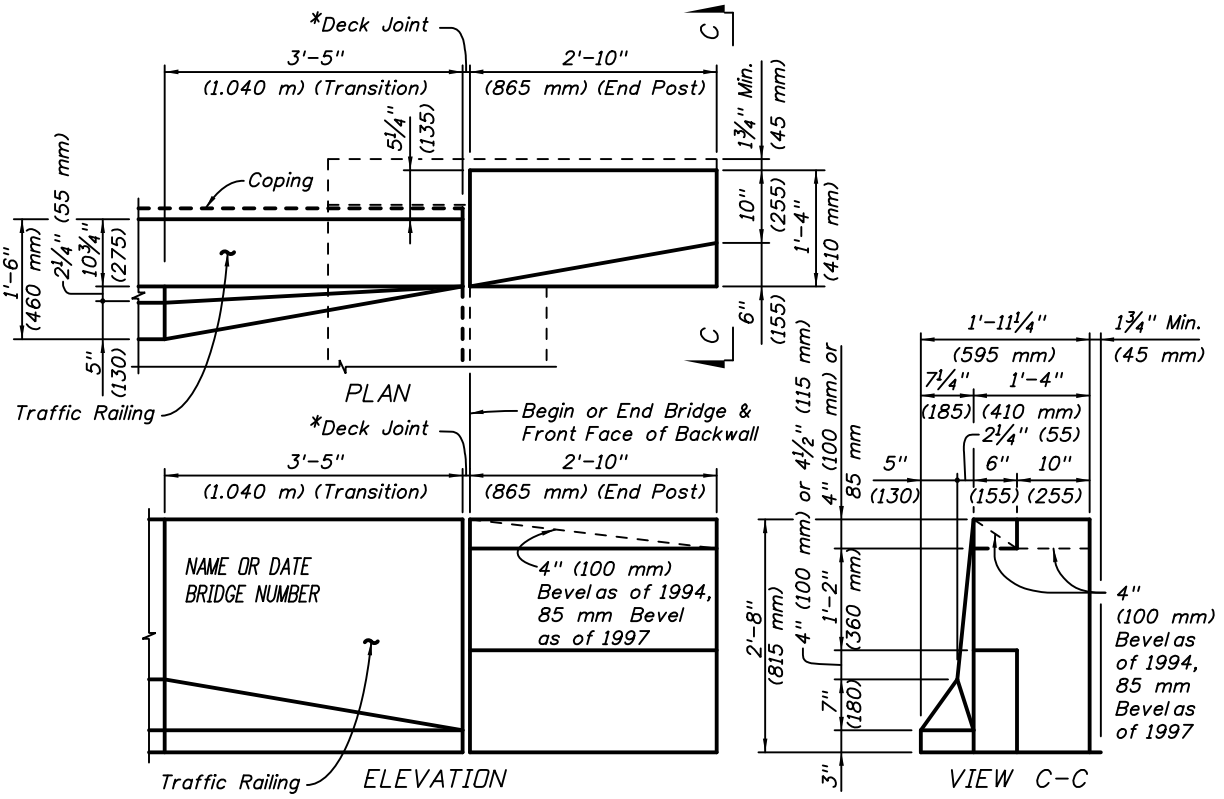


FLAT SLAB TYPE BRIDGES — **TYPICAL END VIEW**

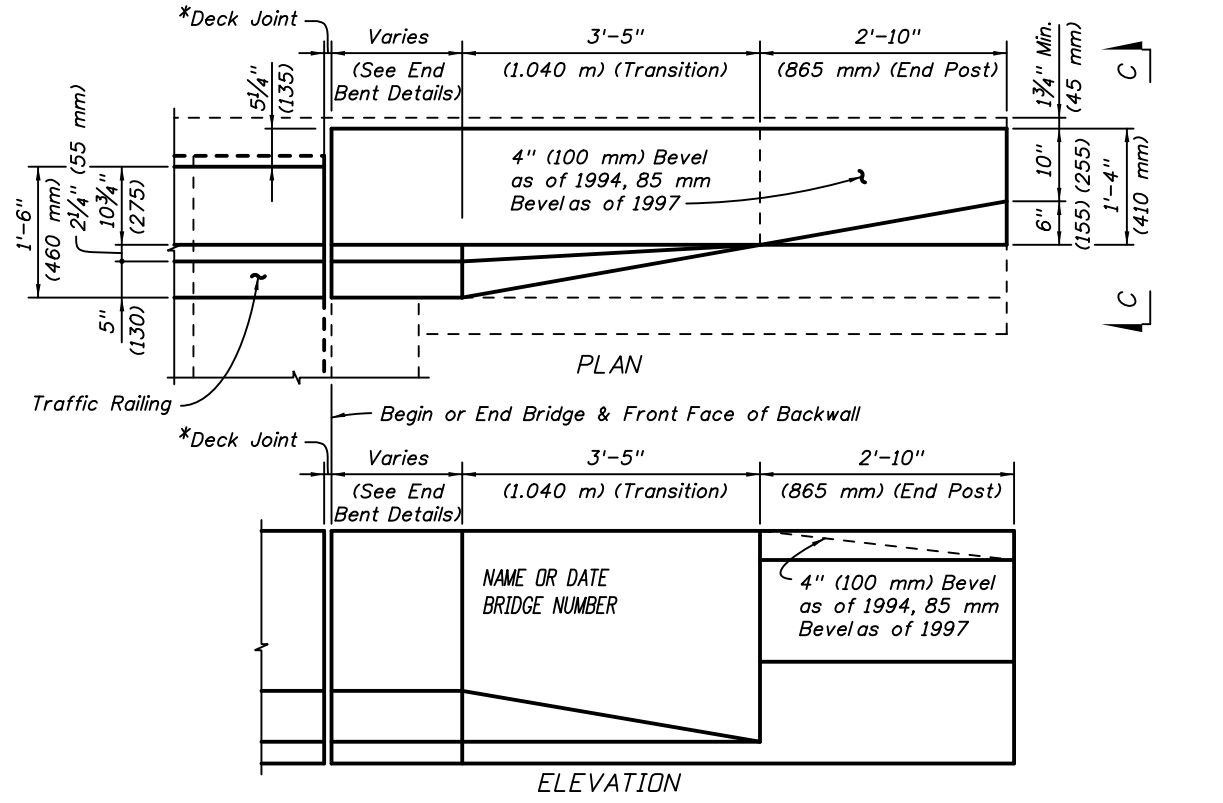


BEAM OR GIRDER TYPE BRIDGES

RAILING END TRANSITION FOR F SHAPES - INDEX NO. 700



FLAT SLAB TYPE BRIDGES — **TYPICAL END VIEW**



BEAM OR GIRDER TYPE BRIDGES

2. Guardrail Approach Transition Retrofit Instructions for Existing Flat Slab Bridges:

These instructions are applicable only to bridges with concrete flat slab superstructures.

The retrofitting of existing "W" beam guardrail transitions is accomplished by installing new Thrie-Beam Guardrail transitions in accordance with Scheme A or Scheme B as presented herein. It is permissible to use both Scheme A and Scheme B on a single bridge as required; e.g. Scheme A at begin bridge and Scheme B at end bridge. Scheme A shall be considered as the preferred choice for retrofitting the existing guardrail transitions. Scheme B should only be used where Scheme A is not applicable. Use of either scheme is dependent on the existing Traffic Railing and End Transition being in sound structural condition, for the portions that will remain in place.

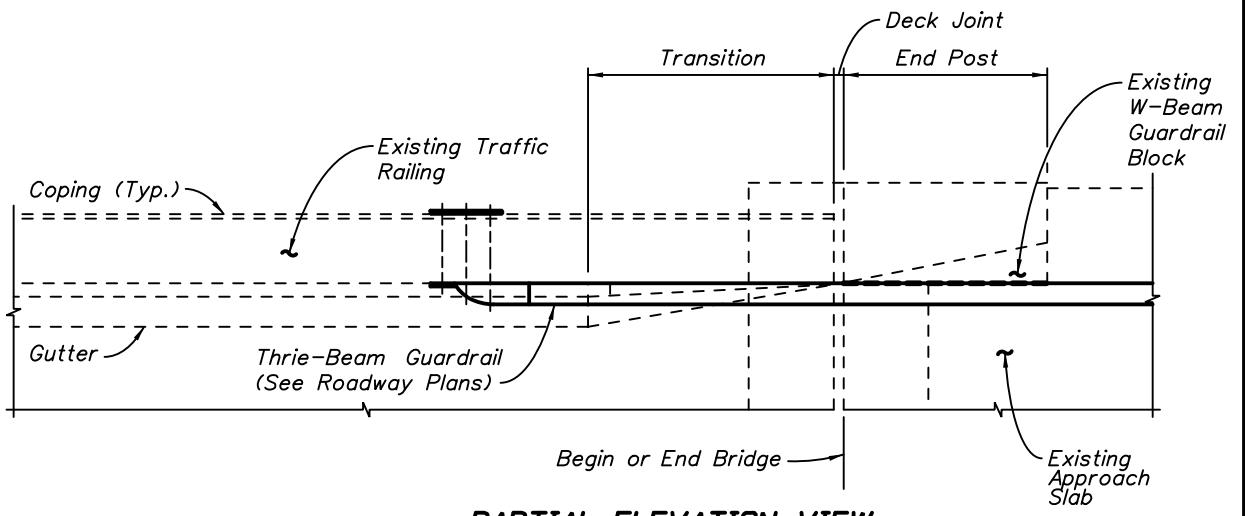
Flat Slab Scheme A

The Thrie-Beam Guardrail transition retrofit details shown in Scheme A are applicable for existing bridges meeting both of the following requirements:

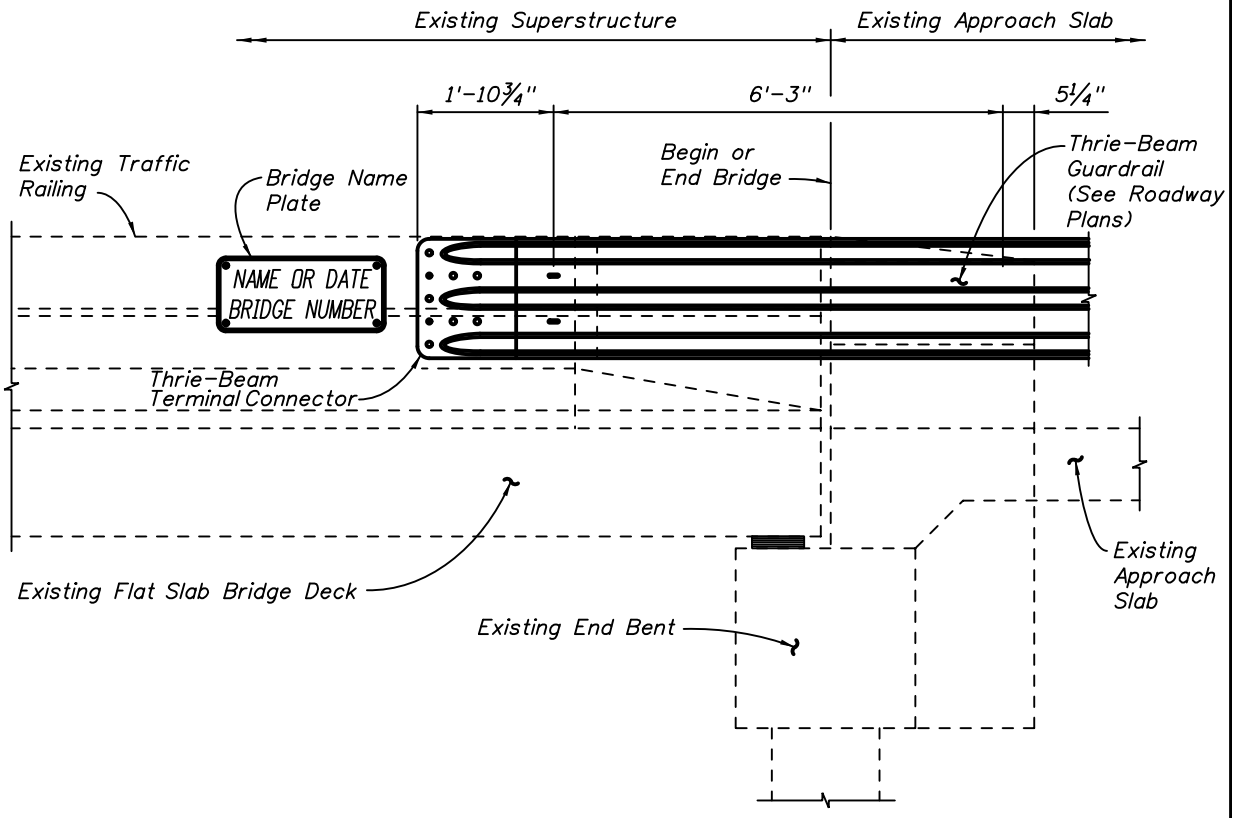
1. The existing bridge Traffic Railings are "F" or "New Jersey" shape railings conforming to one of the superseded FDOT standard designs shown in Section 1 of these Instructions (see above).
2. The total amount of thermal movement at the bridge end expansion joint does not exceed 1½" (¾" in each direction). The total amount of thermal movement at the expansion joint shall be determined by theoretical calculation and confirmed by field measurement where possible. It should be noted that the actual in-service movement due to thermal effects may be less than the value determined by theoretical calculation.

If both of the above requirements cannot be met, then Scheme B shall be evaluated for use. If both of the above requirements are met, the Scheme A details shown below and the following guidelines shall be used to assist in the preparation of the plans.

Generally, if Scheme A is applicable, Structures Plans will not be required for the Thrie-Beam Guardrail transition retrofit. Only Roadway Plans which include a reference to ***Design Standards*** Index 402, Sheet 24 of 24, Scheme I are required.



PARTIAL ELEVATION VIEW
(Existing W-Beam Guardrail to be removed not shown for clarity. "F" Shape Railing shown, "New Jersey" Shape Railing similar)



PARTIAL ELEVATION VIEW
(Existing W-Beam Guardrail to be removed not shown for clarity. "F" Shape Railing shown, "New Jersey" Shape Railing similar)

SCHEME A

Flat Slab Scheme B

The Thrie-Beam Guardrail transition retrofit details shown in Scheme B are applicable for existing bridges meeting both of the following requirements:

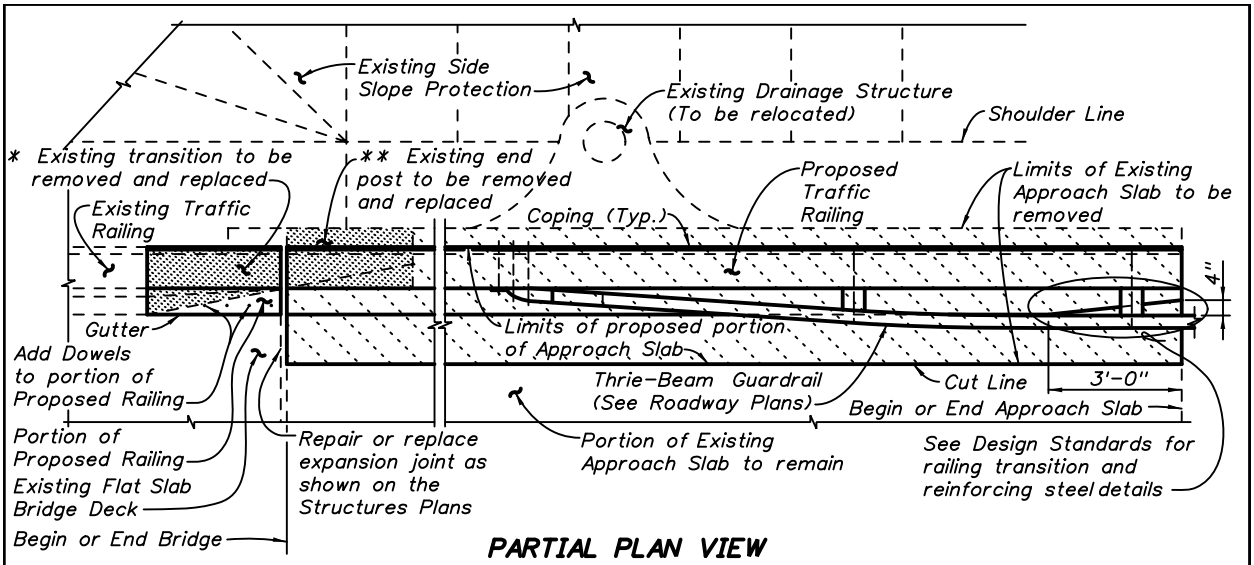
1. The existing bridge Traffic Railings are "F" or "New Jersey" shape railings conforming to one of the superseded FDOT standard designs shown in Section 1 of these Instructions (see above).
2. The total amount of thermal movement at the bridge end expansion joint exceeds 1½" (¾" in each direction). The total amount of thermal movement at the expansion joint shall be determined by theoretical calculation and confirmed by field measurement where possible. It should be noted that the actual in-service movement due to thermal effects may be less than the value determined by theoretical calculation.

If both of the above requirements are met, then Scheme B details shown below and the following guidelines shall be used to assist in the preparation of the plans.

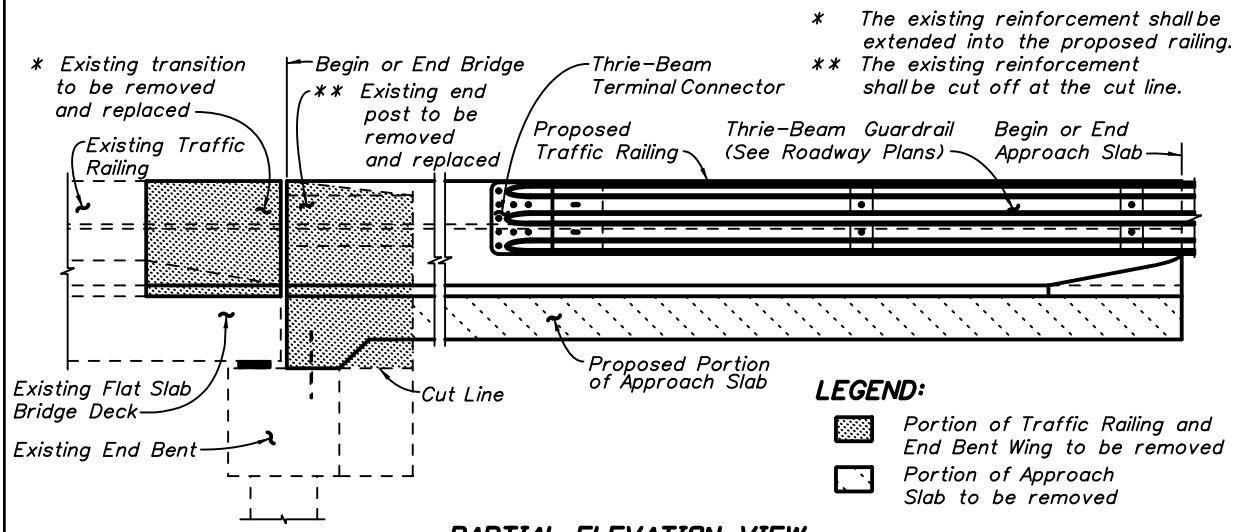
If Scheme B is used, then Structures and Roadway Plans will be required for the Thrie-Beam Guardrail retrofit. The Roadway Plans shall address traffic control issues, removal of the existing "W" Beam Guardrail transition and installation of the new Thrie-Beam Guardrail transition utilizing ***Design Standards*** Index 400, Detail J. The Structures Plans shall address demolition and reconstruction of the required portion of the existing Traffic Railing end transition and approach slab.

If the existing traffic railing is an "F" Shape traffic railing, the appropriate ***Design Standards*** Indexes 420, 421 and 490 shall be referenced and used in their entirety or modified as required by project specific designs included in the Structures Plans. Applicable details from ***Design Standards*** Index 20900 or 20910 shall be used as required for the approach slab reconstruction.

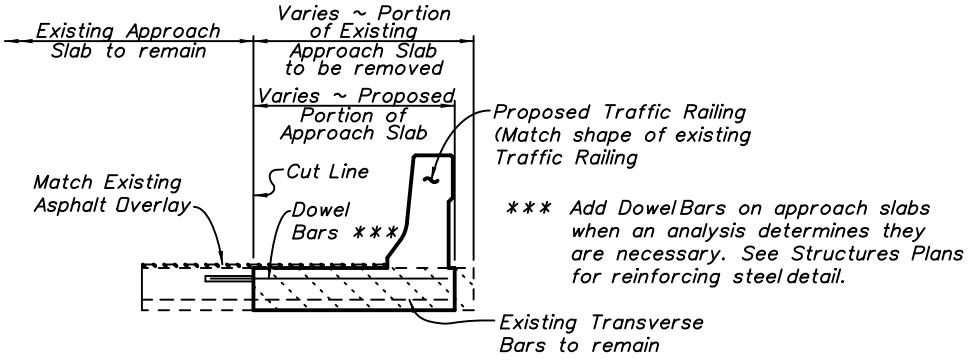
If the existing traffic railing is a "New Jersey" Shape traffic railing, project specific railing details will be required. Applicable details from ***Design Standards*** Index 20900 or 20910 shall be used as required for the approach slab reconstruction.



PARTIAL PLAN VIEW
(Existing W-Beam Guardrail to be removed not shown for clarity.
"F" Shape Railing shown, "New Jersey" Shape Railing similar.)



PARTIAL ELEVATION VIEW
(Existing W-Beam Guardrail to be removed not shown for clarity.
"F" Shape Railing shown, "New Jersey" Shape Railing similar.)



SECTION A-A
(Showing one layer of existing reinforcement)

SCHEME B

3. Guardrail Approach Transition Retrofit Instructions for Existing Beam/Girder Bridges

These instructions are applicable only to bridges with beam or girder superstructures.

The retrofitting of existing "W" beam guardrail transitions is accomplished by installing new Thrie-Beam Guardrail transitions in accordance with Schemes A, B or C as presented herein. It is permissible to use any combination of Schemes A, B and C on a single bridge as required; e.g. Scheme A at begin bridge and Scheme C at end bridge. Schemes A and B shall be considered as the preferred choices for retrofitting the existing guardrail transitions. Scheme C should only be used where Schemes A or B are not applicable. Use of any schemes is dependent on the existing Traffic Railing and End Transition being in sound structural condition, for the portions that will remain in place.

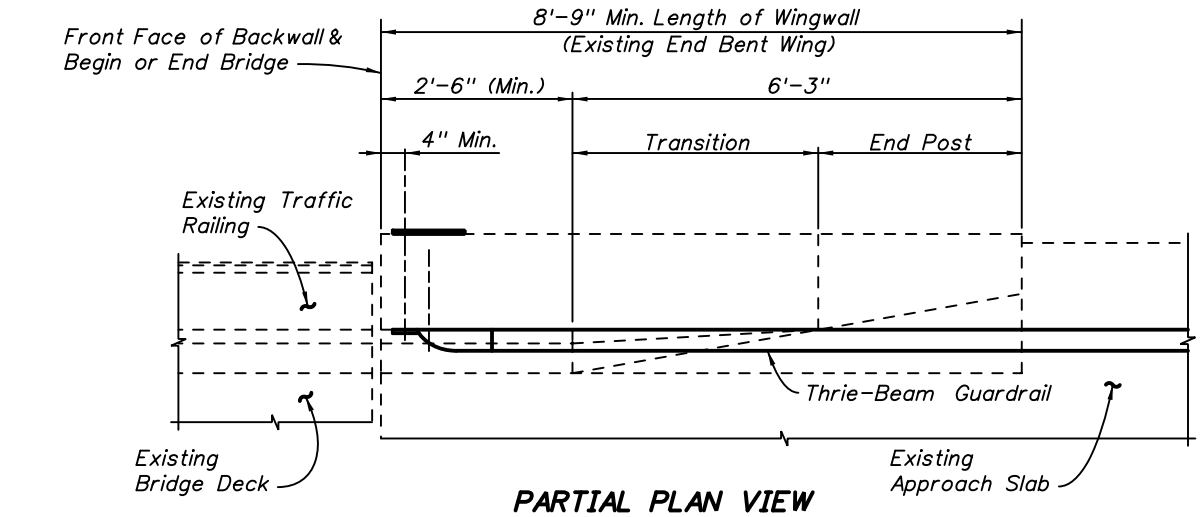
Beam/Girder Scheme A

The Thrie-Beam Guardrail transition retrofit details shown in Scheme A are applicable for existing bridges meeting both of the following requirements:

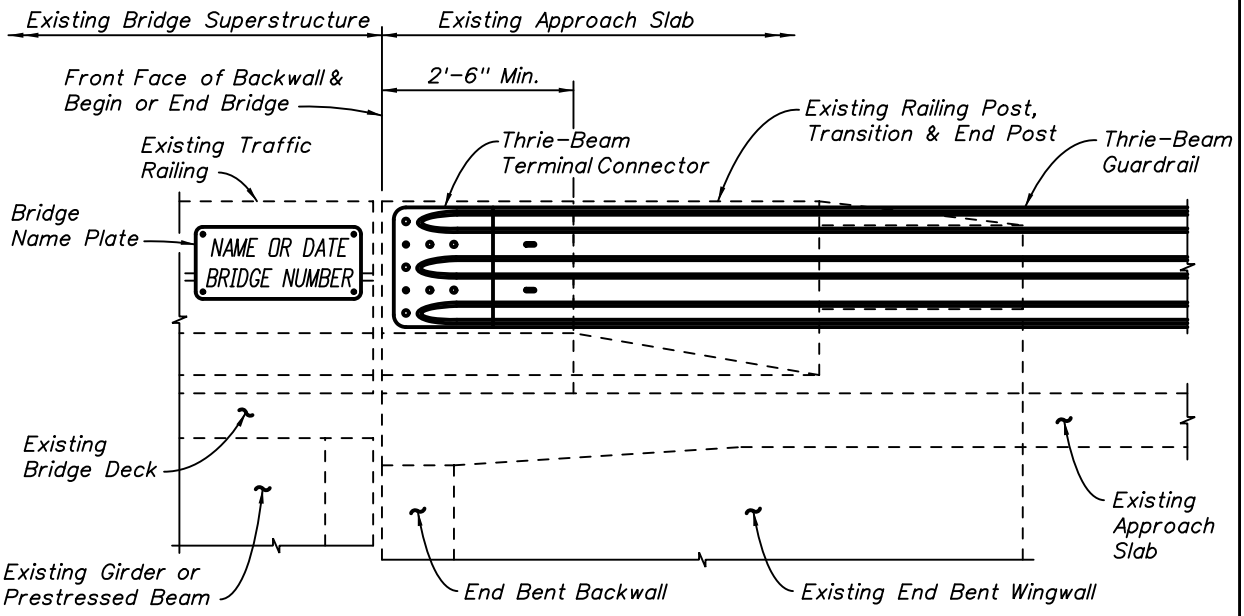
1. The existing bridge Traffic Railings are "F" or "New Jersey" shape railings conforming to one of the superseded FDOT standard designs shown in Section 1 of these Instructions (see above).
2. The existing end bent wingwalls that support the Traffic Railing end transitions are a minimum of 8'-9" in length and are directly supported by a pile or drilled shaft.

If both of the above requirements cannot be met, then Scheme B shall be evaluated for use. If both of the above requirements are met, the Scheme A details shown below and the following guidelines shall be used to assist in the preparation of the plans.

Generally, if Scheme A is applicable, Structures Plans will not be required for the Thrie-Beam Guardrail transition retrofit. Only Roadway Plans which include a reference to ***Design Standards*** Index 402, Sheet 24 of 24, Scheme II are required.



PARTIAL PLAN VIEW
(Existing W-Beam Guardrail to be removed not shown for clarity. "F" Shape Railing shown, "New Jersey" Shape Railing similar)



PARTIAL ELEVATION VIEW
(Existing W-Beam Guardrail to be removed not shown for clarity. "F" Shape Railing shown, "New Jersey" Shape Railing similar)

SCHEME A

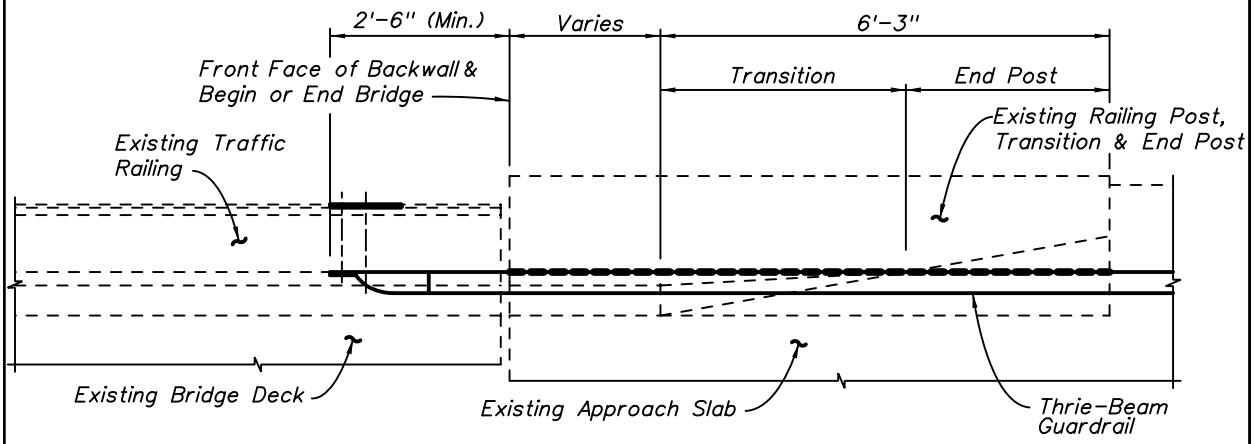
Beam/Girder Scheme B

The Thrie-Beam Guardrail transition retrofit details shown in Scheme B are applicable for existing bridges meeting both of the following requirements:

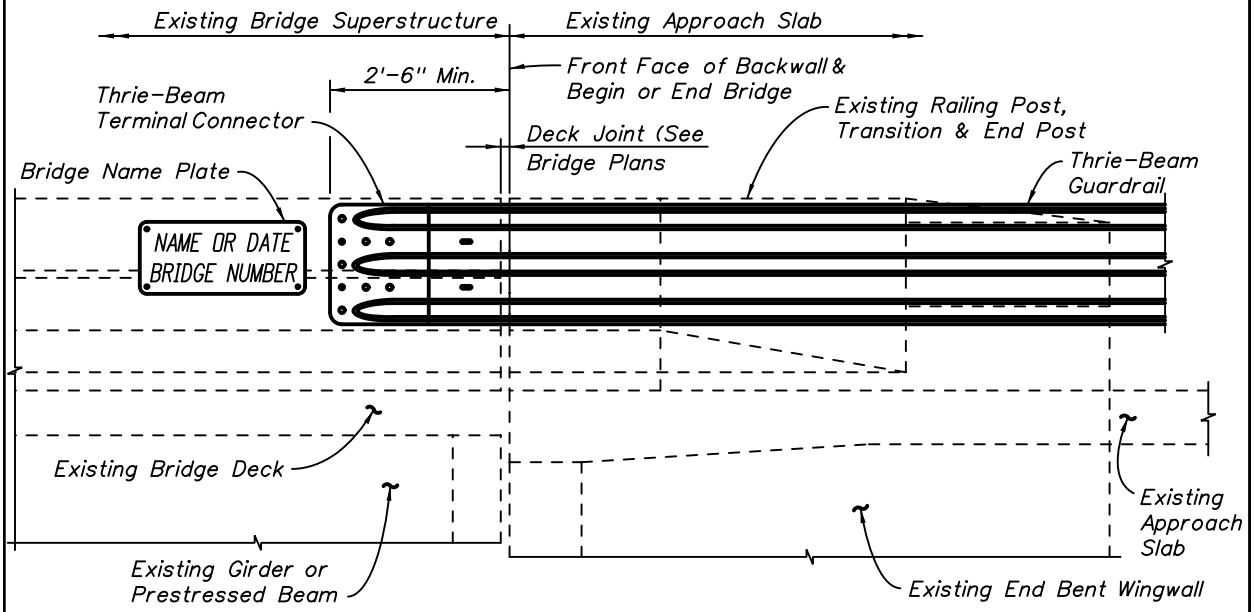
1. The existing bridge Traffic Railings are "F" or "New Jersey" shape railings conforming to one of the superseded FDOT standard designs shown in Section 1 of these Instructions (see above).
2. The total amount of thermal movement at the bridge end expansion joint does not exceed 1½" (¾" in each direction). The total amount of thermal movement at the expansion joint shall be determined by theoretical calculation and confirmed by field measurement where possible. It should be noted that the actual in-service movement due to thermal effects may be less than the value determined by theoretical calculation.

If both of the above requirements cannot be met then Scheme C shall be evaluated for use. If both of the above requirements are met, the Scheme B details shown below and the following guidelines shall be used to assist in the preparation of the plans.

Generally, if Scheme B is determined to be applicable, Structures Plans will not be required for the Thrie-Beam Guardrail retrofit. Only Roadway Plans which include a reference to ***Design Standards*** Index 402, Sheet 24 of 24, Scheme III shall be used for the Thrie-Beam Guardrail retrofit.



PARTIAL PLAN VIEW
(Existing W-Beam Guardrail to be removed not shown for clarity. "F" Shape Railing shown, "New Jersey" Shape Railing similar)



PARTIAL ELEVATION VIEW
(Existing W-Beam Guardrail to be removed not shown for clarity. "F" Shape Railing shown, "New Jersey" Shape Railing similar)

SCHEME B

Beam/Girder Scheme C

The Thrie-Beam Guardrail transition retrofit details shown in Scheme C are applicable for existing bridges meeting both of the following requirements:

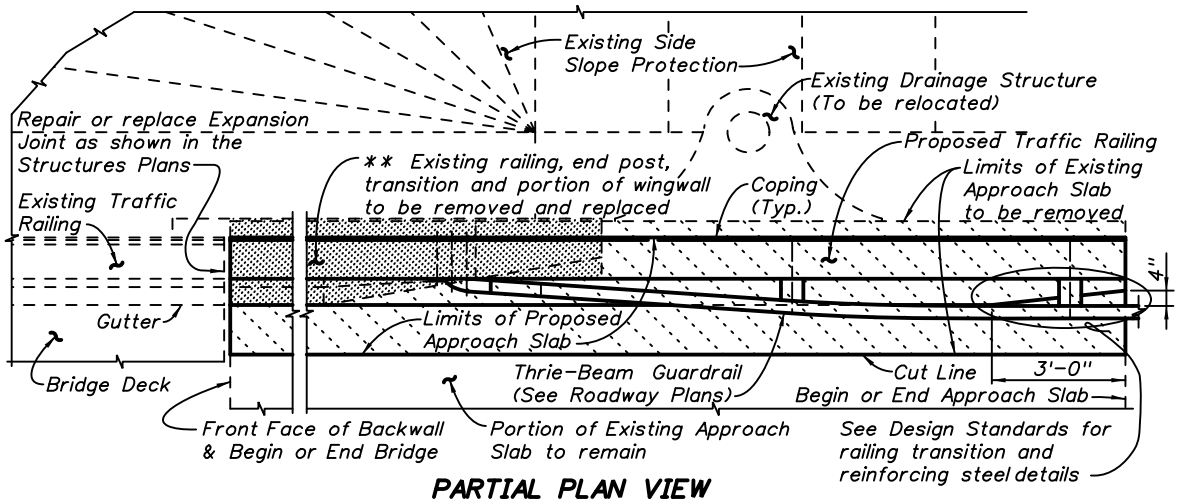
1. The existing bridge Traffic Railings are "F" or "New Jersey" shape railings conforming to one of the superseded FDOT standard designs shown in Section 1 of these Instructions (see above).
2. The total amount of thermal movement at the bridge end expansion joint exceeds 1½" (¾" in each direction). The total amount of thermal movement at the expansion joint shall be determined by theoretical calculation and confirmed by field measurement where possible. It should be noted that the actual in-service movement due to thermal effects may be less than the value determined by theoretical calculation.

If both of the above requirements are met then Scheme C shall be used for the retrofit. In this event, the details shown below and the following guidelines shall be used to assist in the preparation of the plans.

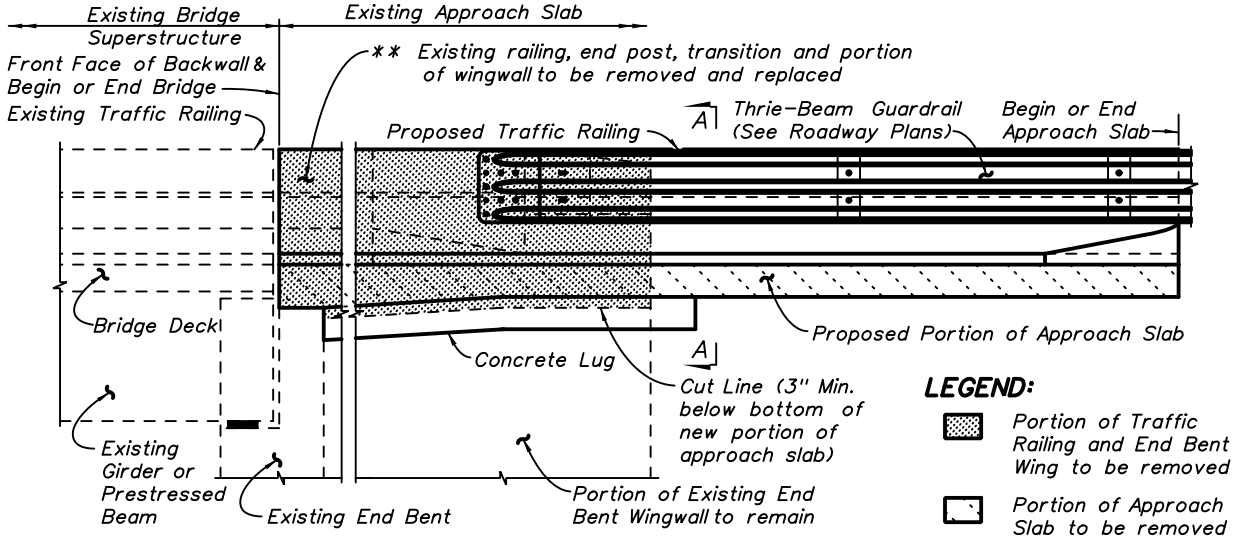
If Scheme C is determined to be applicable, then Structures and Roadway Plans will be required for the Thrie-Beam Guardrail retrofit. The Roadway Plans shall address traffic control issues, removal of the existing "W" Beam Guardrail transition and installation of the new Thrie-Beam Guardrail transition utilizing ***Design Standards*** Index 400, Detail J. The Structures Plans shall address demolition and reconstruction of the required portion of the existing Traffic Railing end transition and approach slab.

If the existing traffic railing is an "F" Shape traffic railing, the appropriate ***Design Standards*** Indexes 420, 421 and 490 shall be referenced and used in their entirety or modified as required by project specific designs included in the Structures Plans. Applicable details from ***Design Standards*** Indexes 20900 or 20910 shall be used as required for the approach slab reconstruction.

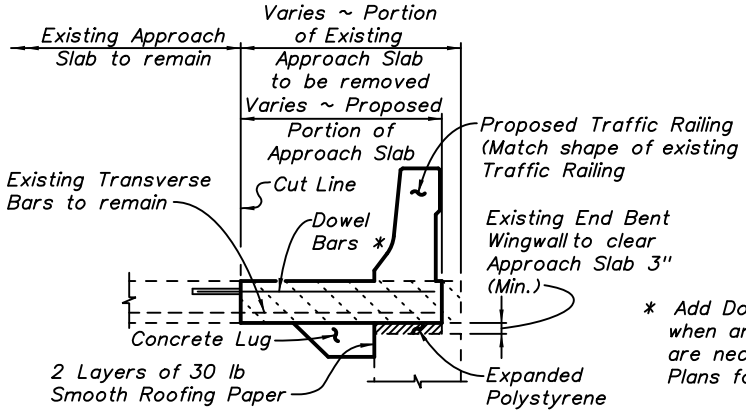
If the existing traffic railing is a "New Jersey" Shape traffic railing, project specific railing details will be required. Applicable details from ***Design Standards*** Index 20900 or 20910 shall be used as required for the approach slab reconstruction.



PARTIAL PLAN VIEW
(Existing W-Beam Guardrail to be removed not shown for clarity. "F" Shape Railing shown, "New Jersey" Shape Railing similar.)



PARTIAL ELEVATION VIEW
(Existing W-Beam Guardrail to be removed not shown for clarity. "F" Shape Railing shown, "New Jersey" Shape Railing similar.)



SECTION A-A
(Showing one layer of existing reinforcement)

SCHEME C

Plan Content Requirements

In the Roadway Plans:

Include the following note in the General Notes:

> Paint reinforcing steel that is exposed during drilling/coring of the Terminal Connector bolt holes with a zinc rich galvanizing compound in accordance with Section 562 of the ***Specifications***.

For Guardrail Approach Transition Retrofits only (not Index 470 and 480 retrofits), if the new guardrail will obscure the bridge name, number or date, include the following note in the General Notes:

> Furnish a Bridge Name / Date Plate(s) and attach it to the appropriate Traffic Railing, approximately 3" from the top, near the end of the Thrie-Beam Guardrail Terminal Connector. Include on the Bridge Name Plate the information on the existing Traffic Railing that has been obscured by the new Thrie-Beam Guardrail, e.g. Bridge Number, Bridge Name or Date. The Bridge Name Plate shall be approximately 1/16" thick aluminum plate conforming to Aluminum Association Alloy 6061-T6 or 5154-H38. Apply white non-reflective sheeting meeting the requirements of Specification Section 994 for the background and 3" tall black letters. Size the Bridge Name Plate appropriately to contain the required information. Mechanically anchor the Bridge Name Plate to the railing with a minimum of four concrete expansion anchors or concrete screws, ¼" diameter by 1" long, as approved by the Engineer. Fabrication and installation of the Bridge Name Plate shall be considered as incidental work for payment purposes.

Payment

Item number	Item description	Unit Measure
536-1-1	Guardrail - Roadway	LF
536-1-5	Guardrail - Roadway, Thrie Beam	LF
536-8	Guardrail - Bridge Anchorage Assembly (Furnish & Install)	EA
536-73	Guardrail Removal	LF

Use 536-1-1 when approach guardrail is W-beam guardrail.

Use 536-1-5 when approach guardrail is Thrie beam guardrail.

Use 536-8 with Index 480 retrofits and when attaching guardrail to existing safety shape bridge traffic railings.

Index 403 Guardrail Transitions for Existing Bridge Traffic Railing Retrofits

Design Criteria

NCHRP Report 350 Test Level 4 Criteria; ***AASHTO LRFD Bridge Design Specifications***, 4th Edition; ***Structures Design Guidelines (SDG)***; ***PPM***

Design Assumptions and Limitations

This standard works with existing bridge traffic railing retrofits constructed in accordance with the obsolete standard entitled "Guardrail Anchorage and Continuous Barrier for Existing Bridges", Index 401, which was included in the ***Roadway and Traffic Design Standards*** from 1987 until 2000.

Schemes 1 and 19 of obsolete Index 401 entitled "Concrete Safety Barrier" are based on a design that has been crash tested as documented in ***Transportation Research Report TRP-03-19-90*** and accepted by FHWA at ***NCHRP Report 350*** Test Level 4.

Scheme 16 of obsolete Index 401 entitled "Guardrail Continuous Across Bridge" has been structurally evaluated and has been determined to be acceptable to FDOT and FHWA to leave in place on RRR projects provided the installation meets the criteria set forth in the ***PPM***, Vol. 1, Chapter 25.

Plan Content Requirements

In the Roadway Plans:

Evaluate the existing guardrail approach transitions and specify in the Plans the necessary upgrades to the transitions as follows.

For the w-beam approach transition shown as Detail J in the 1987 edition of the ***Roadway and Traffic Design Standards***, Index 400 without a continuation of curb beyond the bridge or approach slab, use the following Plan Sheet note placed adjacent to bridge ends:

> Construct Transition Block, nested W Beam Guardrail and additional Guardrail Posts and Offset Blocks as shown in ***Design Standards*** Index 403.

For the nested w-beam approach transition shown as Detail J in the 1987 edition of the ***Roadway and Traffic Design Standards***, Index 400 with a continuation of curb beyond the bridge or approach slab, use the following Plan Sheet note placed adjacent to bridge ends:

> Construct nested W Beam Guardrail and additional Guardrail Posts and Offset Blocks as shown in ***Design Standards*** Index 403.

For the nested w-beam approach transition shown as Detail J in the 1998 edition of the ***Roadway and Traffic Design Standards***, Index 400 without a continuation of curb

beyond the bridge or approach slab, use the following Plan Sheet note placed adjacent to bridge ends:

Construct Transition Block as shown in ***Design Standards*** Index 403.

For all trailing end treatments, specify the necessary guardrail upgrades as appropriate.

Payment

Item number	Item description	Unit Measure
520-2-9	Curb, Special	LF
538-1	Guardrail Reset	LF

Index 411 Pier Protection Barrier

Design Criteria

AASHTO LRFD Bridge Design Specifications, 4th Edition; ***Structures Design Guidelines (SDG)***

Design Assumptions and Limitations

Use the Pier Protection Barrier to shield bridge piers that theoretically do not have sufficient strength to resist the ***LRFD*** equivalent static impact force and for other specialized applications. If the minimum set back requirements of this standard cannot be met, see ***SDG*** Chapter 2 for options.

If the bridge pier can withstand the ***LRFD*** equivalent static impact force, Index 400 or Index 410 would be applicable.

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.

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 ***LRFD*** and the ***SDG***.

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 on the standard.

Select Pier Protection Barrier terminal treatment for design speeds greater than or equal to 50 mph from the following options:

a. Terminated outside of the clear zone of any approach traffic;

b. Terminated within a shielded location;

c. Terminal protection by the use of a crash cushion system; or,

d. 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 on the standard.

If the existing adjacent pier footing is too shallow to provide the 6 inch minimum clearance between footings as shown, reduce the riser dimension between the barrier and the barrier footing and prepare project specific details to supplement the standard. The Pier Protection Barrier itself should not be modified, only its footing and riser should be modified adjacent to the pier footing so as to provide adequate clearance. A project specific shallow footing must provide comparable overturning and sliding resistance to the standard footing.

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

Plan Content Requirements

In the Structures or Roadway Plans:

Designate the Pier Protection Barrier height, footing configuration(s) and limiting stations on the Plan-Profile, Plan and Elevation and or Pier 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.

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.

Prepare project specific footing and riser details as required.

Payment

Item number	Item description	Unit Measure
521-72-10	Shoulder Concrete Barrier Wall, Rigid Shoulder 42"	LF
521-72-11	Shoulder Concrete Barrier Wall, Rigid Shoulder 54"	LF

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

Index 414 Type K Temporary Concrete Barrier System

Design Criteria

NCHRP Report 350 Test Level 4 Criteria; ***AASHTO LRFD Bridge Design Specifications***, 4th Edition, Section 13; ***Structures Design Guidelines (SDG)***

Design Assumptions and Limitations

The Type K Temporary Concrete Barrier System has been crash tested to ***NCHRP Report 350*** Test Level 3 criteria or structurally evaluated to meet the requirements of ***NCHRP Report 350*** Test Level 3 criteria for the installation configurations as shown on the Design Standard utilizing the types, sizes, lengths, shapes, strengths and grades of the fabrication and installation materials as shown.

Type K Barriers are required for temporary installations on bridges for traffic separation, shielding drop-offs and shielding work zones without drop-offs. Type K Barriers are required for temporary installations on retaining walls for shielding drop-offs. Type K Barriers can be used on roadways for traffic separation and for shielding work zones, above ground hazards and drop-offs.

Plan Content Requirements

Designate location(s) where Type K's are to be used along with installation requirements, e.g. freestanding, bolted or staked down, or backfilled.

In order to maintain crashworthiness of the system, do not specify different grades, sizes, shapes or types of reinforcing steel for those shown for constructing Type K Barriers. Also, do not specify different type, size, length or material grade anchor bolts, nuts, washers, adhesives, connector pins, stakes, keeper pins, or guardrail components for installing Type K Barriers. Use only in the configurations shown on the ***Design Standard***.

In the Structures Plans:

Show and label Type K Barriers on the Construction Sequence drawings and other sheets as required. Show offsets to drop-offs, above ground hazards and adjacent lanes as appropriate. Include cross references to ***Design Standards*** Index 414.

In the Roadway Plans:

Show and label Type K Barriers on the Traffic Control Plans and other sheets as required. Show offsets to drop-offs, above ground hazards and adjacent lanes as appropriate. Include cross references to ***Design Standards*** Index 414.

Payment

Item number	Item description	Unit Measure
102-71-14	Barrier Wall, Temporary, F&I, Type K	LF
102-71-24	Barrier Wall, Temporary, Relocate, Type K	LF
102-79	Lights, Barrier Wall Mount, Temp, Type C, Steady Burn	ED

Index 420 Traffic Railing (32" F Shape)

Design Criteria

NCHRP Report 350 Test Level 4 Criteria; ***AASHTO LRFD Bridge Design Specifications***, 4th Edition; ***Structures Design Guidelines (SDG)***

Design Assumptions and Limitations

The 32" F-Shape Traffic Railing is the basic default traffic railing for use on FDOT bridges and retaining walls. Use this railing in accordance with the requirements of ***SDG*** 6.7.

Design bridge decks supporting 32" F-Shape Traffic Railings in accordance with the requirements of ***SDG*** 4.2. For bridge decks up to a maximum thickness of 9", the two Bars 5S placed in the bridge deck may substitute for the longitudinal deck steel located within the limits of Bars 5V, provided that the total area of longitudinal deck steel beneath the railing, as required by calculation, is not reduced.

Indexes 520, 5100, 5300, 20900 and 20910 contain details for the use of 32" F-Shape Traffic Railings on retaining walls and approach slabs.

For treatment of 32" F-Shape Traffic Railings on skewed bridges see Index 490.

Plan Content Requirements

In the Structures Plans:

In the Materials Note on the General Notes Sheet, specify the concrete class in accordance with the superstructure environment classification. See ***SDG*** 1.4.

Include the following Bridge Name Note on the General Notes Sheet:

Place the following bridge name on the traffic railing in accordance with the Traffic Railing Design Standard:

[Use the name of the bridge or non-roadway facility crossed, or include the name of both facilities for roadway crossings, e.g.:

THOMASVILLE ROAD FLYOVER
TOMOKA RIVER
CSX RAILROAD
US 19 OVER EAST BAY DR

For multiple bridges, identify the associated bridge number, e.g.:

Bridge No.	Name
600103	CHOCTAWHATCHEE BAY
600104	CHOCTAWHATCHEE BAY RELIEF]

Show and label the 32" F-Shape Traffic Railing on the Plan and Elevation, Typical Section, Superstructure, Approach Slab and Finish Grade Elevations Cross Section

sheets, Retaining Wall Control Drawings, and other sheets as required. Show limiting stations when transitioning to other type traffic railings. Include cross references to ***Design Standards*** Index 420 and 20900 or 20910 as appropriate.

On the Superstructure section sheets, show the two Bars 5S placed in the bridge deck within the Bars 5V along with the rest of the deck steel.

In the Roadway Plans when the 32" F-Shape Traffic Railing is used on retaining walls:

In the Materials Note on the General Notes Sheet, specify the concrete class in accordance with the retaining wall environment classification. See ***SDG*** 1.4.

Show and label the 32" F-Shape Traffic Railing on the Retaining Wall Control Drawings, and other sheets as required. Show limiting stations when transitioning to other type traffic railings. Include cross references to ***Design Standards*** Index 420 and 520, 5100 or 5300 as appropriate.

All concrete and Bars 5P, 5S and 5V required to construct the traffic railing are included in the Estimated Traffic Railing Quantities. Do not include traffic railing concrete in the estimated concrete quantities, or Bars 5P, 5S and 5V in the reinforcing bar lists and estimated reinforcing steel quantities for supporting bridge decks, approach slabs or retaining walls.

Payment

Item number	Item description	Unit Measure
521-5-1	Concrete Traffic Railing, Bridge 32" F - Shape	LF
521-8-1	Concrete Traffic Railing Barrier, Retaining Wall System, Mounted with Sleeper Slab	LF

Index 421 Traffic Railing (Median 32" F Shape)

Design Criteria

NCHRP Report 350 Test Level 4 Criteria; ***AASHTO LRFD Bridge Design Specifications***, 4th Edition; ***Structures Design Guidelines (SDG)***

Design Assumptions and Limitations

The 32" F-Shape Median Traffic Railing is the basic default median traffic railing for use on FDOT bridges. Use this railing in accordance with the requirements of ***SDG*** 6.7.

Design bridge decks supporting 32" F-Shape Median Traffic Railings in accordance with the requirements of ***SDG*** 4.2. For bridge decks up to a maximum thickness of 9", the three Bars 5S placed in the bridge deck may substitute for the longitudinal deck steel located within the limits of Bars 5W, provided that the total area of longitudinal deck steel beneath the railing, as required by calculation, is not reduced.

For treatment of 32" F-Shape Median Traffic Railings on skewed bridges see Index 490.

Plan Content Requirements

In the Structures Plans:

In the Materials Note on the General Notes Sheet, specify the concrete class in accordance with the superstructure environment classification. See ***SDG*** 1.4.

Show and label the 32" F-Shape Median Traffic Railing on the Plan and Elevation, Typical Section, Superstructure, Approach Slab and Finish Grade Elevations Cross Section sheets, and other sheets as required. Include cross references to ***Design Standards*** Index 421.

On the Superstructure section sheets, show the three Bars 5S placed in the bridge deck within the Bars 5W along with the rest of the deck steel.

All concrete and Bars 5R, 5S and 5W required to construct the traffic railing are included in the Estimated Traffic Railing Quantities. Do not include traffic railing concrete in the estimated concrete quantities, or Bars 5R, 5S and 5W in the reinforcing bar lists and estimated reinforcing steel quantities for supporting bridge decks or approach slabs.

Payment

Item number	Item description	Unit Measure
521-5-3	Concrete Traffic Railing, Bridge, 32" F-Shape, Median, Double Face	LF

Index 422 Traffic Railing (42" Vertical Shape)

Design Criteria

NCHRP Report 350 Test Level 4 Criteria; ***AASHTO LRFD Bridge Design Specifications***, 4th Edition; ***Structures Design Guidelines (SDG)***

Design Assumptions and Limitations

The 42" Vertical Shape Traffic Railing is intended for use on bridges and retaining walls with raised sidewalks. Use this railing in accordance with the requirements of ***SDG*** 6.7.

Design bridge decks supporting 42" Vertical Shape Traffic Railings in accordance with the requirements of ***SDG*** 4.2. For bridge decks up to a maximum thickness of 9", the two Bars 5S placed in the bridge deck may substitute for the longitudinal deck steel located within the limits of Bars 5T, provided that the total area of longitudinal deck steel beneath the railing, as required by calculation, is not reduced.

Indexes 520, 5100, 5300, 20900 and 20910 contain details for the use of 42" Vertical Shape Traffic Railings on retaining walls and approach slabs.

For treatment of 42" Vertical Shape Traffic Railings on skewed bridges see Index 490.

Plan Content Requirements

In the Structures Plans:

In the Materials Note on the General Notes Sheet, specify the concrete class in accordance with the superstructure environment classification. See ***SDG*** 1.4.

Include the following Bridge Name Note on the General Notes Sheet:

Place the following bridge name on the traffic railing in accordance with the Traffic Railing Design Standard:

[Use the name of the bridge or non-roadway facility crossed, or include the name of both facilities for roadway crossings, e.g.:

THOMASVILLE ROAD FLYOVER
TOMOKA RIVER
CSX RAILROAD
US 19 OVER EAST BAY DR

For multiple bridges, identify the associated bridge number, e.g.:

Bridge No.	Name
600103	CHOCTAWHATCHEE BAY
600104	CHOCTAWHATCHEE BAY RELIEF]

Show and label the 42" Vertical Shape Traffic Railing on the Plan and Elevation, Typical Section, Superstructure, Approach Slab and Finish Grade Elevations Cross Section

sheets, and other sheets as required. Include cross references to ***Design Standards*** Index 422.

On the Superstructure section sheets, show the two Bars 5S placed in the bridge deck within the Bars 5T along with the rest of the deck steel.

In the Roadway Plans when the 42" Vertical Shape Traffic Railing is used on retaining walls:

In the Materials Note on the General Notes Sheet, specify the concrete class in accordance with the retaining wall environment classification. See ***SDG*** 1.4.

Show and label the 42" Vertical Shape Traffic Railing on the Retaining Wall Control Drawings, and other sheets as required. Include cross references to ***Design Standards*** Index 422 and 520, 5100 or 5300 as appropriate.

All concrete and Bars 5S, 5T and 5X required to construct the traffic railing are included in the Estimated Traffic Railing Quantities. Do not include traffic railing concrete in the estimated concrete quantities, or Bars 5S, 5T and 5X in the reinforcing bar lists and estimated reinforcing steel quantities for supporting bridge decks, approach slabs or retaining walls.

Payment

Item number	Item description	Unit Measure
521-5-5	Concrete Traffic Railing, Bridge, 42" Vertical Face	LF

Index 423 Traffic Railing (32" Vertical Shape)

Design Criteria

NCHRP Report 350 Test Level 4 Criteria; ***AASHTO LRFD Bridge Design Specifications***, 4th Edition; ***Structures Design Guidelines (SDG)***

Design Assumptions and Limitations

The 32" Vertical Shape Traffic Railing is intended for use on bridges and retaining walls with raised sidewalks. Use this railing in accordance with the requirements of ***SDG*** 6.7.

Design bridge decks supporting 32" Vertical Shape Traffic Railings in accordance with the requirements of ***SDG*** 4.2. For bridge decks up to a maximum thickness of 9", the two Bars 5S placed in the bridge deck may substitute for the longitudinal deck steel located within the limits of Bars 5T, provided that the total area of longitudinal deck steel beneath the railing, as required by calculation, is not reduced.

Indexes 520, 5100, 5300, 20900 and 20910 contain details for the use of 32" Vertical Shape Traffic Railings on retaining walls and approach slabs.

For treatment of 32" Vertical Shape Traffic Railings on skewed bridges see Index 490.

Plan Content Requirements

In the Structures Plans:

In the Materials Note on the General Notes Sheet, specify the concrete class in accordance with the superstructure environment classification. See ***SDG*** 1.4.

Include the following Bridge Name Note on the General Notes Sheet:

> Place the following bridge name on the traffic railing in accordance with the Traffic Railing Design Standard:
>
> [Use the name of the bridge or non-roadway facility crossed, or include the name of both facilities for roadway crossings, e.g.:
>
> > THOMASVILLE ROAD FLYOVER
> > TOMOKA RIVER
> > CSX RAILROAD
> > US 19 OVER EAST BAY DR
>
> For multiple bridges, identify the associated bridge number, e.g.:
>
> | Bridge No. | Name |
> |---|---|
> | 600103 | CHOCTAWHATCHEE BAY |
> | 600104 | CHOCTAWHATCHEE BAY RELIEF] |

Show and label the 32" Vertical Shape Traffic Railing on the Plan and Elevation, Typical Section, Superstructure, Approach Slab and Finish Grade Elevations Cross Section

sheets, and other sheets as required. Include cross references to ***Design Standards*** Index 423.

On the Superstructure section sheets, show the two Bars 5S placed in the bridge deck within the Bars 5T along with the rest of the deck steel.

In the Roadway Plans when the 32" Vertical Shape Traffic Railing is used on retaining walls:

In the Materials Note on the General Notes Sheet, specify the concrete class in accordance with the retaining wall environment classification. See ***SDG*** 1.4.

Show and label the 32" Vertical Shape Traffic Railing on the Retaining Wall Control Drawings, and other sheets as required. Include cross references to ***Design Standards*** Index 423 and 520, 5100 or 5300 as appropriate.

All concrete and Bars 5S, 5T and 5X required to construct the traffic railing are included in the Estimated Traffic Railing Quantities. Do not include traffic railing concrete in the estimated concrete quantities, or Bars 5S, 5T and 5X in the reinforcing bar lists and estimated reinforcing steel quantities for supporting bridge decks, approach slabs or retaining walls.

Payment

Item number	Item description	Unit Measure
521-5-4	Concrete Traffic Railing, Bridge, 32" Vertical Face	LF

Index 424 Traffic Railing (Corral Shape)

Design Criteria

NCHRP Report 350 Test Level 4 Criteria; ***AASHTO LRFD Bridge Design Specifications***, 4th Edition; ***Structures Design Guidelines (SDG)***

Design Assumptions and Limitations

The Corral Shape Traffic Railing is intended for use on bridges and retaining walls when an open traffic railing is desired. When constructed between the traveled way and sidewalks, the Corral Shape Traffic Railing can be used selectively with and without curbs to allow for and control deck drainage between the traveled way and adjacent sidewalks. Note that the "aesthetic openness" of the railing is effectively lost when it is used in an inboard application such as this. Use this railing in accordance with the requirements of ***SDG*** 6.7.

Design bridge decks supporting Corral Shape Traffic Railings in accordance with the requirements of ***SDG*** 4.2. For bridge decks up to a maximum thickness of 9", the two Bars 5R2 placed in the bridge deck may substitute for the longitudinal deck steel located within the limits of Bars 5T, provided that the total area of longitudinal deck steel beneath the railing, as required by calculation, is not reduced.

Indexes 520, 5100, 5300, 20900 and 20910 contain details for the use of Corral Shape Traffic Railings on retaining walls and approach slabs.

Indicate use of Curb beneath railing on low side of deck without sidewalks and other locations where required to contain bridge deck runoff. Define Curb location in Structures Plans Superstructure Sheets by Stationing limits or other appropriate methods.

Define lengths of End Posts in Structures Plans Superstructure Sheets.

Plan Content Requirements

In the Structures Plans:

In the Materials Note on the General Notes Sheet, specify the concrete class in accordance with the superstructure environment classification. See ***SDG*** 1.4.

Include the following Bridge Name Note on the General Notes Sheet:

> Place the following bridge name on the traffic railing in accordance with the Traffic Railing Design Standard:
>
> [Use the name of the bridge or non-roadway facility crossed, or include the name of both facilities for roadway crossings, e.g.:
>
> THOMASVILLE ROAD FLYOVER
> TOMOKA RIVER
> CSX RAILROAD
> US 19 OVER EAST BAY DR

For multiple bridges, identify the associated bridge number, e.g.:

Bridge No.	Name
600103	CHOCTAWHATCHEE BAY
600104	CHOCTAWHATCHEE BAY RELIEF]

Show and label the Corral Shape Traffic Railing on the Plan and Elevation, Typical Section, Superstructure, Approach Slab and Finish Grade Elevations Cross Section sheets, and other sheets as required. Include cross references to ***Design Standards*** Index 424.

On the Superstructure section sheets, show the two Bars 5R2 placed in the bridge deck within the limits of Bars P along with the rest of the deck steel.

In the Roadway Plans when the Corral Shape Traffic Railing is used on retaining walls:

In the Materials Note on the General Notes Sheet, specify the concrete class in accordance with the retaining wall environment classification. See ***SDG*** 1.4.

Show and label the Corral Shape Traffic Railing on the Retaining Wall Control Drawings, and other sheets as required. Include cross references to ***Design Standards*** Index 424 and 520, 5100 or 5300 as appropriate.

All concrete and Bars P, R, S, T, U and V required to construct the traffic railing are included in the Estimated Traffic Railing Quantities. Do not include traffic railing concrete in the estimated concrete quantities, or Bars P, R, S, T, U and V in the reinforcing bar lists and estimated reinforcing steel quantities for supporting bridge decks, approach slabs or retaining walls.

Payment

Item number	Item description	Unit Measure
521-5-6	Concrete Traffic Railing, Bridge, Corral W/Curb	LF
521-5-7	Concrete Traffic Railing, Bridge, Corral Without Curb	LF

Index 425 Traffic Railing (42" F Shape)

Design Criteria

NCHRP Report 350 Test Level 4 Criteria; ***AASHTO LRFD Bridge Design Specifications***, 4th Edition; ***Structures Design Guidelines (SDG)***

Design Assumptions and Limitations

The 42" F-Shape Traffic Railing should be used where a railing with Test Level 5 crashworthiness is warranted. Use this railing in accordance with the requirements of ***SDG*** 6.7.

Design bridge decks supporting 42" F-Shape Traffic Railings in accordance with the requirements of ***SDG*** 4.2. For bridge decks up to a maximum thickness of 11", the two Bars 5S2 placed in the bridge deck may substitute for the longitudinal deck steel located within the limits of Bars 5V, provided that the total area of longitudinal deck steel beneath the railing, as required by calculation, is not reduced.

Indexes 520, 5100, 5300, 20900 and 20910 contain details for the use of 42" F-Shape Traffic Railings on retaining walls and approach slabs.

For treatment of 42" F-Shape Traffic Railings on skewed bridges see Index 490.

Plan Content Requirements

In the Structures Plans:

In the Materials Note on the General Notes Sheet, specify the concrete class in accordance with the superstructure environment classification. See ***SDG*** 1.4.

Include the following Bridge Name Note on the General Notes Sheet:

Place the following bridge name on the traffic railing in accordance with the Traffic Railing Design Standard:

[Use the name of the bridge or non-roadway facility crossed, or include the name of both facilities for roadway crossings, e.g.:

THOMASVILLE ROAD FLYOVER
TOMOKA RIVER
CSX RAILROAD
US 19 OVER EAST BAY DR

For multiple bridges, identify the associated bridge number, e.g.:

Bridge No.	Name
600103	CHOCTAWHATCHEE BAY
600104	CHOCTAWHATCHEE BAY RELIEF]

Show and label the 42" F-Shape Traffic Railing on the Plan and Elevation, Typical Section, Superstructure, Approach Slab and Finish Grade Elevations Cross Section sheets, Retaining Wall Control Drawings, and other sheets as required. Show limiting stations when transitioning to other type traffic railings. Include cross references to ***Design Standards*** Index 425 and 20900 or 20910 as appropriate.

On the Superstructure section sheets, show the two Bars 5S2 placed in the bridge deck within the Bars 5V along with the rest of the deck steel.

In the Roadway Plans when the 42" F-Shape Traffic Railing is used on retaining walls:

In the Materials Note on the General Notes Sheet, specify the concrete class in accordance with the retaining wall environment classification. See ***SDG*** 1.4.

Show and label the 42" F-Shape Traffic Railing on the Retaining Wall Control Drawings, and other sheets as required. Show limiting stations when transitioning to other type traffic railings. Include cross references to ***Design Standards*** Index 425 and 520, 5100 or 5300 as appropriate.

All concrete and Bars 5P, S, 8T and 5V required to construct the traffic railing are included in the Estimated Traffic Railing Quantities. Do not include traffic railing concrete in the estimated concrete quantities, or Bars 5P, S, 8T and 5V in the reinforcing bar lists and estimated reinforcing steel quantities for supporting bridge decks, approach slabs or retaining walls.

Payment

Item number	Item description	Unit Measure
521-5-2	Concrete Traffic Railing, Bridge 42" F-Shape	LF

Index 470 Series Traffic Railing - (Thrie Beam Retrofit)

Design Criteria

NCHRP Report 350, Test Level 4; ***AASHTO LRFD Bridge Design Specifications***, 4th Edition, Section 13; ***Structures Design Guidelines (SDG)***

Design Assumptions and Limitations

Index 470 is the lead standard for the Traffic Railing (Thrie-Beam Retrofit) standard series which includes Indexes 470 through 476. Use this standard with Indexes 402, 471, 472, 473, 474, 475 and 476.

The Traffic Railing (Thrie-Beam Retrofit) Indexes 470 through 476, are applicable for retrofitting specific types of existing bridge mounted traffic railings (a.k.a. concrete handrails) that are not based on crash tested designs.

These Standards are to be used in conjunction with Index 402. The appropriate Index 402 approach transition retrofit for Index 470 Series bridge railing retrofits must be selected and specified in the plans based on the shapes and designs of the existing bridge traffic railings, approach slabs and end bent wing walls. See the Instructions for Index 402 and ***SDG*** 6.7 for more information.

The applicability of the Thrie-Beam Retrofit to a particular bridge shall be determined based on a review of the Load Rating of the existing bridge, a comparison of the existing bridge geometry to that shown for the Thrie-Beam Retrofit and an evaluation of the structural adequacy of the existing bridge deck and wing walls in accordance with the requirements of the ***SDG***. The average weights per linear foot of the retrofits are 40 lb/ft for Index Nos. 471, 475 and 476 and 30 lb/ft for Index Nos. 472, 473 and 474.

The Traffic Railing (Thrie-Beam Retrofit) is based on a design that has been successfully crash tested in accordance with ***NCHRP Report 350*** Test Level 4 criteria. The Standards all utilize 10 Gauge Thrie-Beam Guardrail that is installed adjacent to the face of the existing curb and in front of, or in place of, all or part of the existing traffic railing. The Standards work with existing traffic railings that incorporate either solid concrete parapet type or concrete post and beam type railings with or without top mounted metal railings. These existing traffic railings are typically mounted on top of concrete curbs of varying widths and heights. The individual Standards address both narrow and wide curbs (a.k.a. "safety curbs"), and skewed and non-skewed bridges with parallel, perpendicular, angled or flared end bent wing walls. Each Standard includes several schemes that address the given wing wall configurations. Examples depicting existing curb and end bent wing wall configurations are shown in the Existing Curb Schematics and the Partial Plan Views of Existing Bridges herein.

Generally, the Roadway Plans shall include all of the sheets necessary to define and detail the retrofit of the existing traffic railings. Index 470, Traffic Railing (Thrie-Beam Retrofit) General Notes and Details shall be referenced in the Roadway Plans, or a similar project specific drawing depicting general notes and details, shall be included in

the Roadway Plans. In addition, one or more of the appropriate Indexes 471 through 476, that most closely matches the configuration of the existing traffic railing and curb is to be referenced in the Roadway Plans for each bridge as required. Generally, these Standards can be used without any modifications being made to them. More than one of the Indexes 471 through 476 may be required for a single bridge due to the curbs or sidewalks on the two sides of the bridge possibly having different widths. A separate Plan and Elevation sheet of the type used in Structures Plans is generally not required.

The heights of the exposed portions of the existing bridge curbs may vary and shall be determined by field measurement. These Standards are applicable for bridges with exposed curb heights from 5" to 1'-0". If resurfacing of the bridge deck is proposed, then the Roadway Engineer shall ensure sufficient milling depth is shown in the Plans in order to maintain the 5" minimum exposed curb height. The appropriate post designation of "A", "B" or "C" shall be determined and shown in the Plans for each bridge based on the criteria given in the Post Dimension Table on ***Design Standards*** Index 470. The selection of the appropriate post shall consider any proposed milling and resurfacing work.

The need to remove all or part of the existing traffic railing down to the top of the curb in order to provide room for the construction of the retrofit is addressed in the individual Standards. Payment for the removal of all or part of the existing traffic railing shall be included in Removal of Existing Structures, Pay Item 110-3. As part of the overall retrofit concept for a bridge, the existing traffic railing may be removed, even though it is not specifically required to be, in order to reduce the dead load carried by the bridge. In these cases, the potential drop off hazard for pedestrians that will be created behind the retrofit shall be addressed in the Plans.

The treatment of the approach end of the retrofit shall consist of Index 402 or another appropriate site specific treatment. The appropriate treatment of the trailing end of the retrofit shall be determined by the Roadway Engineer. As a minimum, if no other hazards are present, an Index 400, W-Thrie Beam Transition Section and an End Anchorage Assembly Type II shall be provided on the trailing end of the retrofit. On approach ends, a Transition Block or Curb is required if the existing Approach Slab does not have a curb. A Transition Block is not required on trailing ends with no opposing traffic; however, a Curb may be required due to drainage needs. An Index 300, Type D Concrete Curb is generally suitable for this application. The appropriate site specific approach and trailing end treatments shall be shown in the Plans.

Indexes 402 and 470 through 476 shall be supplemented as required with project specific details that may be deemed necessary to complete the installation of the retrofit. These details may include locations and details of any existing utilities, conduits, drainage structures, sign structures and luminaire supports, and/or any other needed information not included in these Standards. In the event that the designs and details presented in the Standards do not closely match the existing conditions, the Structures and/or Roadway Engineer(s) shall prepare a customized project specific retrofit design based on the crash tested bridge railing and guardrail transition designs presented in Indexes 402 and 470 through 476 as guides. Contact the Structures Design Office and Roadway Design Office for guidance in this event.

The Structures Engineer shall evaluate the thermal movements of the existing bridge using the following criteria and shall identify the locations in the Plans (if any are required) where a Thrie-Beam Expansion Section is to be included in the guardrail. If the total thermal movement at an individual bridge deck expansion joint is 1½" (¾" in each direction) or less, the Thrie-Beam Guardrail shall span the joint without the use of an expansion section. If the total thermal movement at an individual bridge deck expansion joint exceeds 1½", a Thrie-Beam Expansion Section must be installed at that location. The total amount of thermal movement at bridge deck expansion joints shall be determined by theoretical calculation and confirmed by field measurements where possible. It should be noted that the actual in-service movement due to thermal effects may be less than the value determined by theoretical calculation.

The Utility Adjustment Plans, if required, shall contain all necessary utility adjustment information required for the construction of the retrofit. Utilities and/or conduits may exist in or adjacent to the existing traffic railings and will vary in size, number and location. The presence, size, number and locations of existing utilities and/or conduits shall be determined by a review of existing Plans and confirmed by field verification. It should be noted that utility and/or conduit installations may vary by location on a single bridge. Thus, a field verification shall be conducted for each individual installation of the retrofit. Existing utilities and/or conduits that conflict with the retrofit shall be relocated if possible or placed out of service. The required field verification work should be completed as early in the evaluation phase as possible.

The Traffic Control Plans for the construction of the retrofit shall be prepared in accordance with Index 600 Series. The Plans shall address all aspects of the full or partial removal of the existing traffic railing (when required) and construction of the retrofit. Generally, the use of Indexes 471 and 474 will require the removal of the existing traffic railing and will require traffic control consisting of shifting, narrowing and/or closing of travel lanes and or shoulders. In this case, the use of crash tested Precast Concrete Temporary Barriers will also be required to protect the drop-off exposed by the removal of the existing traffic railing.

Indexes 470 through 476 do not address retrofitting of the existing traffic railings, curbs or sidewalks for pedestrian use. The potential need to retrofit the existing bridge for pedestrian use shall be evaluated on a project by project basis and the necessary Plans developed accordingly. Generally, the potential effects on pedestrian use of the bridge will be confined to bridges with sidewalks or wide curbs. The use of Index 400, Pedestrian Safety Pipe Rail, shall be evaluated and noted in the Plans where appropriate. The reduction in clear width of the curb or sidewalk caused by the installation of the retrofit and Pedestrian Safety Pipe Rail shall be considered.

It should be noted that the existing traffic railings and/or guardrail end transitions may have been previously retrofitted utilizing a scheme presented in Roadway and Traffic ***Design Standards*** Index 401 (2000 and earlier Editions). In this event, the requirements for removal or replacement of the prior retrofit shall be evaluated and addressed in the Plans as required. The removal of the prior retrofit may be considered as incidental work with no separate payment made.

The applicability of the individual Standards to different curb widths and superstructure types is described as follows:

Index 471 - Applicable for existing narrow curbs as shown below. This index requires removal of the existing traffic railing to the top of the existing curb along the entire length of the bridge and wing walls. On flat slab type superstructures, the potential reduction in the vertical clearance beneath the bridge due to the installation of this index shall be considered.

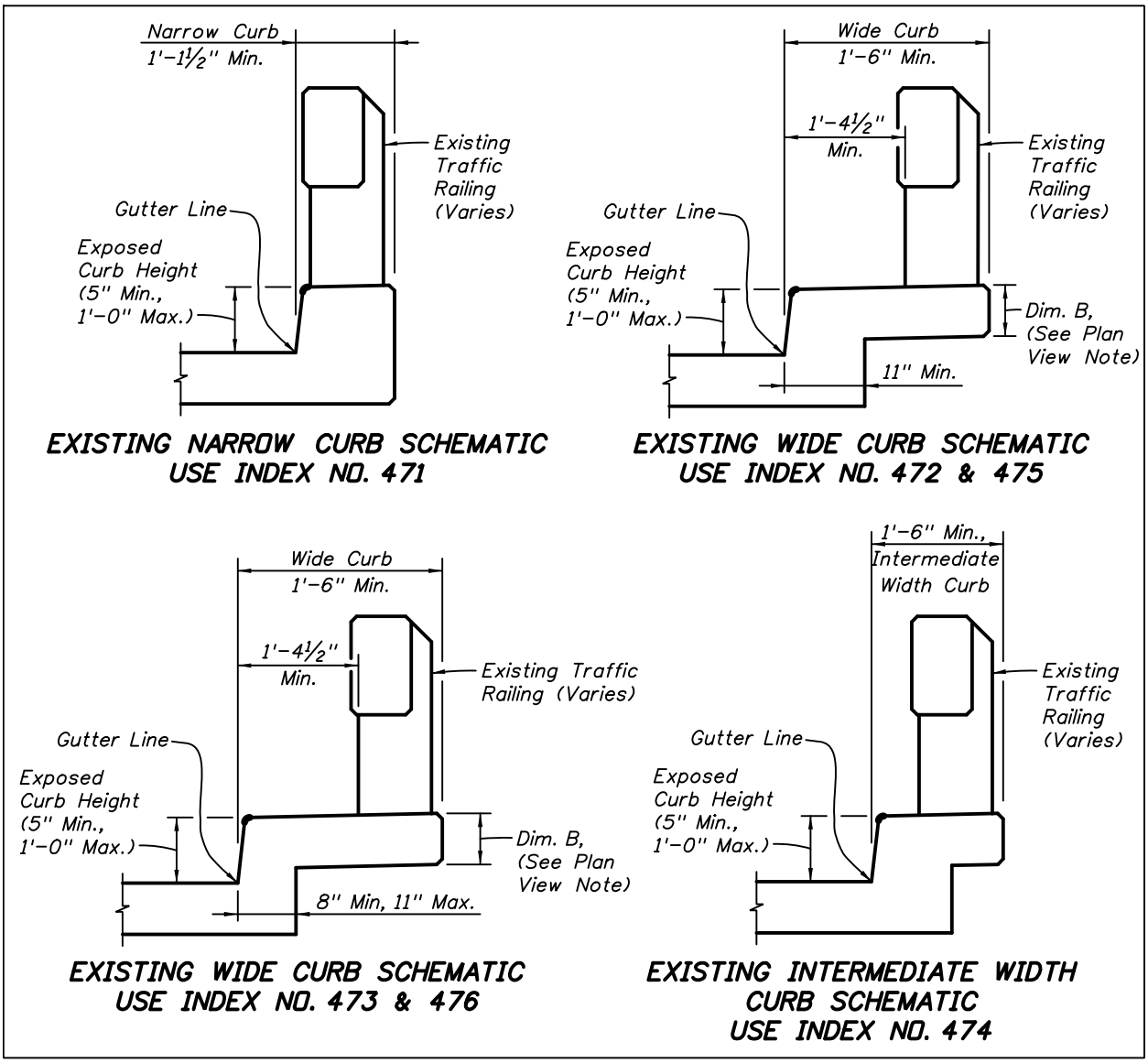
Index 472 - Applicable for existing wide curbs or sidewalks as shown below. This index generally allows the entire existing traffic railing to remain in place.

Index 473 - Applicable for existing wide curbs or sidewalks as shown below. This index generally allows the entire existing traffic railing to remain in place.

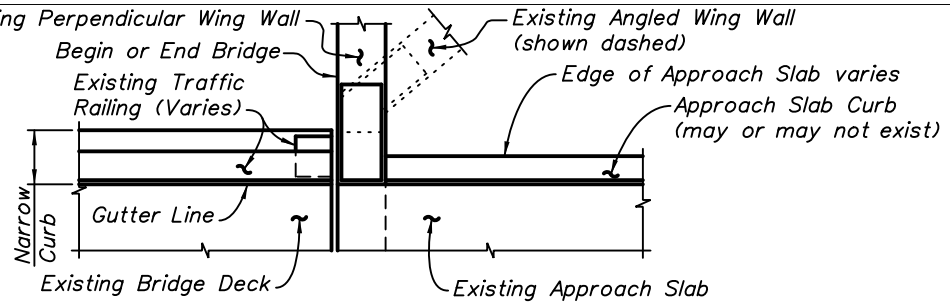
Index 474 - Applicable for existing intermediate width curbs as shown below. This index requires removal of the existing traffic railing to the top of the existing curb along the entire length of the bridge and wing walls.

Index 475 - Applicable for existing wide curbs or sidewalks as shown below on bridges with decks that do not meet the strength requirements for Index 472. This index generally allows the entire existing traffic railing to remain in place. This index is primarily intended for use on bridges with superstructures consisting of longitudinally prestressed, transversely post-tensioned, solid or voided concrete slab units but it can also be used for other types of superstructures.

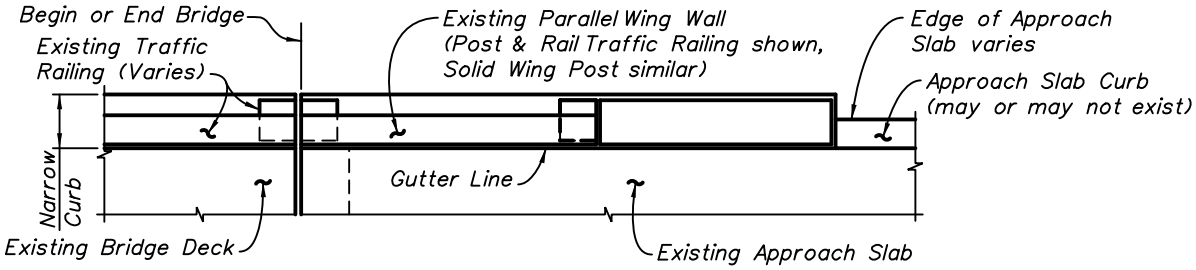
Index 476 - Applicable for existing wide curbs or sidewalks as shown below on bridges with decks that do not meet the strength requirements for Index 473. This index generally allows the entire existing traffic railing to remain in place. On flat slab type superstructures, the potential reduction in the vertical clearance beneath the bridge due to the installation of this index shall be considered. Indexes 471, 472 and 476 cannot be used on bridges with superstructures consisting of longitudinally prestressed, transversely post-tensioned, solid or voided concrete slab units.



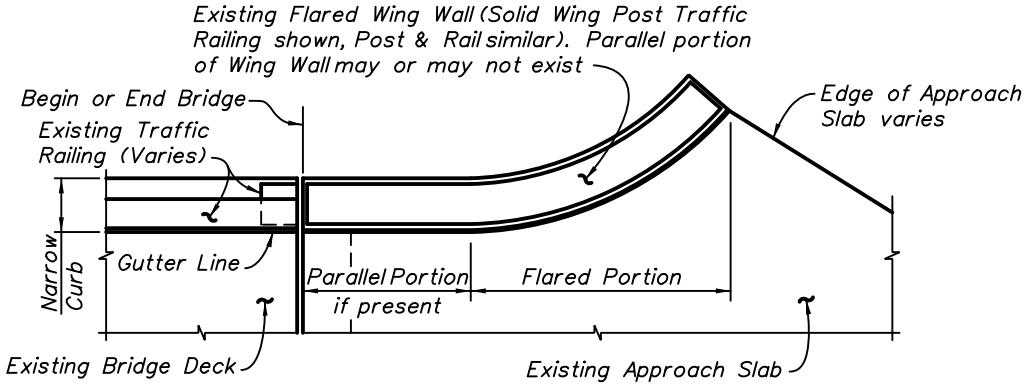
The applicability of the individual retrofit schemes to different wing wall configurations is shown below.



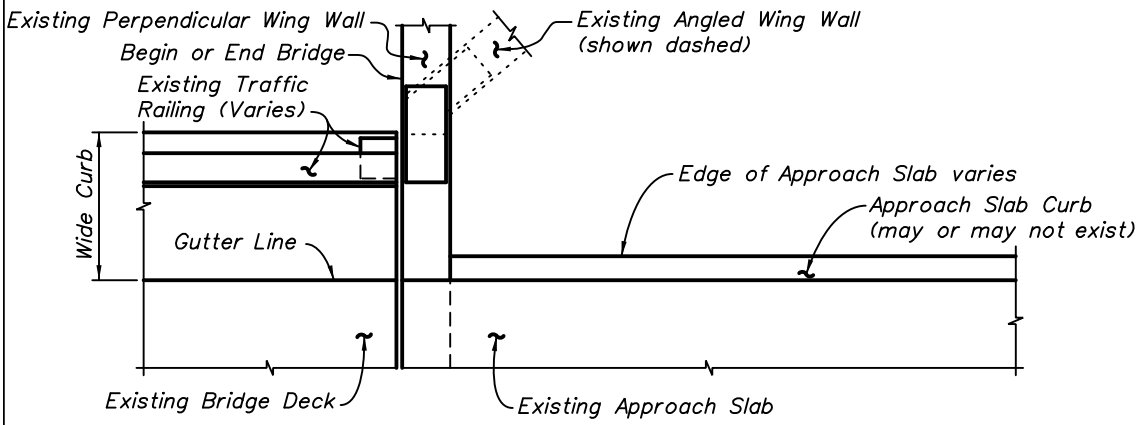
PARTIAL PLAN VIEW OF EXISTING BRIDGE WITH NARROW CURBS AND PERPENDICULAR OR ANGLED WING WALLS - USE INDEX NO. 471, SCHEME 1



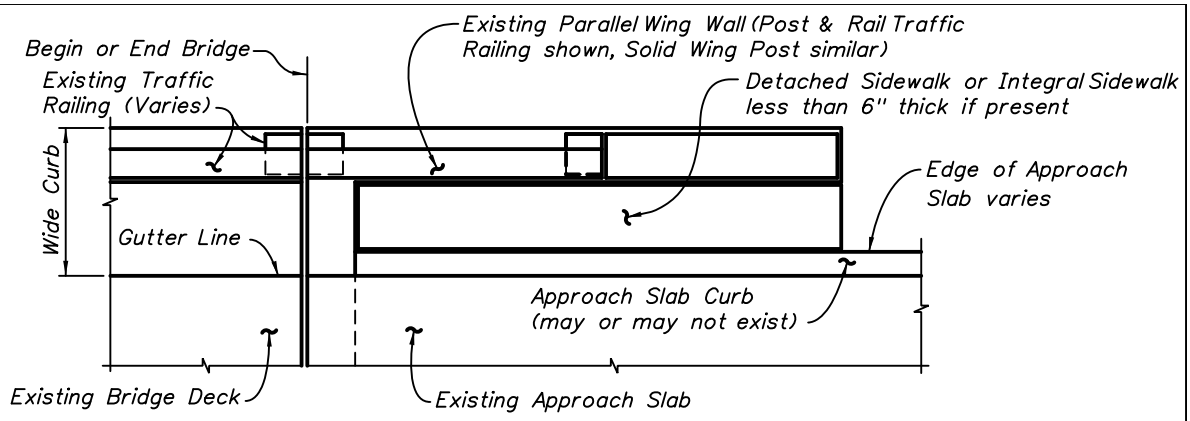
PARTIAL PLAN VIEW OF EXISTING BRIDGE WITH NARROW CURBS AND PARALLEL WING WALLS - USE INDEX NO. 471, SCHEME 2



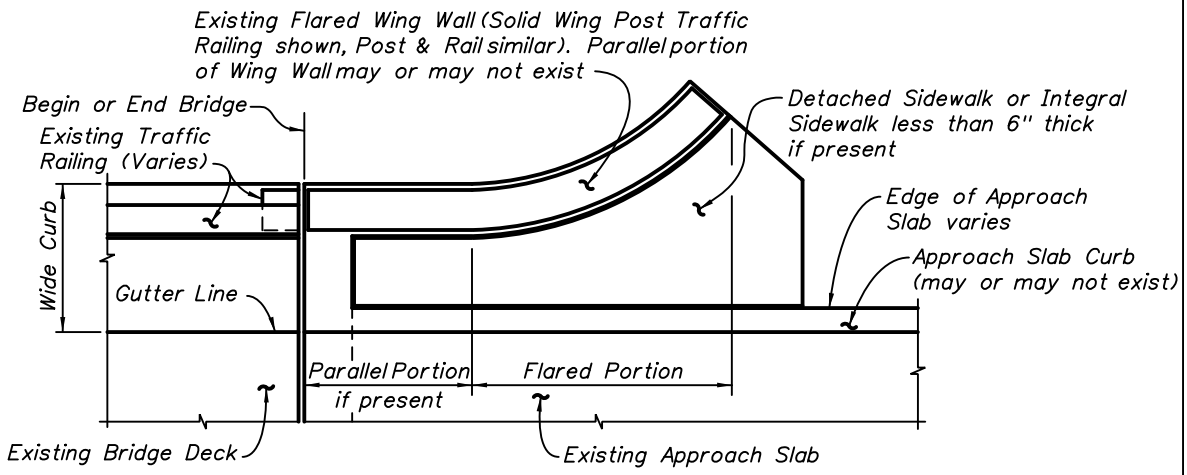
PARTIAL PLAN VIEW OF EXISTING BRIDGE WITH NARROW CURBS AND FLARED WING WALLS - USE INDEX NO. 471, SCHEME 3



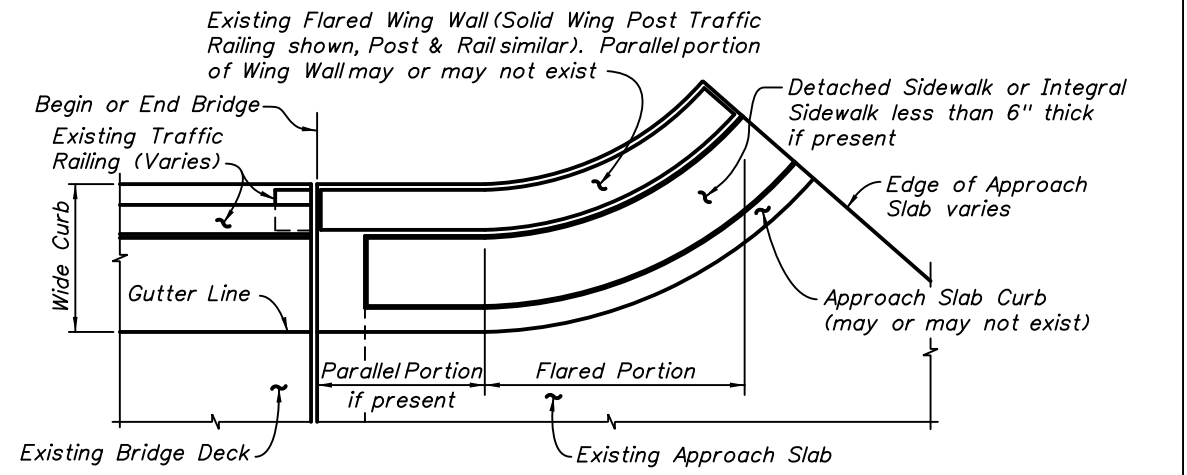
PARTIAL PLAN VIEW OF EXISTING BRIDGE WITH WIDE CURBS AND PERPENDICULAR OR ANGLED WING WALLS - USE INDEX NOS. 472, 473, 475 OR 476, SCHEME 1



PARTIAL PLAN VIEW OF EXISTING BRIDGE WITH WIDE CURBS, PARALLEL WING WALLS AND APPROACH SLABS WITH DETACHED SIDEWALKS OR SIDEWALKS LESS THAN 6" THICK - USE INDEX NOS. 472, 473, 475 OR 476 SCHEME 2

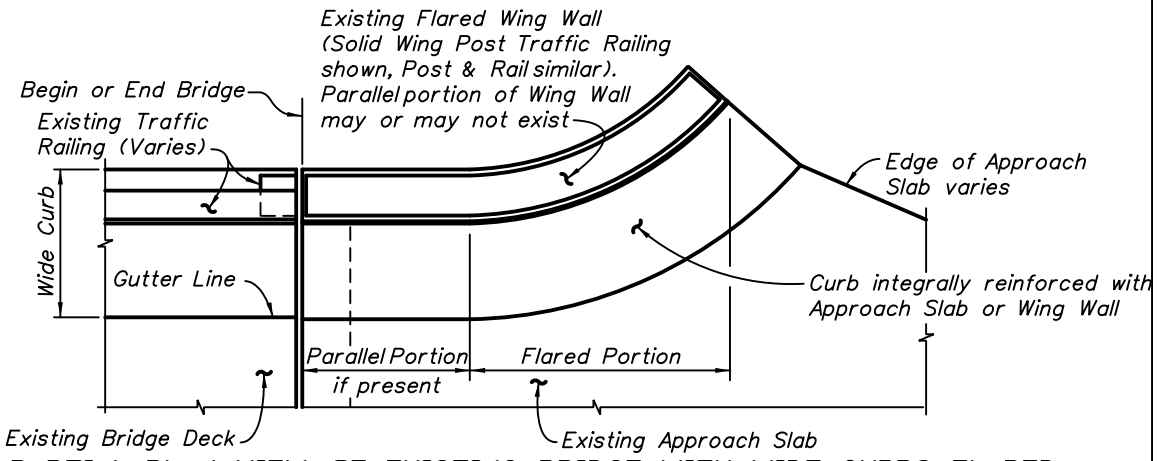


PARTIAL PLAN VIEW OF EXISTING BRIDGE WITH WIDE CURBS, FLARED WING WALLS AND APPROACH SLABS WITH DETACHED SIDEWALKS OR SIDEWALKS LESS THAN 6" THICK - USE INDEX NOS. 472, 473, 475 OR 476 SCHEME 2



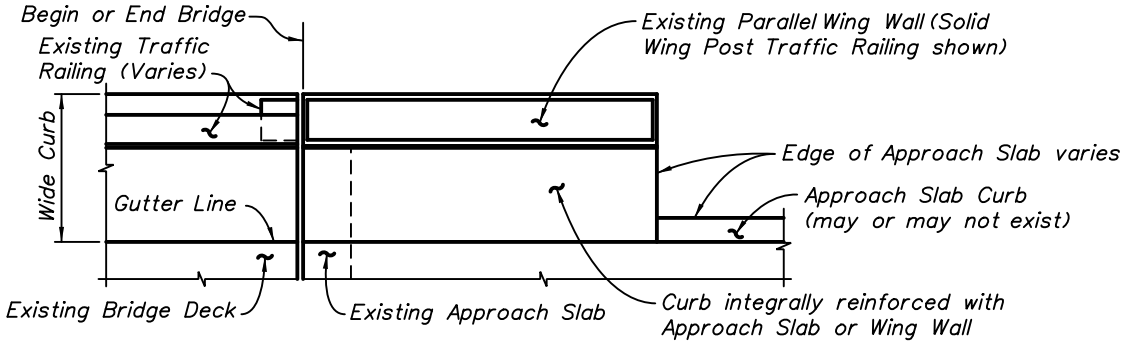
PARTIAL PLAN VIEW OF EXISTING BRIDGE WITH WIDE CURBS, FLARED WING WALLS AND APPROACH SLABS WITH DETACHED SIDEWALKS OR SIDEWALKS LESS THAN 6" THICK - USE INDEX NOS. 472, 473, 475 OR 476 SCHEME 2

NOTE: If Existing Curb or Wing Wall Dimension B is 1'-3" or greater use Scheme 3. If Existing Curb or Wing Wall Dimension B is equal to or greater than 6" but less than 1'-3", use Scheme 4. If Dimension B is less than 6", use Scheme 2. See Sheet 1 of 5 for Dimension B.



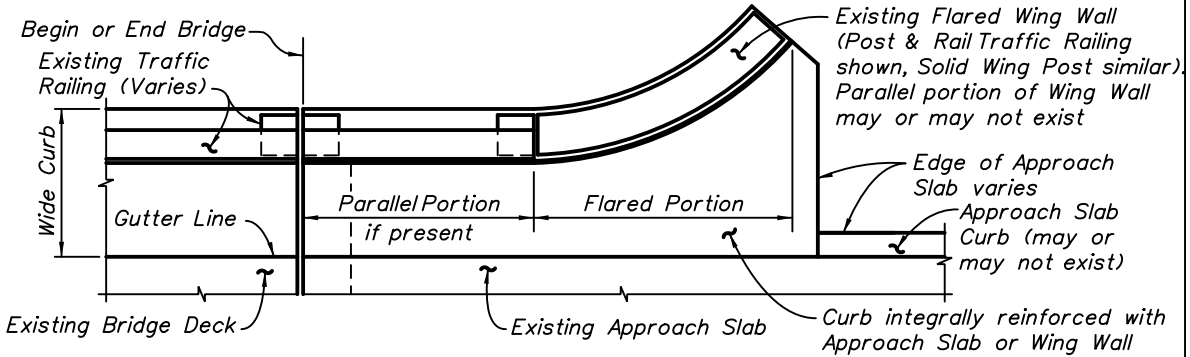
PARTIAL PLAN VIEW OF EXISTING BRIDGE WITH WIDE CURBS, FLARED WING WALLS AND FLARED INTEGRALLY REINFORCED APPROACH SLAB CURBS - USE INDEX NOS. 472, 473, 475 OR 476 SCHEMES 3 OR 4

NOTE: If Existing Curb or Wing Wall Dimension B is 1'-3" or greater use Scheme 5. If Existing Curb or Wing Wall Dimension B is equal to or greater than 6" but less than 1'-3", use Scheme 6. If Dimension B is less than 6", use Scheme 2. See Sheet 1 of 5 for Dimension B.

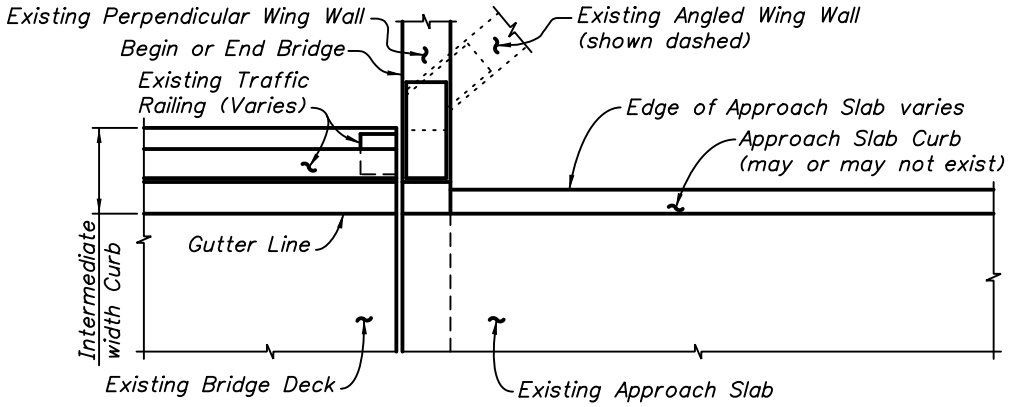


PARTIAL PLAN VIEW OF EXISTING BRIDGE WITH WIDE CURBS, PARALLEL WING WALLS AND INTEGRALLY REINFORCED APPROACH SLAB CURBS - USE INDEX NOS. 472, 473, 475 OR 476 SCHEMES 5 OR 6

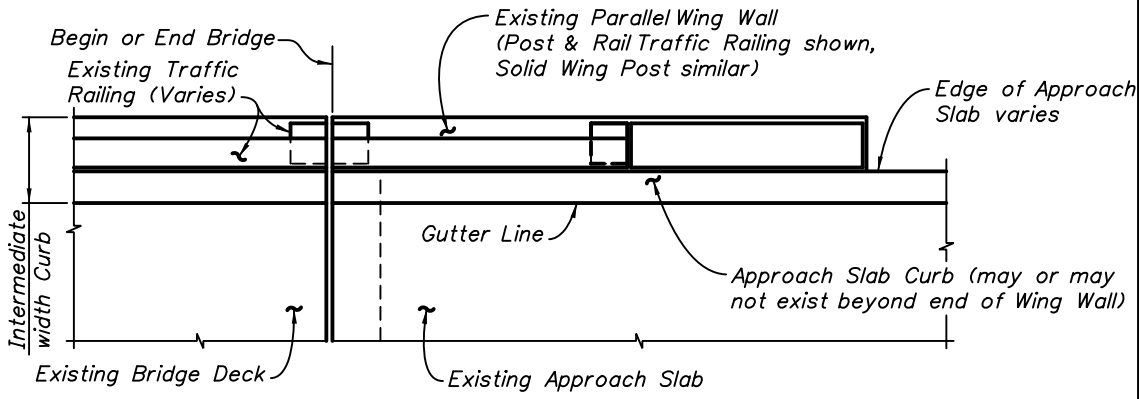
NOTE: If Existing Curb or Wing Wall Dimension B is 1'-3" or greater use Scheme 5. If Existing Curb or Wing Wall Dimension B is equal to or greater than 6" but less than 1'-3", use Scheme 6. If Dimension B is less than 6", use Scheme 2. See Sheet 1 of 5 for Dimension B.



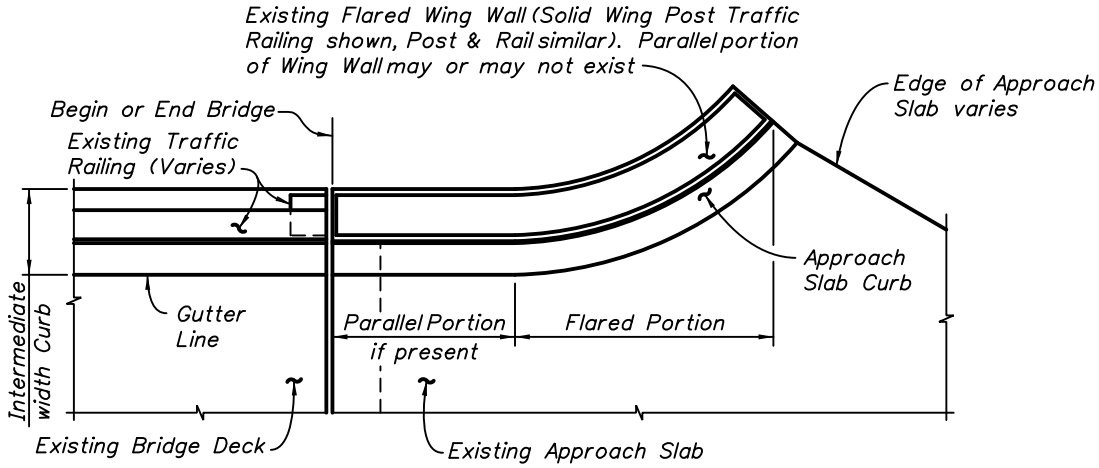
PARTIAL PLAN VIEW OF EXISTING BRIDGE WITH WIDE CURBS, FLARED WING WALLS AND PARALLEL INTEGRALLY REINFORCED APPROACH SLAB CURBS - USE INDEX NOS. 472, 473, 475 OR 476 SCHEMES 5 OR 6



PARTIAL PLAN VIEW OF EXISTING BRIDGE WITH INTERMEDIATE WIDTH CURBS AND PERPENDICULAR OR ANGLED WING WALLS - USE INDEX NO. 474, SCHEME 1



PARTIAL PLAN VIEW OF EXISTING BRIDGE WITH INTERMEDIATE WIDTH CURBS AND PERPENDICULAR OR ANGLED WING WALLS - USE INDEX NO. 474, SCHEME 2



PARTIAL PLAN VIEW OF EXISTING BRIDGE WITH INTERMEDIATE WIDTH CURBS, FLARED WING WALLS AND FLARED INTEGRAL APPROACH SLAB CURBS - USE INDEX NO. 474, SCHEME 3

Plan Content Requirements

The appropriate ***Design Standards*** Index number and Scheme number shall be shown in the Roadway Plans for each bridge along with the limiting stations of the retrofit. The appropriate post designation of "A", "B" or "C" shall be determined and shown in the Plans for each bridge based on the criteria given in the Post Dimension Table on ***Design Standards*** Index 470. The selection of the appropriate post shall consider any proposed milling and resurfacing work.

The limiting stations or overall length of the retrofit for each bridge shall also be shown. An example of a note containing the required information as it would appear on a Plan or Plan-Profile sheet is as follows:

> "Construct Traffic Railing (Thrie-Beam Retrofit), Index No. 47X, Scheme X, from Sta. XX+XX.XX (at or near Begin Bridge) to Sta. XX+XX.XX (at or near End Bridge). On left side of bridge utilize Post "X". On right side of bridge utilize Post "X". See ***Design Standards*** Index 470 for post details."

If the same height post can be used on both sides of the bridge, a single post designation is all that is required.

For projects with multiple bridges, a tabular format may be used to convey the necessary information.

A separate Plan and Elevation sheet of the type used in Structures Plans is generally not required.

Payment

Item number	Item description	Unit Measure
460-71-1	Metal Traffic Railing, Thrie Beam Retrofit	LF

Example Quantity Calculations

The following examples cover the three general cases for quantity calculations for the length of payment along each side of a bridge:

CASE I - Indexes 471 and 474 Scheme 2 and Indexes 472, 473, 475 and 476 Schemes 5 and 6 - Traffic Railing (Thrie-Beam Retrofit) extends close to the end of the wing wall or parallel curb on the approach slab.

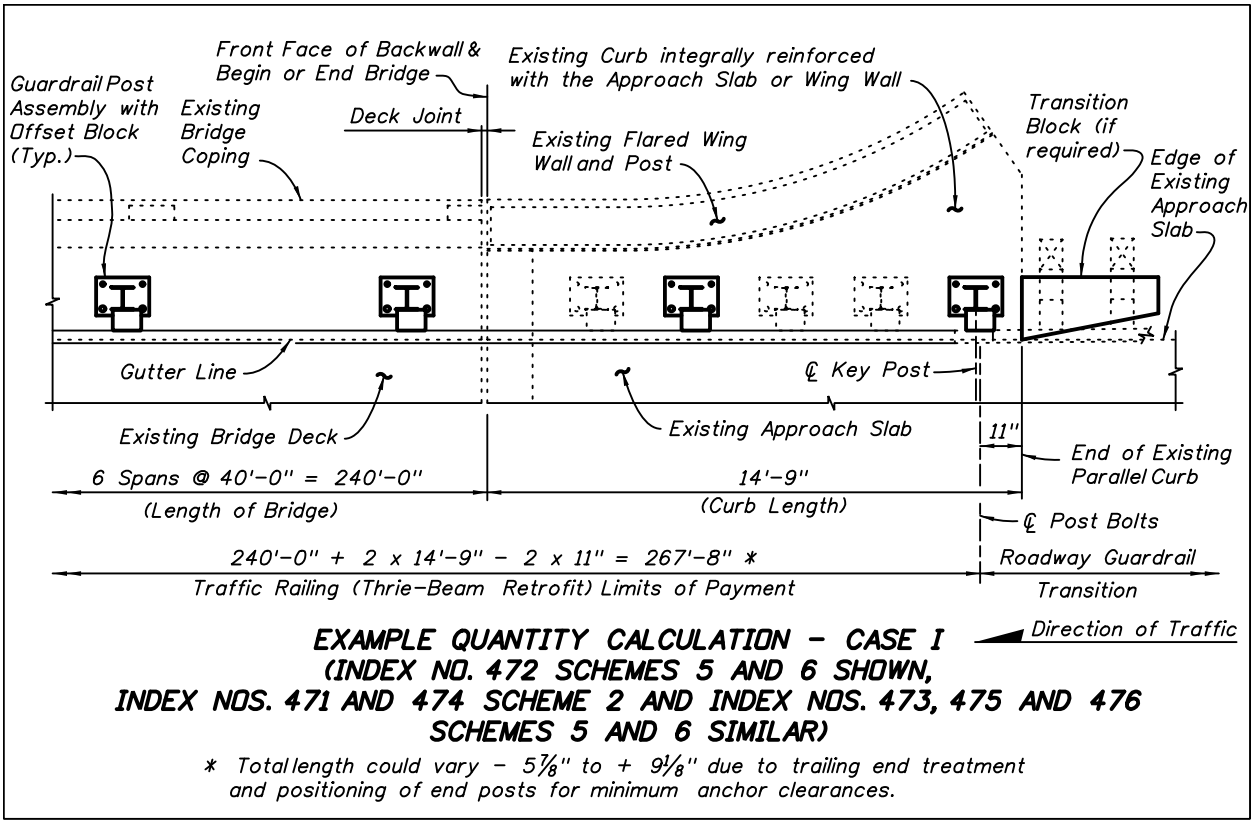
CASE II - Indexes 471, 472, 473, 474, 475 and 476 Scheme 1 and Indexes 472, 473, 475 and 476 Scheme 2 - Traffic Railing (Thrie-Beam Retrofit) extends close to the end of the bridge deck.

CASE III - Indexes 472, 473, 475 and 476 Schemes 3 and 4 and Index 474 Scheme 3 - Traffic Railing (Thrie-Beam Retrofit) extends far enough along the flared curb until the Special Steel Guardrail Post can be located on the approach slab.

In the following examples, it is assumed that the trailing end treatment is the same as the approach end treatment. For Case III, Indexes 472, 473, 475 and 476 Schemes 3 and 4, different trailing end treatments usually give an error of less than one foot for each side of the bridge. Different trailing end treatments for Case III, Index 474 Scheme 3 may give an error of ± 3'-0", due to the flexibility given to the Contractor for locating the posts on the flared wing wall. The Designer may need to show stationing limits in the plans for these Standard Indexes when the location of a site specific end treatment is critical. Different trailing end treatments for Case I and Case II will have no effect on the length of payment.

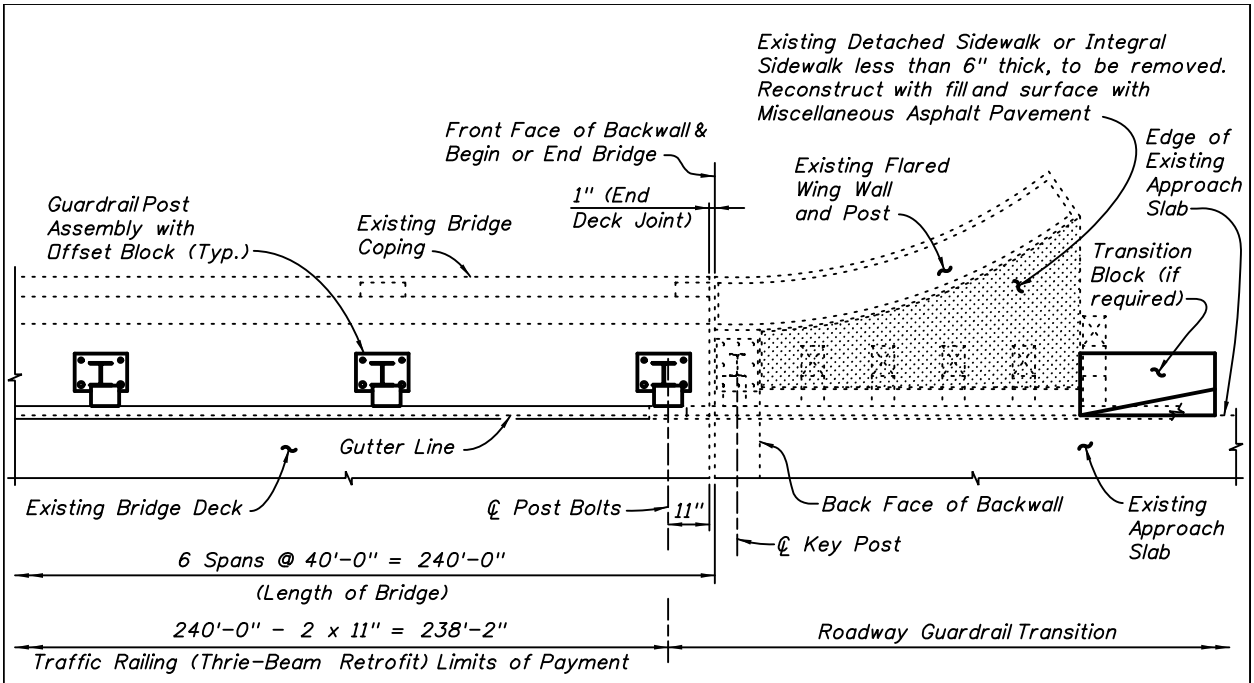
For bridges with different wing wall lengths at begin and end bridge, such as skewed bridges, the calculated lengths should be adjusted accordingly for Cases I & III.

For curved bridges the length of payment shall be measured along the gutter line, and the arc angle projection of the gutter line for flared curbs (Case III).



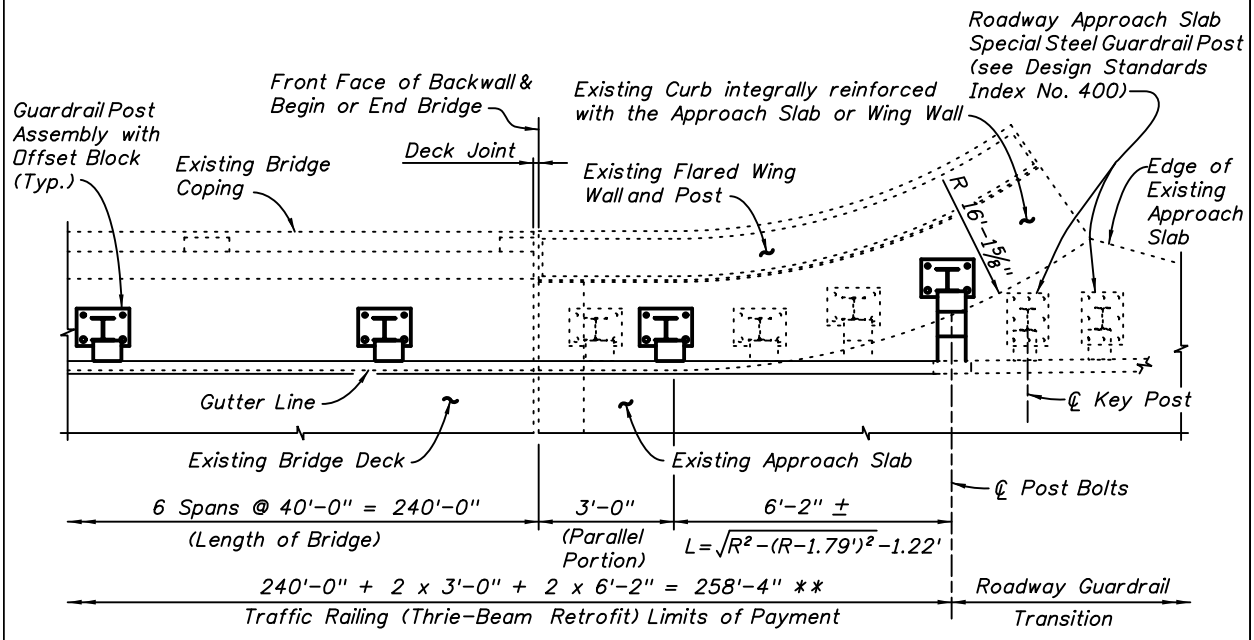
EXAMPLE QUANTITY CALCULATION - CASE I
(INDEX NO. 472 SCHEMES 5 AND 6 SHOWN, INDEX NOS. 471 AND 474 SCHEME 2 AND INDEX NOS. 473, 475 AND 476 SCHEMES 5 AND 6 SIMILAR)

* Total length could vary - 5⅞" to + 9⅛" due to trailing end treatment and positioning of end posts for minimum anchor clearances.



EXAMPLE QUANTITY CALCULATION - CASE II
(INDEX NO. 472 SCHEME 2 SHOWN, INDEX NOS. 471, 472, 473, 474, 475 AND 476 SCHEME 1 AND INDEX NOS. 473 AND 476 SCHEME 2 SIMILAR)

Direction of Traffic



EXAMPLE QUANTITY CALCULATION - CASE III
(INDEX NO. 472 SCHEMES 3 AND 4 SHOWN, INDEX NOS. 473, 475 AND 476 SCHEMES 3 AND 4 AND INDEX NO. 474 SCHEME 3 SIMILAR)

Direction of Traffic

** Total length could vary due to trailing end treatment.

Index 480 Series Traffic Railing - (Vertical Face Retrofit)

Design Criteria

NCHRP Report 350, Test Level 4; ***AASHTO LRFD Bridge Design Specifications***, 4th Edition, Section 13; ***Structures Design Guidelines (SDG)***

Design Assumptions and Limitations

Index 480 is the lead standard for the Traffic Railing (Vertical Face Retrofit) standard series which includes Indexes 480 through 484. Use this standard with Indexes 402, 410, 481, 482, 483 and 484.

The Traffic Railing (Vertical Face Retrofit), Indexes 480 through 483, are applicable for retrofitting specific types of existing bridge mounted traffic railings (a.k.a. concrete handrails) that are not based on crash tested designs.

Index 484 should only be used when space is limited, which precludes the use of a guardrail end treatment or crash cushion. Determine the Length of Advancement for the Tapered End Transition using the criteria shown on Index 484, Sheet 1.

These Standards are to be used in conjunction with Indexes 402 and 410. The appropriate Index 402 approach transition retrofit for Index 480 Series bridge railing retrofits or Index 484 Tapered End Transition must be selected and specified in the plans based on the shapes and designs of the existing bridge traffic railings, approach slabs and end bent wing walls. See the Instructions for Index 402 and ***SDG*** 6.7 for more information.

The applicability of the Vertical Face Retrofit to a particular bridge shall be determined based on a review of the Load Rating of the existing bridge, a comparison of the existing bridge geometry to that shown for the Vertical Face Retrofit and an evaluation of the structural adequacy of the existing bridge deck and wing walls in accordance with the requirements of the ***SDG***. The average weight per linear foot of the retrofit installed on an 8 inch tall curb is 270 lb/ft.

The Traffic Railing (Vertical Face Retrofit) has been structurally evaluated to be equivalent or greater in strength to a design which has been successfully crash tested previously and approved for a ***NCHRP Report 350*** Test Level 4 rating. The Standards all utilize a cast in place, vertical face, reinforced concrete block that is installed adjacent to the face of the existing curb and in front of, or in place of, all or part of the existing traffic railing. The Standards work with existing traffic railings that incorporate either solid concrete parapet type or concrete post and beam type railings with or without top mounted metal railings. These existing traffic railings are typically mounted on top of concrete curbs of varying widths and heights. The individual Standards address both narrow and wide curbs (a.k.a. "safety curbs"), and skewed and non-skewed bridges with parallel, perpendicular, angled or flared end bent wing walls. Each Standard includes several schemes that address the given wing wall configurations. Examples depicting existing curb and end bent wing wall configurations are shown in the Existing Curb Schematic and the Partial Plan Views of Existing Bridges herein.

Generally, the Roadway Plans shall include all of the sheets necessary to define and detail the retrofit of the existing traffic railings. Index 480, Traffic Railing (Vertical Face Retrofit) General Notes and Details, shall be referenced in the Roadway Plans or a similar project specific drawing depicting general notes and details, shall be included in the Roadway Plans. In addition, one or more of the appropriate Indexes 481 through 484, that most closely matches the configuration of the existing traffic railing and curb is to be referenced in the Roadway Plans for each bridge as required. Generally, these Standards can be used without any modifications being made to them. More than one of the Indexes 481 through 484, may be required for a single bridge due to the curbs or sidewalks on the two sides of the bridge possibly having different widths.

The need to remove all or part of the existing traffic railing down to the top of the curb in order to provide room for the construction of the retrofit is addressed in the individual retrofit indexes. Payment for the removal of all or part of the existing traffic railing shall be included in Removal of Existing Structures, Pay Item 110-3. As part of the overall retrofit concept for a bridge, the existing traffic railing may be removed, even though it is not specifically required to be, in order to reduce the dead load carried by the bridge. In these cases, the potential drop off hazard for pedestrians that will be created behind the retrofit shall be addressed in the Plans.

The treatment of the approach end of the retrofit shall consist of Index 402, 484 or another appropriate site specific treatment. The appropriate treatment of the trailing end of the retrofit shall be determined by the Roadway Engineer. On approach ends, a Transition Block or Curb is required if the existing Approach Slab does not have a curb. A Transition Block is not required on trailing ends with no opposing traffic, however, a Curb may be required due to drainage needs. An Index 300, Type D Concrete Curb is generally suitable for this application. The appropriate site specific approach and trailing end treatments shall be shown in the Plans.

If an Index 402 Roadway Guardrail Transition is used, the defining station of the end of the transition must be shown in the Plans. The attachment point for the Thrie-Beam Terminal Connector shall be determined based on the shape, length, structural adequacy and direct means of support of the end most section of the Vertical Face Retrofit, the existing wing wall and or approach slab as follows:

Perpendicular or Angled Wing Walls -

Attach the Thrie-Beam Terminal Connector to the Vertical Face Retrofit on the bridge.

Parallel Wing Walls -

1. If the Vertical Face Retrofit is supported by the wing wall, attach the Thrie-Beam Terminal Connector to the Vertical Face Retrofit along the wing wall if the wing wall is a minimum of 5'-0" long, directly pile supported and structurally adequate. If the Vertical Face Retrofit is supported by the approach slab, attach the Thrie-Beam Terminal Connector along the approach slab section of the retrofit if that section is a minimum of 5'-0" long.

2. Attach Thrie-Beam Terminal Connector to the Vertical Face Retrofit on the bridge if the any of the appropriate preceding criteria for parallel wing walls or approach slabs are not met.

Flared Wing Walls with parallel portions -

1. If the Vertical Face Retrofit is supported by the wing wall, attach the Thrie-Beam Terminal Connector to the Vertical Face Retrofit along the parallel portion of the Vertical Face Retrofit if the wing wall is a minimum of 5'-0" long, directly pile supported, structurally adequate and if the parallel portion of Vertical Face Retrofit is a minimum of 2'-0" long. If the Vertical Face Retrofit is supported by the approach slab, attach the Thrie-Beam Terminal Connector along the approach slab section of the retrofit if that section is a minimum of 5'-0" long and has a parallel portion that is a minimum of 2'-0" long.
2. Attach Thrie-Beam Terminal Connector to the Vertical Face Retrofit on the bridge if any of the preceding criteria for flared wing walls with parallel portions are not met.

Flared Wing Walls without parallel portions -

Attach Thrie-Beam Terminal Connector to the Vertical Face Retrofit on the bridge.

Indexes 402 and 480 through 484 shall be supplemented as required with project specific details that may be deemed necessary to complete the installation of the retrofit railing. These details may include locations and details of any existing utilities, conduits, drainage structures, sign structures and luminaire supports, or designs and details of traffic railing sliding plate assemblies for large expansion joints and any other needed information not included in these Standards. In the event that the details and indexes presented in these Standards do not closely match the existing conditions, the Structures and or Roadway Engineer(s) shall prepare a customized project specific retrofit design using the crash tested bridge railing and guardrail transition designs presented in Indexes 402 and 480 through 484 as guides. Contact the Structures Design Office and Roadway Design Office for guidance in this event.

The Utility Adjustment Plans, if required, shall contain all necessary utility adjustment information required for the retrofit of the existing traffic railings. Utilities and/or conduits may exist in or adjacent to the existing traffic railings and will vary in size, number and location. The presence, size, number and locations of existing utilities and/or conduits shall be determined by a review of existing Plans and confirmed by field verification. It should be noted that utility and/or conduit installations may vary by location on a single bridge. Thus, a field verification shall be conducted for each individual installation of the retrofit. Existing utilities and/or conduits that conflict with the retrofit shall be relocated if possible or placed out of service. The required field verification work should be completed as early in the evaluation phase as possible.

The Traffic Control Plans for the construction of the retrofit shall be prepared in accordance with Index 600 Series. The Plans shall address all aspects of the full or partial removal of the existing traffic railing (when required) and construction of the retrofit. Generally, the use of Indexes 481 and 483 will require the removal of the existing traffic railing and will require traffic control consisting of shifting, narrowing and or closing

of travel lanes and or shoulders. In this case, the use of crash tested Precast Concrete Temporary Barriers will also be required to protect the drop-off exposed by the removal of the existing traffic railing.

Indexes 480 through 484 do not address retrofitting of the existing traffic railings, curbs or sidewalks for pedestrian use. The potential need to retrofit the existing bridge for pedestrian use shall be evaluated on a project by project basis and the necessary Plans developed accordingly. Generally, the potential effects on pedestrian use of the bridge will be confined to bridges with sidewalks or wide curbs. The reduction in clear width of the curb or sidewalk caused by the installation of the retrofit shall be considered.

It should be noted that the existing traffic railings and or guardrail end transitions may have been previously retrofitted utilizing a scheme presented in Roadway and Traffic ***Design Standards*** Index 401 (2000 and earlier Editions). In this event, the requirements for removal, modification or replacement of the prior retrofit shall be evaluated and addressed in the Plans as required. Of the retrofit schemes presented in Roadway and Traffic ***Design Standards*** Index 401, only Schemes 1 and 19 can be left in placed and utilized as a component of the crash tested designs presented in Indexes 402 and 480 through 484. The removal of the prior retrofit, if required, may be considered as incidental work with no separate payment made.

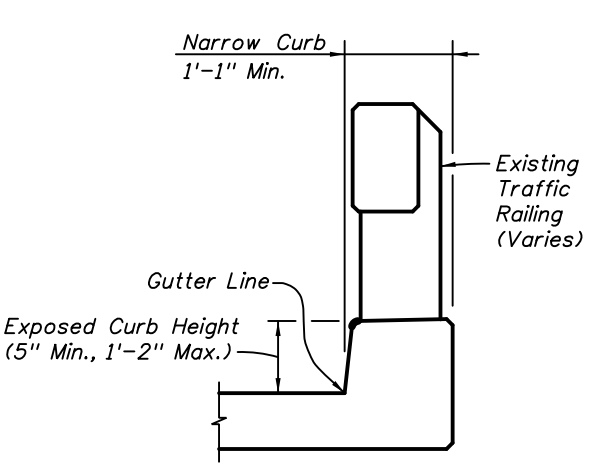
The applicability of the individual retrofit schemes to different wing wall configurations is shown in the following views.

The applicability of the individual Standards to different curb widths is described as follows:

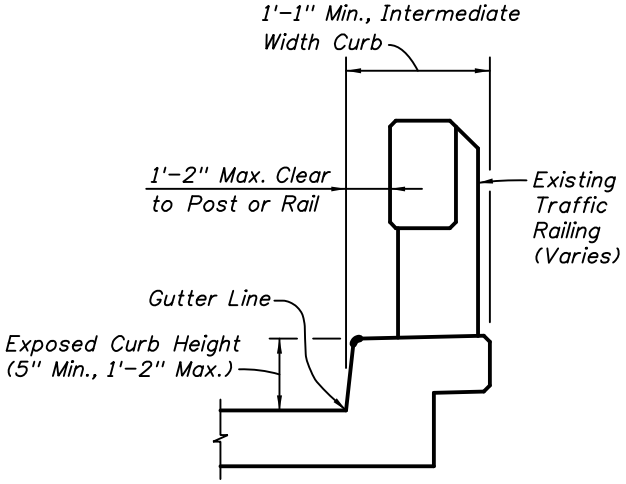
Index 481 - Applicable for existing narrow curbs as shown below. This index requires removal of the existing traffic railing to the top of the existing curb along the entire length of the bridge and wing walls.

Index 482 - Applicable for existing wide curbs or sidewalks as shown below. This index generally allows the entire existing traffic railing to remain in place.

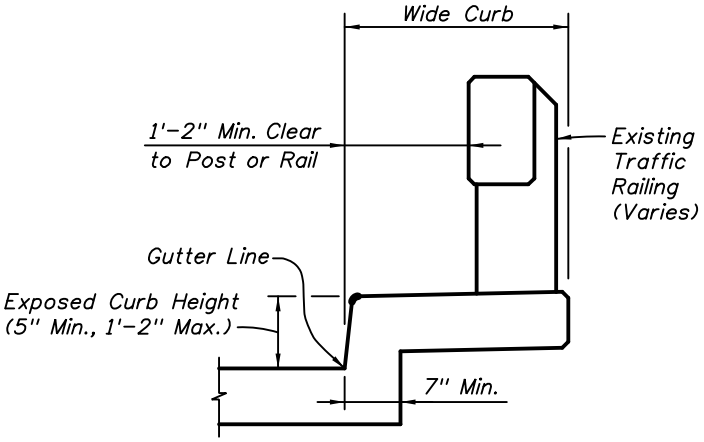
Index 483 - Applicable for existing intermediate width curbs as shown below. This index requires removal of the existing traffic railing to the top of the existing curb along the entire length of the bridge and wing walls



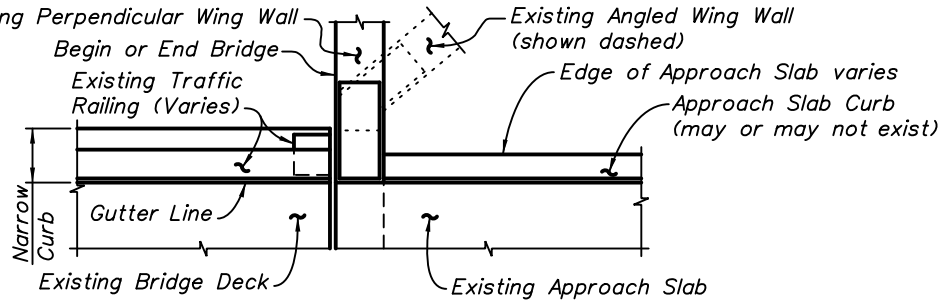
EXISTING NARROW CURB SCHEMATIC
USE INDEX NO. 481



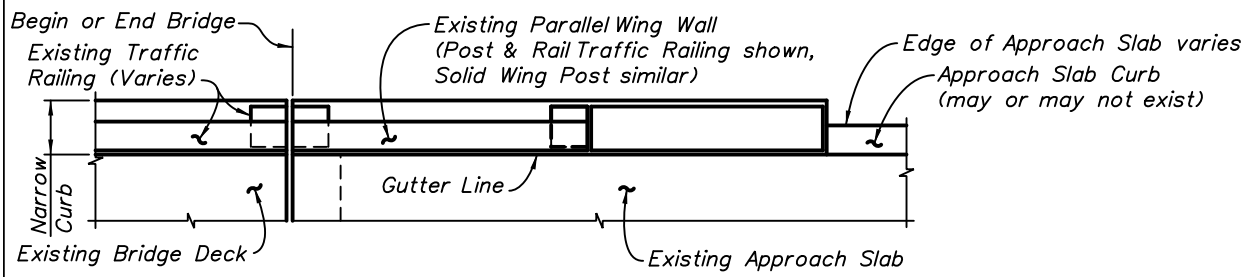
EXISTING INTERMEDIATE WIDTH CURB SCHEMATIC
USE INDEX NO. 483



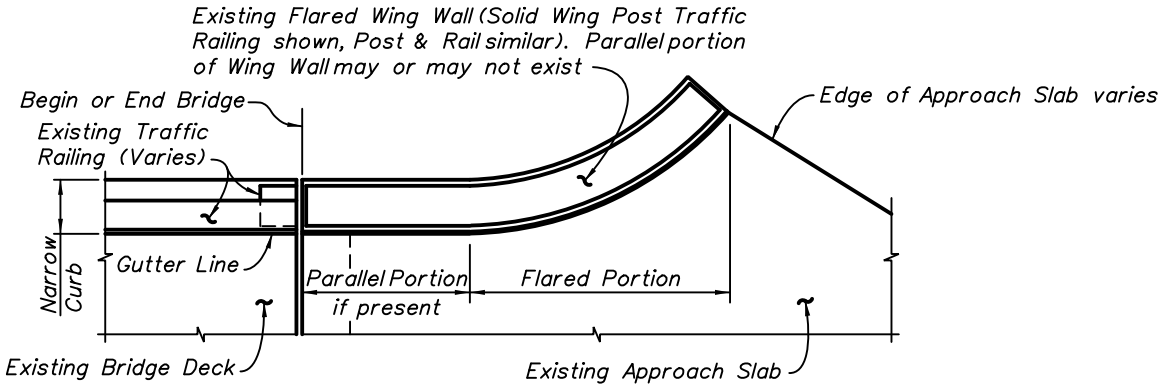
EXISTING WIDE CURB SCHEMATIC
USE INDEX NO. 482



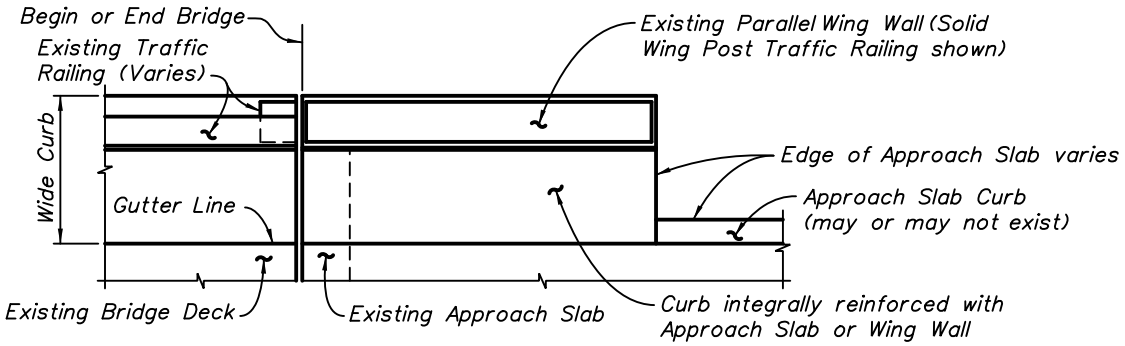
PARTIAL PLAN VIEW OF EXISTING BRIDGE WITH NARROW CURBS AND PERPENDICULAR OR ANGLED WING WALLS - USE INDEX NO. 481, SCHEME 1



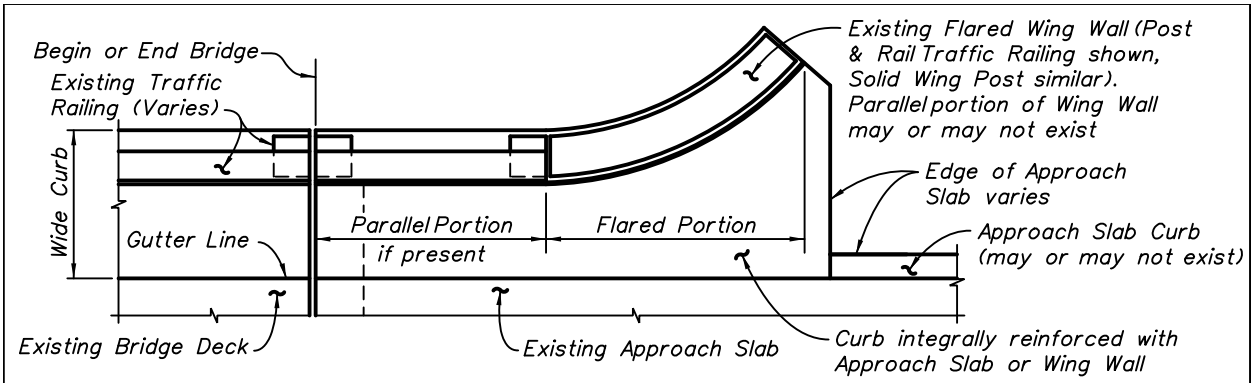
PARTIAL PLAN VIEW OF EXISTING BRIDGE WITH NARROW CURBS AND PARALLEL WING WALLS - USE INDEX NO. 481, SCHEME 2



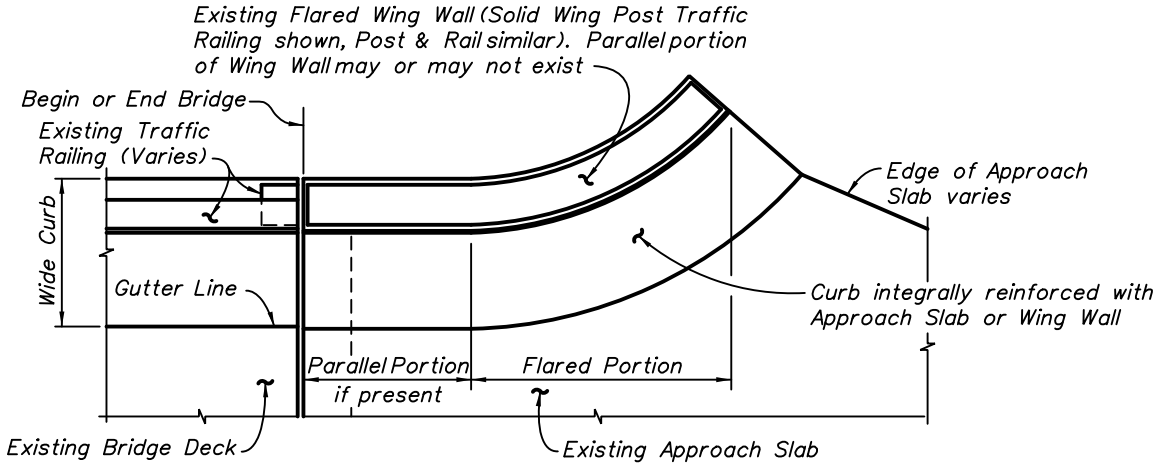
PARTIAL PLAN VIEW OF EXISTING BRIDGE WITH NARROW CURBS AND FLARED WING WALLS - USE INDEX NO. 481, SCHEME 3



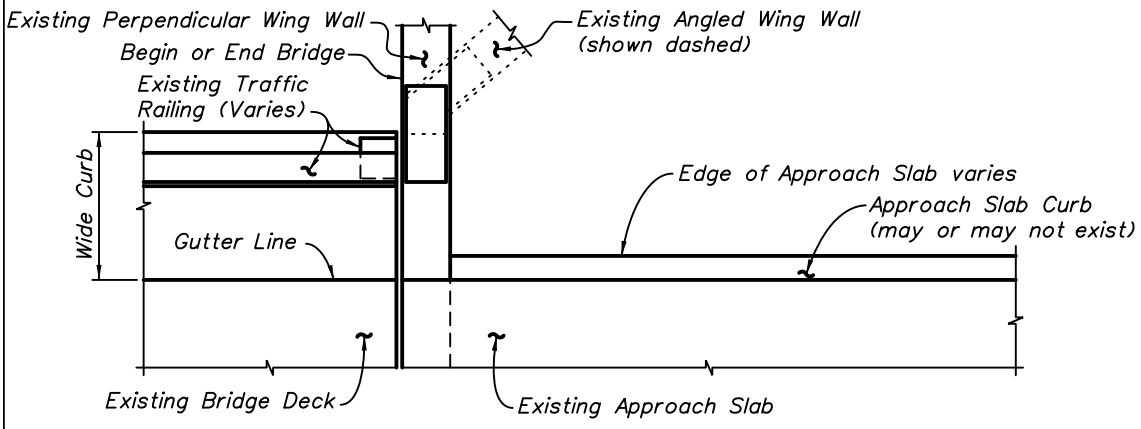
PARTIAL PLAN VIEW OF EXISTING BRIDGE WITH WIDE CURBS, PARALLEL WING WALLS AND INTEGRALLY REINFORCED APPROACH SLAB CURBS - USE INDEX NO. 482, SCHEME 2



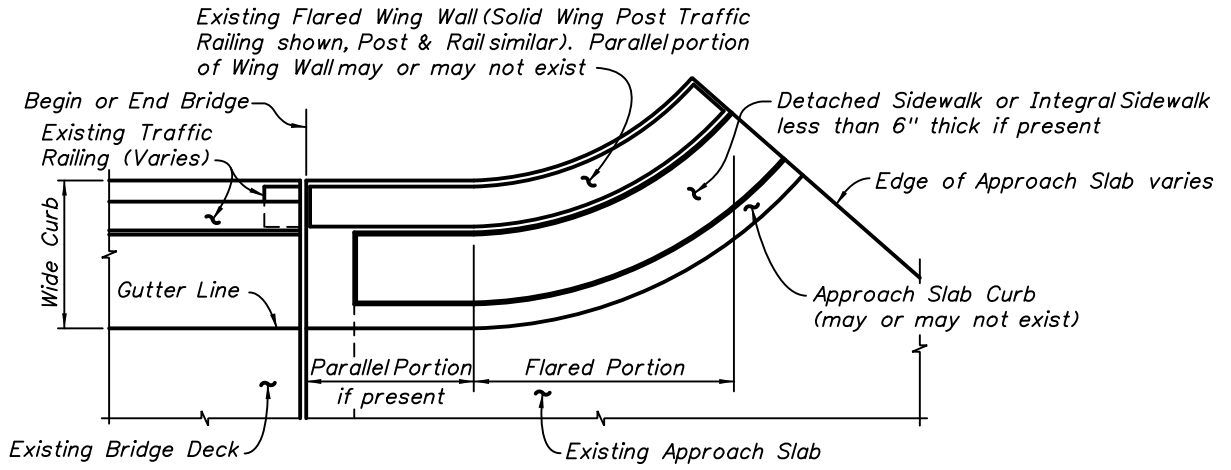
PARTIAL PLAN VIEW OF EXISTING BRIDGE WITH WIDE CURBS, FLARED WING WALLS AND PARALLEL INTEGRALLY REINFORCED APPROACH SLAB CURBS - USE INDEX NO. 482, SCHEME 2



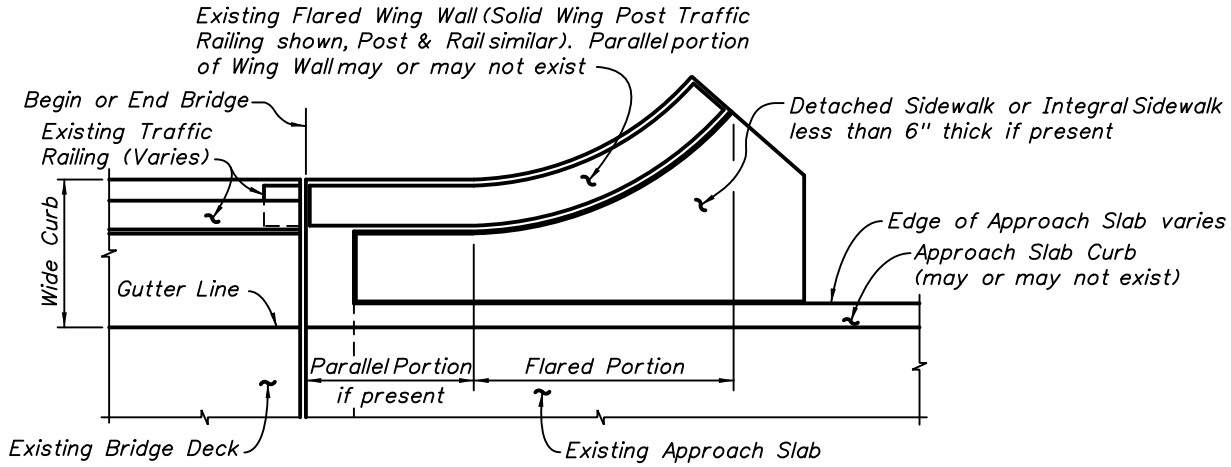
PARTIAL PLAN VIEW OF EXISTING BRIDGE WITH WIDE CURBS, FLARED WING WALLS AND FLARED INTEGRALLY REINFORCED APPROACH SLAB CURBS - USE INDEX NO. 482, SCHEME 3



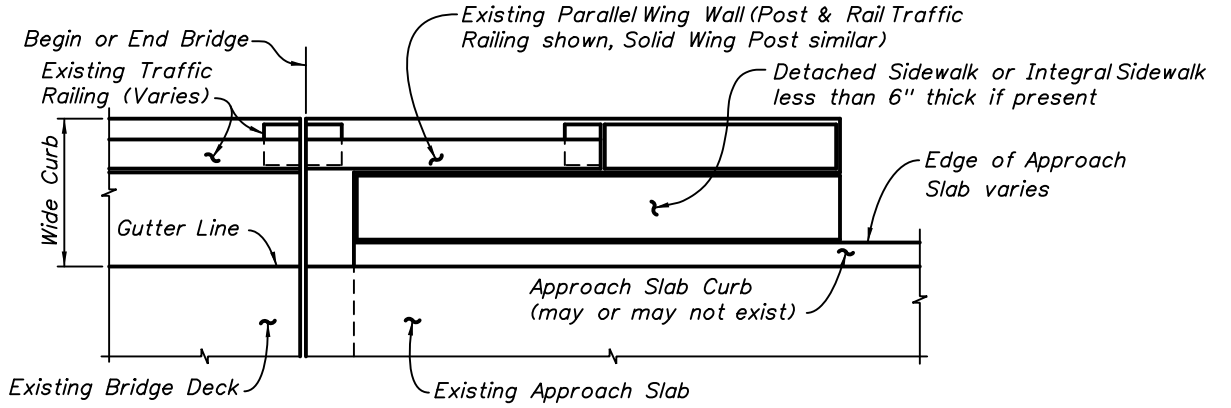
PARTIAL PLAN VIEW OF EXISTING BRIDGE WITH WIDE CURBS AND PERPENDICULAR OR ANGLED WING WALLS - USE INDEX NO. 482, SCHEME 1



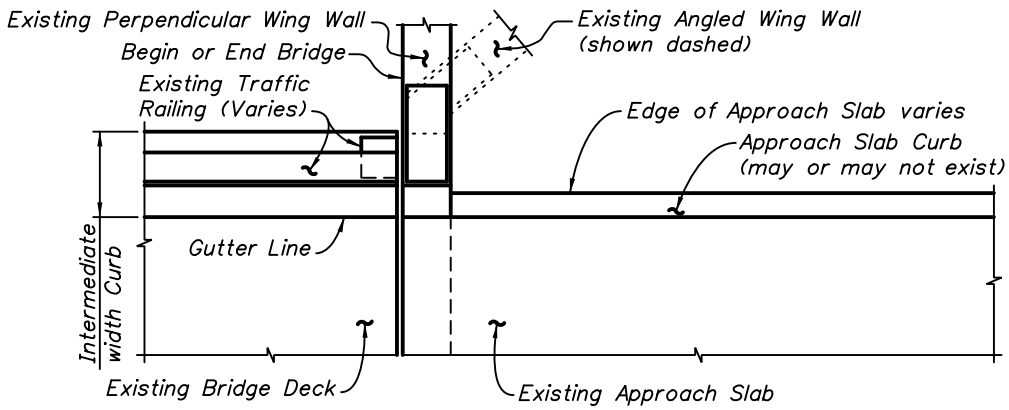
PARTIAL PLAN VIEW OF EXISTING BRIDGE WITH WIDE CURBS, FLARED WING WALLS AND APPROACH SLABS WITH DETACHED SIDEWALKS OR SIDEWALKS LESS THAN 6" THICK - USE INDEX NO. 482, SCHEME 4



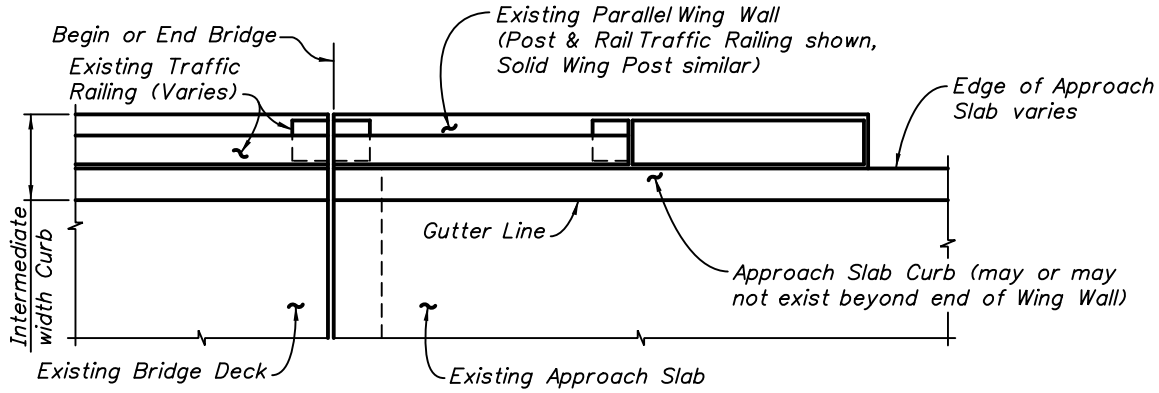
PARTIAL PLAN VIEW OF EXISTING BRIDGE WITH WIDE CURBS, FLARED WING WALLS AND APPROACH SLABS WITH DETACHED SIDEWALKS OR SIDEWALKS LESS THAN 6" THICK - USE INDEX NO. 482, SCHEME 5



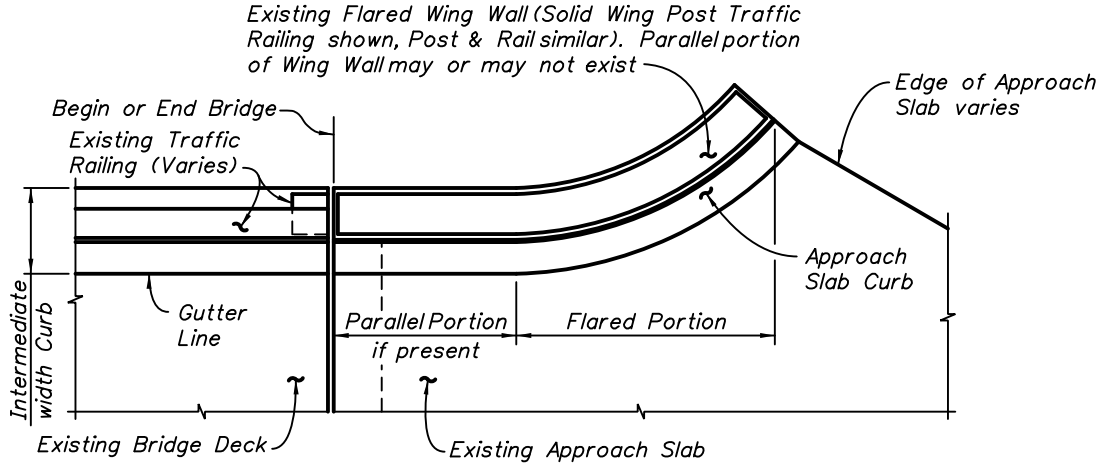
PARTIAL PLAN VIEW OF EXISTING BRIDGE WITH WIDE CURBS, PARALLEL WING WALLS AND APPROACH SLABS WITH DETACHED SIDEWALKS OR SIDEWALKS LESS THAN 6" THICK - USE INDEX NO. 482, SCHEME 5



PARTIAL PLAN VIEW OF EXISTING BRIDGE WITH INTERMEDIATE WIDTH CURBS AND PERPENDICULAR OR ANGLED WING WALLS - USE INDEX NO. 483, SCHEME 1



PARTIAL PLAN VIEW OF EXISTING BRIDGE WITH INTERMEDIATE WIDTH CURBS, PARALLEL WING WALLS AND PARALLEL INTEGRAL APPROACH SLAB CURBS - USE INDEX NO. 483, SCHEME 2



PARTIAL PLAN VIEW OF EXISTING BRIDGE WITH INTERMEDIATE WIDTH CURBS, FLARED WING WALLS AND FLARED INTEGRAL APPROACH SLAB CURBS - USE INDEX NO. 483, SCHEME 3

Plan Content Requirements

The appropriate ***Design Standards*** Index number and Scheme number shall be shown in the Roadway Plans for each bridge along with the limiting stations of the retrofit. Examples of notes containing the required information as they would appear on a Plan or Plan-Profile sheet are as follows:

> "Construct Traffic Railing (Vertical Face Retrofit), Index 48X, Scheme X, from Sta. XX+XX.XX (at or near Begin Bridge) to Sta. XX+XX.XX (at or near End Bridge)."
>
> "Construct Traffic Railing (Vertical Face Retrofit) Spread Footing Approach, Index 484, Scheme X, from Sta. XX+XX.XX (at beginning of Length of Advancement, or at or near End Bridge) to Sta. XX+XX.XX (at or near Begin Bridge, or end of Length of Advancement)."

For projects with multiple bridges, a tabular format may be used to convey the necessary information.

A separate Plan and Elevation sheet of the type used in Structures Plans is generally not required.

Payment

Item number	Item description	Unit Measure
521-5-8	Concrete Traffic Railing, Bridge, Retrofit-Vertical Face	LF

Index 490 Skew Details for Traffic Railings, Parapets and Traffic Separators

Design Criteria

NCHRP Report 350 (for Traffic Railings); ***AASHTO LRFD Bridge Design Specifications***, 4th Edition, Section 13; ***Structures Design Guidelines (SDG)***

Design Assumptions and Limitations

Details of the ends of bridge traffic railings as presented in this standard are consistent with guardrail attachment details shown on Index 400.

Use this standard with Indexes 302, 400, 410, 420, 421, 422, 423, 425, 820, 20900, 20910, 21100 and 21110.

Plan Content Requirements

In the Structures Plans:

Show details consistent with this standard on Approach Slab, Superstructure, Superstructure Details and other sheets as required.

Payment

See corresponding Traffic Railing, Pedestrian/Bicycle Railing, Median Traffic Railing, Traffic Separator or Approach Slab Design Standard Index Instructions for applicable pay item(s).

Index 501 Geosynthetic Reinforced Soils

Design Criteria

PPM, Vol. 1, Chapter 31and ***Soils and Foundations Handbook,*** Chapter 8.

Design Assumptions and Limitations

For reinforced slopes and reinforced foundation over soft soils applications (application usages 1 & 2), refer to ***PPM***, Vol. 1, Chapter 31.

For reinforced embankment and construction expedient applications (application usages 4 & 5), refer to Chapter 8 of the ***Soils and Foundations Handbook***.

Plan Content Requirements

For all usages, provide the description of the application for which the geosynthetic selected from Index 501 must be approved.

Additional plan content requirements are as follows:

For reinforced slopes and reinforced foundation over soft soils applications (application usages 1 & 2), refer to ***PPM***, Vol. 1, Chapter 31.

When specifying Reinforcement Grid (Pay Item 145-71), for reinforced embankment and construction expedient applications a geogrid strength and the application usage must be provided to assist the contractor in selecting an applicable product. Provide the required geogrid strength as follows:

- For reinforced embankment applications include the required Ta values for both layers (as determined using the equation in Note 2 on Sheet 1) for the geosynthetic material.
- For construction expedient usage, provide the required strength of the geosynthetic at either 2% strain or 5% strain, whichever is most appropriate for the project.

Payment

Item number	Item description	Unit Measure
145-1	Geosynthetic Reinforced Soil Slope	SF
145-2	Geosynthetic Reinforced Foundation Over Soft Soil	SY
145-71	Reinforcement Grid, Biaxial	SY

Index 520 Gravity Wall

Design Criteria

AASHTO LRFD Bridge Design Specifications, 4th Edition; ***Structures Design Guidelines (SDG)***; ***PPM*** Vol. 1, Chapter 30

Design Assumptions and Limitations

Index 520 has been developed as a self-contained standard having pre-designed wall sections; therefore, no additional reinforcing list is required in the Contract Plans.

The maximum 5 feet height limit is based on guidance in the ***PPM*** Vol. 1, Chapter 30, which states that gravity walls are generally most efficient when the difference in height between the ground levels are less than 5 feet. If the difference in height between ground levels is greater than 5 feet, other wall systems or project specific designs are required.

See the "Design Notes" on the Standard Drawing for design assumptions and other applicability notes to determine if this Standard is applicable to the project under consideration.

Plan Content Requirements

In the Structures or Roadway Plans:

Add any aesthetic requirements (e.g. coordinating appearance of exposed surface with adjacent walls) to the General Notes.

Prepare Control Drawings containing the following information and include them in the plans:

Plan View

1. Wall Location;
2. Begin/End Wall Stationing and Offset;
3. Offset definition, usually from the baseline to the front face of the wall;
4. Reference to "Index 520 Gravity Wall" and Wall Scheme (Scheme 1, Scheme 2 or Scheme 3) in accordance with that shown on the Design Standard.

Cross Sections (Roadway Plans only)

1. Base of Wall Elevation;
2. Existing Ground Line;
3. Proposed Ground Line;
4. Top of Wall Elevation;
5. Traffic Railing with Junction Slab (if Scheme 3 is required).

Elevation (Structures Plans only)

1. Base of Wall Elevation at 25ft. intervals;
2. Existing Ground Line;
3. Proposed Ground Line Elevation;
4. Top of Wall Elevation at 25ft. intervals;
5. Top of Traffic Railing Elevation at 25ft. intervals (if Scheme 3 is required).

Payment

Item number	Item description	Unit Measure
400-0-1	Concrete Class NS, Gravity Wall	CY
521-8-1	Concrete Traffic Railing Barrier-Retaining Wall System, Mounted With Sleeper Slab, 32" F-Shape	LF
521-8-2	Concrete Traffic Railing Barrier-Retaining Wall System, Mounted With Sleeper Slab, 42" F-Shape	LF
521-8-3	Concrete Traffic Railing Barrier-Retaining Wall System, Mounted With Sleeper Slab, 32" Vertical Face	LF
521-8-4	Concrete Traffic Railing Barrier-Retaining Wall System, Mounted With Sleeper Slab, 42" Vertical Face	LF

Cost of reinforcing steel, face texture, finish, joint seal, drain pipes, drainage layer, galvanized mesh and geotextile fabric to be included in the Contract Unit Price for Concrete Class NS, Gravity Wall. Cost of concrete for Junction Slab in Scheme 3, to be included in Contract Unit Price for Concrete Traffic Railing Barrier-Retaining Wall System, Mounted With Sleeper Slab. Adjunct -, pedestrian/bicycle railings or fences to be paid for separately.

Commentary for Reviewers: Class NS Concrete - This class of concrete was determined to be appropriate for Index 520 based on consultation with the Structures Design, Roadway Design, Sate Materials and Construction Offices in 2005 during the LRFD redesign. This class of concrete is an economical choice and structurally appropriate for a non-flexural (gravity) earth retention system.

Index 521 Concrete Steps

Design Criteria

Florida Building Commission "***Florida Building Code***", 2004 Edition

Design Assumptions and Limitations

Do not use this Index for suspended (structural) steps or stairways.

Maximum of 12 risers permitted between level landing areas.

Use of Index 850, 860, 870, 880 or project specific pedestrian railings is required.

Plan Content Requirements

Show locations and lengths of steps in the plans. Consider maximum number of risers between landings, landing widths and tie-ins to adjacent sidewalks when establishing overall limits of steps. Coordinate profile of steps and landings with shapes of supporting embankments.

Show Index 850, 860, 870, 880 or project specific pedestrian railings.

Include references to ***Design Standards*** Index 521 and pedestrian railing standard index (if used).

Payment

Item number	Item description	Unit Measure
400-0-13	Concrete Class NS, Concrete Steps	CY
415-1-6	Reinforcing Steel - Miscellaneous	LB

Index 810 Bridge Fencing (Vertical)

Design Criteria

NCHRP Report 350 Test Level 3 Criteria; ***AASHTO LRFD Bridge Design Specifications***, 4th Edition; ***Structures Design Guidelines (SDG)***

Design Assumptions and Limitations

The Traffic Railing mounted version of this fence (back of railing mounted with tension wires) is based on a design that was successfully crash tested in accordance with the ***AASHTO Guide Specifications for Bridge Railings*** Performance Level 2 pickup test. Modifications have been made to improve the crashworthiness to ***NCHRP Report 350*** Test Level 3 Criteria. This fence can be used on Index 420, 422, 423, 424, 425 and 480 Series Traffic Railings, certain non-FDOT standard concrete traffic railings meeting the requirements of ***SDG*** 6.7 and on existing New Jersey and F-Shape Traffic Railings listed in the ***Instructions for Design Standards*** Index 402.

The Concrete Parapet mounted version of this fence (top of parapet mounted with horizontal rails) is not a crash tested design and cannot be used on traffic railings. This fence can be used on Concrete Parapets constructed in accordance with Index 820 in lieu of the bullet railing shown on Indexes 820 and 822.

Evaluate the expansion joint movements of the bridge. Expansion rails are required for concrete parapet installations at expansion joints where the total movement exceeds 1-inch. If the total movement at an individual expansion joint is 6-inches or less, the bridge fence will span the joint without using an expansion assembly. If the total movement at an individual expansion joint exceeds 6-inches, an Expansion Assembly must be installed at that location.

Use of the Concrete Parapet mounted version of this fence in lieu of Index 811 Bridge Fencing (Curved Top) or Index 812 Bridge Fencing (Enclosed) should be based on project and site specific requirements.

Plan Content Requirements

In the Structures and/or Roadway Plans:

Show and label the Bridge Fencing (Vertical) on the Plan and Elevation, Typical Section, Superstructure and Approach Slab sheets, Retaining Wall Control Drawings, and other sheets as required. Include cross references to ***Design Standards*** Index 810 as appropriate.

Show the limits of fencing in the plans if they are not from begin of approach slab at Begin Bridge to end of approach slab at End Bridge.

Show estimated quantities for bridge fencing with estimated quantities for Traffic Railing and/or concrete parapets in the superstructure details sheets.

Determine if bridge fencing requires grounding. If required, provide details in the superstructure sheets.

Provide locations for expansion joints requiring expansion rails or expansion assemblies in the superstructure layout sheets.

Designate the required finish in the General Notes, e.g., zinc or aluminum coated, or polyvinyl chloride (PVC) coated. If PVC coated fence is used, include the following notes in the General Notes:

1. A note specifying the color of the PVC coating for chain link fabric.
2. A note to paint the fence framework to match the color of the PVC chain link fabric.
3. A note for preparation of galvanized steel for painting.
4. A note to coat tension wire and fence fittings to match the color of the PVC chain link fabric.

Payment

Item number	Item description	Unit Measure
550-10-315	Fencing, Type R, 0 - 5.0', Vertical	LF
550-10-325	Fencing, Type R, 5.1 - 6.0', Vertical	LF
550-10-335	Fencing, Type R, 6.1 - 7.0', Vertical	LF

Index 811 Bridge Fencing (Curved Top)

Design Criteria

AASHTO LRFD Bridge Design Specifications, 4th Edition; ***Structures Design Guidelines (SDG)***

Design Assumptions and Limitations

This fence is not a crash tested design and cannot be used on traffic railings. This fence can be used on Concrete Parapets constructed in accordance with Index 820 in lieu of the bullet railing shown on Indexes 820 and 822.

Evaluate the expansion joint movements of the bridge. Expansion rails are required for concrete parapet installations at expansion joints where the total movement exceeds 1-inch. If the total movement at an individual expansion joint is 6-inches or less, the bridge fence will span the joint without using an expansion assembly. If the total movement at an individual expansion joint exceeds 6-inches, an Expansion Assembly must be installed at that location.

Use of this fence in lieu of Index 810 Bridge Fencing (Vertical) or Index 812 Bridge Fencing (Enclosed) should be based on project and site specific requirements.

Plan Content Requirements

In the Structures and/or Roadway Plans:

Show and label the Bridge Fencing (Vertical) on the Plan and Elevation, Typical Section, Superstructure and Approach Slab sheets, Retaining Wall Control Drawings, and other sheets as required. Include cross references to ***Design Standards*** Index 811 as appropriate.

Show the limits of fencing in the plans if they are not from begin of approach slab at Begin Bridge to end of approach slab at End Bridge.

Show estimated quantities for bridge fencing with estimated quantities for Traffic Railing and/or concrete parapets in the superstructure details sheets.

Determine if bridge fencing requires grounding. If required, provide details in the superstructure sheets.

Provide locations for expansion joints requiring expansion rails or expansion assemblies in the superstructure layout sheets.

Designate the required finish in the General Notes, e.g., zinc or aluminum coated, or polyvinyl chloride (PVC) coated. If PVC coated fence is used, include the following notes in the General Notes:

1. A note specifying the color of the PVC coating for chain link fabric.
2. A note to paint the fence framework to match the color of the PVC chain link fabric.

3. A note for preparation of galvanized steel for painting.
4. A note to coat tension wire and fence fittings to match the color of the PVC chain link fabric.

Payment

Item number	Item description	Unit Measure
550-10-344	Fencing, Type R, 7.1 - 8.0’, W / Partial Enclosure	LF
550-10-354	Fencing, Type R, 8.1 - 10.0', W/ Partial Enclosure, Type R Only	LF

Index 812 Bridge Fencing (Enclosed)

Design Criteria

AASHTO LRFD Bridge Design Specifications, 4th Edition; ***NCHRP Report 350*** Test Level 3 Criteria (portion of fence adjacent to traffic railing only); ***Structures Design Guidelines (SDG)***

Design Assumptions and Limitations

The Traffic Railing mounted side of this fence is based on a design that was successfully crash tested in accordance with the ***AASHTO Guide Specifications for Bridge Railings*** Performance Level 2 pickup test. Modifications have been made to improve the crashworthiness to ***NCHRP Report 350*** Test Level 3 Criteria.

This fence can be used on Index 820 Concrete Parapets, Indexes 410, 420, 422, 423, 424 and 425 Traffic Railings, certain non-FDOT standard concrete traffic railings meeting the requirements of ***SDG*** 6.7 and on existing New Jersey and F-Shape Traffic Railings listed in the ***Instructions for Design Standards*** Index 402.

Evaluate the expansion joint movements of the bridge. Expansion rails are required for concrete parapet installations at expansion joints where the total movement exceeds 1-inch. If the total movement at an individual expansion joint is 6-inches or less, the bridge fence will span the joint without using an expansion assembly. If the total movement at an individual expansion joint exceeds 6-inches, an Expansion Assembly must be installed at that location.

Use of this fence in lieu of Index 810 Bridge Fencing (Vertical) or Index 811 Bridge Fencing (Curved Top) should be based on project and site specific requirements.

Plan Content Requirements

In the Structures and/or Roadway Plans:

Show and label the Bridge Fencing (Enclosed) on the Plan and Elevation, Typical Section, Superstructure and Approach Slab sheets, Retaining Wall Control Drawings, and other sheets as required. Include cross references to ***Design Standards*** Indexes 812, 820 and the traffic railing standard as appropriate.

Show the limits of fencing in the plans if they are not from begin of approach slab at Begin Bridge to end of approach slab at End Bridge.

Show estimated quantities for bridge fencing with estimated quantities for Traffic Railing and/or concrete parapets in the superstructure details sheets.

Determine if bridge fencing requires grounding. If required, provide details in the superstructure sheets.

Provide locations for expansion joints requiring expansion rails or expansion assemblies in the superstructure layout sheets.

Designate the required finish in the General Notes, e.g., zinc or aluminum coated, or polyvinyl chloride (PVC) coated. If PVC coated fence is used, include the following notes in the General Notes:

1. A note specifying the color of the PVC coating for chain link fabric.
2. A note to paint the fence framework to match the color of the PVC chain link fabric.
3. A note for preparation of galvanized steel for painting.
4. A note to coat tension wire and fence fittings to match the color of the PVC chain link fabric.

Payment

Item number	Item description	Unit Measure
550-10-343	Fencing, Type R, 7.1 - 8.0', With Full Enclosure	LF
550-10-353	Fencing, Type R, 8.1 - 10.0', With Full Enclosure	LF

Index 820 Pedestrian/Bicycle Railing

Design Criteria

AASHTO LRFD Bridge Design Specifications, 4th Edition; ***Structures Design Guidelines (SDG)***

Design Assumptions and Limitations

The standard height railing is the Pedestrian / Bicycle Railing. The Special Height Bicycle Railing should only be used where warranted by steep grades, sharp curves or other unusual site specific geometry.

Index 820 cannot be used as a traffic railing. A crashworthy traffic railing is required between Index 820 and adjacent traffic lanes.

Use this standard in conjunction with Indexes 420, 424, or 425 and 810, 811, 812 or 822.

Plan Content Requirements

In the Structures and / or Roadway Plans:

In the Materials Note on the General Notes Sheet, specify the concrete class in accordance with the superstructure or retaining wall environment classification. See ***SDG*** 1.4.

Show and label the Pedestrian / Bicycle Railing on the Plan and Elevation, Typical Section, Superstructure, Approach Slab and Finish Grade Elevations Cross Section sheets, Retaining Wall Control Drawings, and other sheets as required. Specify the type of railing required, e.g., Pedestrian / Bicycle Railing or Special Height Bicycle Railing. Include cross references to ***Design Standards*** Index 810, 811, 812 or 822 as appropriate.

All concrete required to construct the parapet and Bars 4P and 4S are included in the Estimated Concrete Parapet Quantities. Do not include parapet concrete in the estimated concrete quantities, or Bars 4P and 4S in the reinforcing bar lists and estimated reinforcing steel quantities for supporting bridge decks, approach slabs or retaining walls.

Payment

Item number	Item description	Unit Measure
521-6-1	Concrete Parapet, Pedestrian/Bicycle	LF

Index 821 Aluminum Pedestrian/Bicycle Bullet Railing for Traffic Railing (32" F Shape)

Design Criteria

AASHTO LRFD Bridge Design Specifications, 4th Edition; ***Structures Design Guidelines (SDG)***

Design Assumptions and Limitations

This railing is intended for use when a Bicycle Lane is required and a raised pedestrian sidewalk is not provided.

The standard height railing is the Pedestrian / Bicycle Railing. The Special Height Bicycle Railing should only be used where warranted by steep grades, sharp curves or other unusual site specific geometry.

Use this standard in conjunction with Indexes 420 and 822.

Plan Content Requirements

Show and label the Aluminum Pedestrian / Bicycle Bullet Railing on the Plan and Elevation, Typical Section, Superstructure, Approach Slab and Finish Grade Elevations Cross Section sheets, Retaining Wall Control Drawings, and other sheets as required. Specify the type of railing required, e.g., Pedestrian / Bicycle Railing or Special Height Bicycle Railing. Include cross references to ***Design Standards*** Indexes 420 and 822 as appropriate.

Payment

Item number	Item description	Unit Measure
460-70-1	Aluminum Bullet Railings, Single Rail	LF
460-70-2	Aluminum Bullet Railings, Double Rail	LF

Index 822 Aluminum Pedestrian/Bicycle Bullet Railing Details

Design Criteria

AASHTO LRFD Bridge Design Specifications, 4th Edition; ***Structures Design Guidelines (SDG)***

Design Assumptions and Limitations

The standard height railing is the Pedestrian / Bicycle Railing. The Special Height Bicycle Railing should only be used where warranted by steep grades, sharp curves or other unusual site specific geometry.

Use this standard in conjunction with Indexes 420, 423, 820 and/or 821.

Plan Content Requirements

Show and label the Aluminum Pedestrian / Bicycle Bullet Railing on the Plan and Elevation, Typical Section, Superstructure, Approach Slab and Finish Grade Elevations Cross Section sheets, Retaining Wall Control Drawings, and other sheets as required. Specify the type of railing required, e.g., Pedestrian / Bicycle Railing or Special Height Bicycle Railing. Include cross references to ***Design Standards*** Indexes 420, 423, 820 and 821 as appropriate.

Payment

Item number	Item description	Unit Measure
460-70-1	Aluminum Bullet Railings, Single Rail	LF
460-70-2	Aluminum Bullet Railings, Double Rail	LF
460-70-3	Aluminum Bullet Railings, Triple Rail	LF

Index 850 Steel Pedestrian/Bicycle Picket Railing

Design Criteria

AASHTO LRFD Bridge Design Specifications, 4th Edition, including 75 year Design Life

Florida Department of Transportation (FDOT) "***Structures Design Guidelines for Load and Resistance Factor Design***", January 2006.

Florida Building Commission "***Florida Building Code***", 2004 Edition, except for Handrail diameter

U.S. Access Board "***ADA Accessibility Guidelines***" July 2004 as adopted with amendments by the USDOT under 49CFR Part 37.

National Fire Protection Association (NFPA) 101, "***Life Safety Code***", 2003 Edition.

DESIGN LIVE LOADS:

Post and Base Plate: Equivalent point load = 200 lb. load + (50 lb./ft. x Post Spacing (ft.)) applied transversely at top rail connection.

Top & Bottom Rails: 50 lb./ft. uniform load applied simultaneously vertically and transversely + 200 lb. concentrated point load applied at midspan in the directions for both maximum stress and deflection.

Handrails: Maximum of either 50 lb./ft. uniform load applied in any direction or 250 lb. concentrated load applied in any direction at any point along the top.

Pickets: Concentrated 200 lb. load applied transversely over an area of 1.0 square foot.

GEOMETRY:

Clear Opening between Pickets: Shall reject the passage of a 4" diameter sphere below 42" height, and an 8" diameter sphere above 42" height.

Clear Opening under Bottom Rail: Shall reject the passage of a 2" diameter sphere.

ADA Handrail Height: 34"

Standard Pedestrian/Bicycle Railing Height: 42" minimum.

Special Height Bicycle Railing Height: 54" minimum.

DEFLECTION:

Total combined deflection of the railing system including the resilient or neoprene pads, due to the top rail design live loads, shall not exceed 1 1/2 " when measured at midspan of the top rail.

Design Assumptions and Limitations

This railing is not applicable for shielding drop-off hazards for vehicular traffic. This railing is applicable for all cases where a pedestrian or bicyclist drop-off hazard exceeds 2'-6" or when a drop-off hazard is less than 2'-6" and is required by design. Refer to ***PPM***, Volume 1, Chapters 4 & 8, for the definition of vehicular, pedestrian and bicyclist "drop-off hazards".

Adequate foundation support for anchorage and stability against overturning must be provided. Design a site specific railing for unusual site conditions.

A handrail is required for use on ramps with a grade steeper than 5% to conform with the requirements of the Americans with Disabilities Act (ADA).

Expansion joints shall be spaced at a maximum 40'-0". Railing must be continuous across a minimum of two posts.

The steel railing shown in this index and the aluminum railing shown in Index 860 are similar in form and function. Select which of these railings to use at a given site based on District preferences, aesthetic or finish color requirements, corrosion concerns, theft potential issues, fabrication issues, weight of railing and any other project specific requirements. In some cases, both of these railings are acceptable for use and the selection of which to provide is left to the contractor by the use of Pay Items 515-2-101 or 515-2-102.

See Index 851 for special requirements and modifications for use on bridges.

Plan Content Requirements

In the Structures and/or Roadway Plans:

Show Pedestrian Railings on sidewalks and walls as required. Designate locations where handrails are required.

Include cross references to ***Design Standards*** Index 850 as appropriate.

When either Index 850 or 860 are acceptable, include cross references to both indexes and use Pay Items 515-2-101 or 515-2-102 as appropriate.

Payment

Item number	Item description	Unit Measure
515-2-101	Pedestrian / Bicycle Railing, Non Specified, 42" Picket Rail	LF
515-2-102	Pedestrian / Bicycle Railing, Non Specified, 54" Picket Rail	LF
515-2-201	Pedestrian / Bicycle Railing, Steel Only, 42" Picket Rail	LF
515-2-202	Pedestrian / Bicycle Railing, Steel Only, 54" Picket Rail	LF

Index 851 Bridge Pedestrian/Bicycle Picket Railing (Steel)

Design Criteria

See Instructions for ***Design Standards*** Index 850.

Design Assumptions and Limitations

Bridge picket Railing is limited to use on bridges with expansion joint thermal movements not exceeding 5". Scheme 3 is limited to bridge retrofit applications where additional sidewalk width is required.

See Instructions for ***Design Standards*** Index 850 for additional information.

Plan Content Requirements

In the Structures and/or Roadway Plans:

Provide railing layout Control Drawings to show post spacing, curb joint, V-groove, deck joint, expansion joint locations and Scheme number.

For existing bridge retrofits special end treatment details may be required for perpendicular or flared wingwalls at Begin and End Bridge. Provide existing railing removal details when required.

Include cross references to ***Design Standards*** Index 851 as appropriate.

When either Index 851 or 861 are acceptable, include cross references to both indexes and use Pay Items 515-2-101 or 515-2-102 as appropriate.

Payment

Item number	Item description	Unit Measure
515-2-101	Pedestrian, Bicycle Railing, Non Specified, 42" Picket Rail	LF
515-2-102	Pedestrian, Bicycle Railing, Non Specified, 54" Picket Rail	LF
515-2-201	Pedestrian / Bicycle Railing, Steel Only, 42" Picket Rail	LF
515-2-202	Pedestrian / Bicycle Railing, Steel Only, 54" Picket Rail	LF

Include concrete and reinforcing steel quantities for the concrete curb (Scheme 2) in the bridge deck plan quantity pay items.

Index 860 Aluminum Pedestrian/Bicycle Picket Railing

Design Criteria

AASHTO LRFD Bridge Design Specifications, 4th Edition, including 75 year Design Life

Florida Department of Transportation (FDOT) "***Structures Design Guidelines for Load and Resistance Factor Design***", January 2006.

Florida Building Commission "***Florida Building Code***", 2004 Edition, except for Handrail diameter

U.S. Access Board "***ADA Accessibility Guidelines***" July 2004 as adopted with amendments by the USDOT under 49CFR Part 37.

National Fire Protection Association (NFPA) 101, "***Life Safety Code***", 2003 Edition.

DESIGN LIVE LOADS:

Post and Base Plate: Equivalent point load = 200 lb. load + (50 lb./ft. x Post Spacing (ft.)) applied transversely at top rail connection.

Top & Bottom Rails: 50 lb./ft. uniform load applied simultaneously vertically and transversely + 200 lb. concentrated point load applied at midspan in the directions for both maximum stress and deflection.

Handrails: Maximum of either 50 lb./ft. uniform load applied in any direction or 250 lb. concentrated load applied in any direction at any point along the top.

Pickets: Concentrated 200 lb. load applied transversely over an area of 1.0 square foot.

GEOMETRY:

Clear Opening between Pickets: Shall reject the passage of a 4" diameter sphere below 42" height, and a 8" diameter sphere above 42" height.

Clear Opening under Bottom Rail: Shall reject the passage of a 2" diameter sphere.

ADA Handrail Height: 34"

Standard Pedestrian/Bicycle Railing Height: 42" minimum.

Special Height Bicycle Railing Height: 54" minimum.

DEFLECTION:

Total combined deflection of the railing system including the resilient or neoprene pads, due to the top rail design live loads, shall not exceed 1 1/2 " when measured at midspan of the top rail.

Design Assumptions and Limitations

This railing is not applicable for shielding drop-off hazards for vehicular traffic. This railing is applicable for all cases where a pedestrian or bicyclist drop-off hazard exceeds 2'-6" or when a drop-off hazard is less than 2'-6" and is required by design. Refer to ***PPM***, Vol. 1, Chapters 4 & 8, for the definition of vehicular, pedestrian and bicyclist "drop-off hazards".

Adequate foundation support for anchorage and stability against overturning must be provided. Design a site specific railing for unusual site conditions.

A handrail is required for use on ramps with a grade steeper than 5% to conform with the requirements of the Americans with Disabilities Act (ADA).

Expansion joints shall be spaced at a maximum 40'-0". Railing must be continuous across a minimum of two posts.

Indexes 850 and 860 are similar in form and function. Select which of these railings to use at a given site based on District preferences, aesthetic or finish color requirements, corrosion concerns, theft potential issues, fabrication issues, weight of railing and any other project specific requirements. In some cases, both of these railings are acceptable for use and the selection of which to provide is left to the contractor by the use of Pay Items 515-2-101 or 515-2-102.

See Index 861 for special requirements and modifications for use on bridges.

Plan Content Requirements

In the Structures and/or Roadway Plans:

Show Pedestrian Railings on sidewalks and walls as required. Designate locations where handrails are required.

Include cross references to ***Design Standards*** Index 860 as appropriate.

When either Index 850 or 860 are acceptable, include cross references to both indexes and use Pay Items 515-2-101 or 515-2-102 as appropriate.

Payment

Item number	Item description	Unit Measure
515-2-101	Pedestrian, Bicycle Railing, Non Specified, 42" Picket Rail	LF
515-2-102	Pedestrian, Bicycle Railing, Non Specified, 54" Picket Rail	LF
515-2-301	Pedestrian, Bicycle Railing, Aluminum Only, 42" Picket Rail	LF
515-2-302	Pedestrian, Bicycle Railing, Aluminum Only, 54" Picket Rail	LF

Index 861 Pedestrian/Bicycle Picket Railing (Aluminum)

Design Criteria

See Instructions for ***Design Standards*** Index 860.

Design Assumptions and Limitations

Bridge picket Railing is limited to use on bridges with expansion joint thermal movements not exceeding 5". Scheme 3 is limited to bridge retrofit applications where additional sidewalk width is required.

See Instructions for ***Design Standards*** Index 860 for additional information.

Plan Content Requirements

In the Structures and/or Roadway Plans:

Provide railing layout Control Drawings in the Plans to show post spacing, curb joint, V-groove, deck joint, expansion joint locations and Scheme number.

For existing bridge retrofits special end treatment details may be required for perpendicular or flared wingwalls at Begin and End Bridge. Provide existing railing removal details when required.

Include cross references to ***Design Standards*** Index 861 as appropriate.

When either Index 851 or 861 are acceptable, include cross references to both indexes and use Pay Items 515-2-101 or 515-2-102 as appropriate.

Payment

Item number	Item description	Unit Measure
515-2-101	Pedestrian, Bicycle Railing, Non Specified, 42" Picket Rail	LF
515-2-102	Pedestrian, Bicycle Railing, Non Specified, 54" Picket Rail	LF
515-2-301	Pedestrian, Bicycle Railing, Aluminum Only, 42" Picket Rail	LF
515-2-302	Pedestrian, Bicycle Railing, Aluminum Only, 54" Picket Rail	LF

Index 870 Aluminum Pipe Guiderail

Design Criteria

ADA Accessibility Guidelines July 2004 as adopted with amendments by the USDOT under 49 CFR Part 37

Design Assumptions and Limitations

This Guiderail was tested by the FDOT Structural Research Center and found to resist an equivalent Service Loading of 50 lbs./ft. acting simultaneously in the transverse and vertical direction when applied at the height of the Top Rail.

This Index is not approved for use on bridges. This railing is not applicable for shielding drop-off hazards for vehicular traffic. This railing is applicable for all cases where a pedestrian or bicyclist drop-off hazards do not exceed 2'-6". Refer to ***PPM***, Volume 1, Chapters 4 & 8, for the definition of vehicular, pedestrian and bicyclist "drop-off hazards". This railing is also applicable for select uses on sidewalks within service areas and similar locations or maintenance areas where the drop off exceeds 2'-6".

Adequate foundation support for anchorage and stability against overturning must be provided. Design a site specific railing for unusual site conditions.

Indexes 870 and 880 are similar in form and function. Select which of these railings to use at a given site based on District preferences, aesthetic or finish color requirements, corrosion concerns, theft potential issues, fabrication issues, weight of railing and any other project specific requirements.

Plan Content Requirements

In the Structures and/or Roadway Plans:

Show Pipe Guiderail on sidewalks and walls as required. Designate locations where guiderails are required.

Include cross references to ***Design Standards*** Index 870 as appropriate.

Payment

Item number	Item description	Unit Measure
515-1-2	Pipe Handrail - Guiderail, Aluminum	LF

Index 880 Steel Pipe Guiderail

Design Criteria

ADA Accessibility Guidelines July 2004 as adopted with amendments by the USDOT under 49 CFR Part 37

Design Assumptions and Limitations

This Guiderail resists an equivalent Service Loading of 50 lbs./ft. acting simultaneously in the transverse and vertical direction when applied at the height of the Top Rail.

This Index is not approved for use on bridges. This railing is not applicable for shielding drop-off hazards for vehicular traffic. This railing is applicable for all cases where a pedestrian or bicyclist drop-off hazards do not exceed 2'-6". Refer to ***PPM***, Volume 1, Chapters 4 & 8, for the definition of vehicular, pedestrian and bicyclist "drop-off hazards". This railing is also applicable for select uses on sidewalks within service areas and similar locations or maintenance areas where the drop off exceeds 2'-6".

Adequate foundation support for anchorage and stability against overturning must be provided. Design a site specific railing for unusual site conditions.

Indexes 870 and 880 are similar in form and function. Select which of these railings to use at a given site based on District preferences, aesthetic or finish color requirements, corrosion concerns, theft potential issues, fabrication issues, weight of railing and any other project specific requirements.

Plan Content Requirements

In the Structures and/or Roadway Plans:

Show Pipe Guiderail on sidewalks and walls as required. Designate locations where guiderails are required.

Include cross references to ***Design Standards*** Index 880 as appropriate.

Payment

Item number	Item description	Unit Measure
515-1-1	Pipe Handrail - Guiderail, Steel	LF

Index 5100 Retaining Wall - Cast In Place

Design Criteria

AASHTO LRFD Bridge Design Specifications, 4th Edition; ***Structures Design Guidelines (SDG)***

Design Assumptions and Limitations

The Retaining Wall Standard Drawings consist of ***Design Standards*** Index 5100 and companion Data Tables, located in the FDOT Structures Bar Menu as MicroStation CADD cells. These Standard Drawings are intended to work in conjunction with each other and the ***LRFD*** Retaining Wall Program, developed by the Structures Design Office.

Design assumptions used in the development of the Standard Drawings may be found in 'Retaining Wall Notes' within the Program. The Standard Drawings and Program are intended for conventional retaining walls only, not abutments. The EOR should consider the applicability of the following: overall stability, settlement and seismic loading.

The Engineer of Record (EOR) shall be responsible for the Retaining Wall Design in its entirety. The EOR should complete and/or alter the Standard Drawings to suit the particular design. The EOR should consider the appropriateness of the use of the Standard Drawings and Program if the particulars of the design conflict significantly with the assumptions used in the development of the Standard Drawings.

The Standard Drawings are intended to work in conjunction with Retaining Wall Control Drawings located within the Plans. The Control Drawings should define geometrics, locations and other specifics of the Retaining Wall such that when used in conjunction with the Standard Drawings, the Contractor has sufficient information for construction.

Plan Content Requirements

Prepare Control Drawings containing the following information and include them in the plans.

Plan View

- Wall Location
- Begin/End Wall Stationing and Offset
- Wall Joint/Expansion Joint Stationing and Offset
- Offset definition, usually from baseline to front face of wall
- Step Locations

Elevation

- Top/Bottom of Footing Elevation
- Ground line Elevation
- Top of Wall Elevation
- Top of Barrier Elevation

The Program outputs five text files:

- retwall_line1.txt
- retwall_line2.txt
- retwall_line3.txt
- retwall_line4.txt
- retwall_line5.txt

These five text files correspond sequentially to the five Retaining Wall Data tables contained in the companion Data Tables for Index 5100. Complete these data tables using the five text files and include the Data Tables in the plans. See Introduction I.3 for more information regarding use of Data Tables.

The text files can be inserted into the tables by using the 'Include' Key-In Utility in MicroStation at the active points in each table. Font 169 must be used to align inserted text with table columns.

RETAINING WALLS DATA TABLE

WALL DIMENSIONS

Wall No.	Begin		End		Height				Wall Length		D	W	L foot		L toe		Slope Bkwall	D soil		L key	D key	V step	Wall Cover	FtgCov (typ.)	FtgCov (bot.)
					Begin		End																		
	Station	Offset	Station	Offset	ft.	in.	ft.	in.	ft.	in.	in.	in.	ft.	in.	ft.	in.		ft.	in.	in.	in.	in.	in.	in.	in.

BILL OF REINFORCING STEEL

Wall No.	Bars J										Bars K										Bars M							
	Size	No.	Spacing	A				B		Average Total Length		Size	No.	Spacing	A				B		Average Total Length		Size	No.	A		B		Total Length	
				Begin		End									Begin		End											
			in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.			in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.			ft.	in.	ft.	in.	ft.	in.

BILL OF REINFORCING STEEL

Wall No.	Bars H					Bars G1						Bars R			Bars Z				Bars A						
	Size	No.	Spacing	Length		Size	No.	Spacing	No. of Lap Splices	Total Length		Size	No.	Length	Size	No.	Spacing	Length	Size	No.	Length				
																					Begin		End		Average Length
			in.	ft.	in.			in.		ft.	in.			ft.			in.	ft.	in.				ft.	in.	ft.	in.	ft.	in.

BILL OF REINFORCING STEEL

Wall No.	Bars F								Bars G2			Bars D			Bars N			Bars G3			
	Size	No.	Spacing	Length				Average Length	Size	No.	Length	Size	No.	Length	Size	No.	Total Length	Size	No.	Length	
				Begin		End															
			in.	ft.	in.	ft.	in.	ft.	in.			ft.	in.		ft.	in.		ft.	in.		

ESTIMATED QUANTITIES

Wall No.	Concrete			Reinf. Steel ③
	Footing ①	Wall ②	TOTAL	
	C. Y.	C. Y.	C. Y.	LBS.

QUANTITIES NOTES:

① Includes concrete for optional shear key.

② Includes additional concrete at top of wall for support of optional traffic railing barrier but does not include concrete for barrier itself (see Index No. 5100 – Payment note).

③ Does not include Bars 5V or any other reinf. steel for optional traffic railing barrier (see Index No. 5100 – Payment note).

NOTES:

1. Concrete Class (f'c =)
2. A value of '0' for Slope Backwall indicates front and back of wall are parallel.
3. Dsoil is typical depth of soil and is used for design purposes only. See Control Drawings for actual ground line.
4. Non-zero values for Lkey and Dkey indicate the existence of a shear key.
5. A non-zero value for Vstep indicates the existence of a footing step, see Control Drawings for location.
6. Bars J, K, A and F vary uniformly between begin and end wall heights as indicated by begin and end dimensions.
7. The number of G1 Bars includes 2 additional bars when a shear key is specified.
8. For walls with variable begin/end height, Bars G2 shall be fanned such that they are evenly spaced throughout length of wall.
9. Non-zero values for Bars N and Bars G3 indicate the existence of a barrier on the wall.

Payment

Item number	Item description	Unit Measure
400-2-11	Concrete Class II, Retaining Walls	CY
400-4-11	Concrete Class IV, Retaining Walls	CY
415-1-3	Reinforcing Steel - Retaining Wall	LB

Retaining Wall quantities shall not include concrete nor reinforcing steel for Traffic Railings. Traffic Railing (including Bars 5V) shall be paid for under Concrete Traffic Railing (Bridge).

Index 5200 Series Precast Sound Barriers

Design Criteria

AASHTO Guide Specifications for Structural Design of Sound Barriers (Current Edition); ***PPM*** Volume 1

Design Assumptions and Limitations

Use this standard with Indexes 5201, 5202, 5203, 5204, 5205, 5206 and 5207.

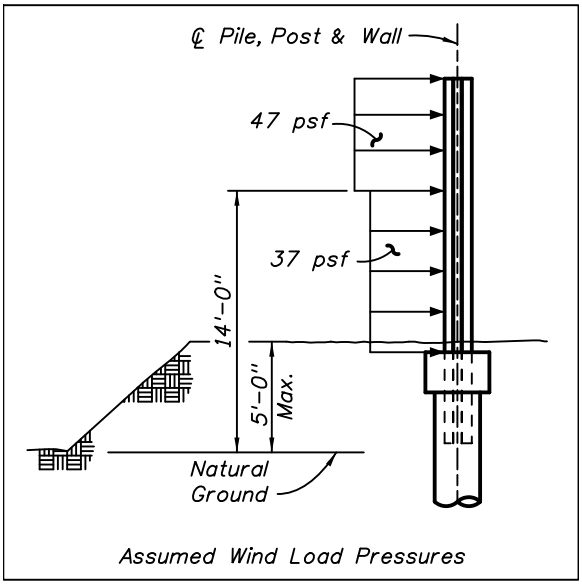
These Standards allow for the Sound Barrier to be constructed on berm or fill sections up to 5'-0" high. See sketch (right). For projects where Sound Barriers are constructed on fill sections in excess of 5'-0", project specific designs are required.

The design of the panels, posts and piles assumes the following wind pressures:

Posts & Piles: 37 psf - Height Up to 14 ft. above Natural Ground.

47 psf - Height Over 14 ft. to 29 ft. above Natural Ground.

Panels: 47 psf



Assumed Wind Load Pressures

The Sound Barrier system has been designed for wind loads only, with no provisions for vehicle impact loads. See ***PPM*** Volume I (current version). Sound Barriers shall be placed outside Clear Zone or set back 5'-0" from the front face of a TL-4 minimum crash-tested barrier. If there is insufficient room to accommodate the barrier and 5'-0" set back, Indexes 5210 and/or 5211 may be used instead.

The auger cast pile foundations shown on the standard have been designed in accordance with the current ***AASHTO Guide Specification for Structural Design of Sound Barriers***. In addition to meeting strength requirements, the auger cast pile lengths have been sized to limit top of wall deflections to Wall Height / 50, or 5 inches, whichever is smaller, and deflection of the head of pile at ground level has been limited to 1 inch.

These Precast Sound Barriers Standard Indexes depict 5 Pile/Post Connection Options, based on either 10'-0" or 20'-0" post spacing, and are applicable for sites with soil SPT N values between 10 and 40. For project sites where soil N values are less than 10, specific designs are required. If muck/organic soils are encountered, removal or soil improvement methods may be necessary. The limits of muck/organic soils should be shown in the plans with specified removal/improvement methods and method of payment. For project sites where rock/very strong soils are encountered at shallow depths (N values greater than 40), specific designs are required.

Proprietary Options: Any of the approved proprietary sound barrier panels, posts and foundations, or proprietary systems (panels and foundations) listed on the ***Qualified Products List*** may be allowed as alternates to the Precast Standard, provided the proprietary panel/system option meets the project's aesthetic requirements as depicted on the "PROJECT AESTHETIC REQUIREMENTS" table in the contract plans.

Soil Survey: Maximum preferred boring spacing is 200 ft. and minimum boring depth is 2.0 times the intended wall height for that location or 30'-0" whichever is less. Soil borings shall be considered as structural borings which include SPT performed at a maximum of 3 ft. intervals along the depth of the borings.

Utilities: In some instances, auger cast piles may not be practical due to overhead/ underground utilities. At these locations, spread footings should be considered. The Designer should provide project specific foundation designs as required.

Wall Layout: Wall alignment should be field staked at 20'-0" spacing during the design process in order to locate potential conflicts.

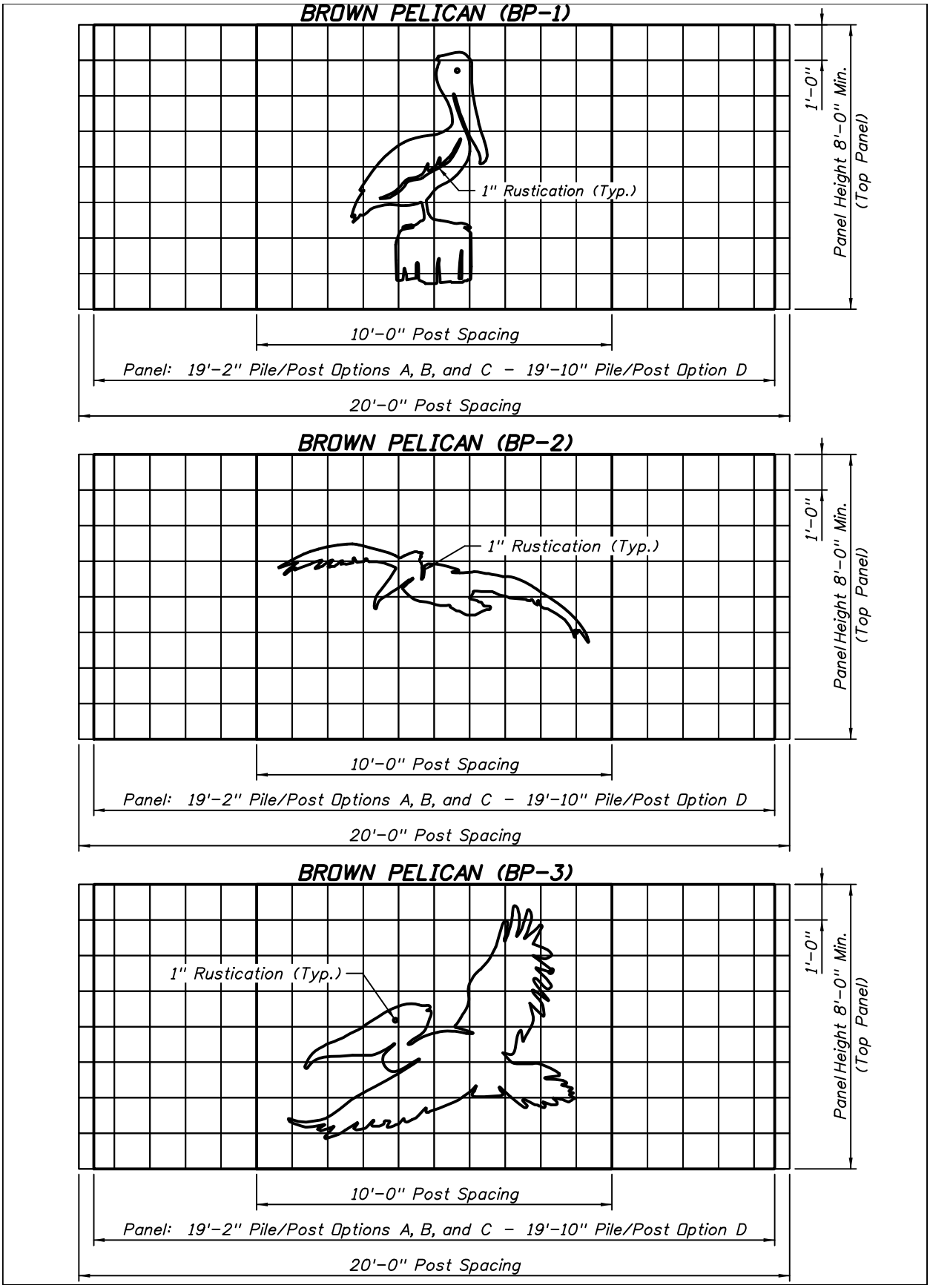
Drainage Holes: The Designer is responsible for locating wall drain holes based on site requirements. Drain holes should be clearly shown in the Control Drawings (including Type). See Index 5204 for details.

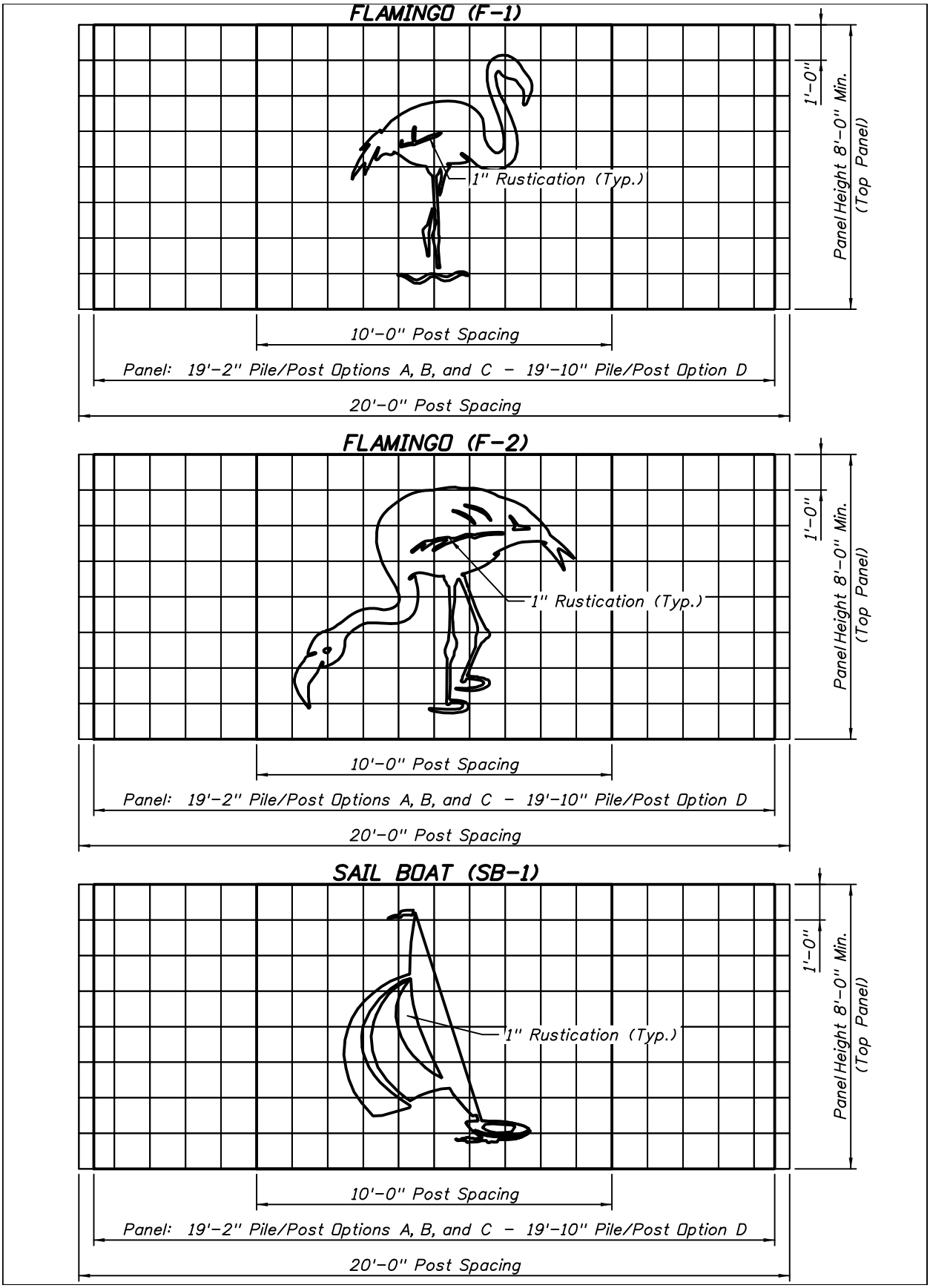
Fire Access Holes: The Designer is responsible for locating fire access holes based on project requirements. Fire Access Holes should be located at all existing hydrant locations.

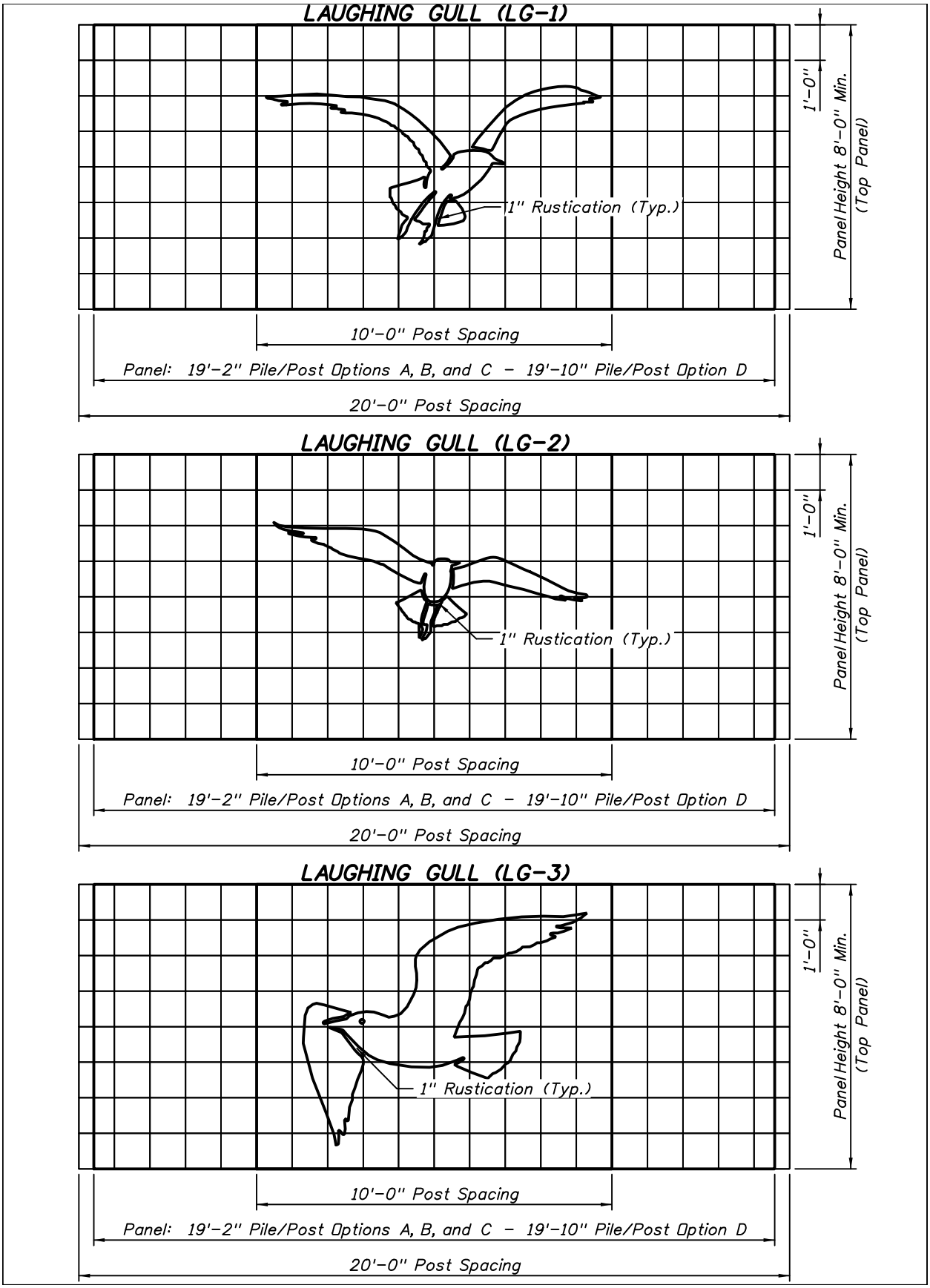
Anti-Graffiti Coating: Consideration should be given to coat all portions of the wall accessible to the public with anti-graffiti coating. Wall areas not receiving anti-graffiti coating, shall be coated with a Class 5 Applied Finish in accordance with ***Specifications*** Section 400. Color of Class 5 Finish should match the anti-graffiti coating system unless specified otherwise in the plans. Tabulate limits of anti-graffiti shown on the "LIMITS OF ANTI-GRAFFITI COATING" Data Table. Either sacrificial or non-sacrificial coating systems may be specified based on District Maintenance recommendations (See Pay Items).

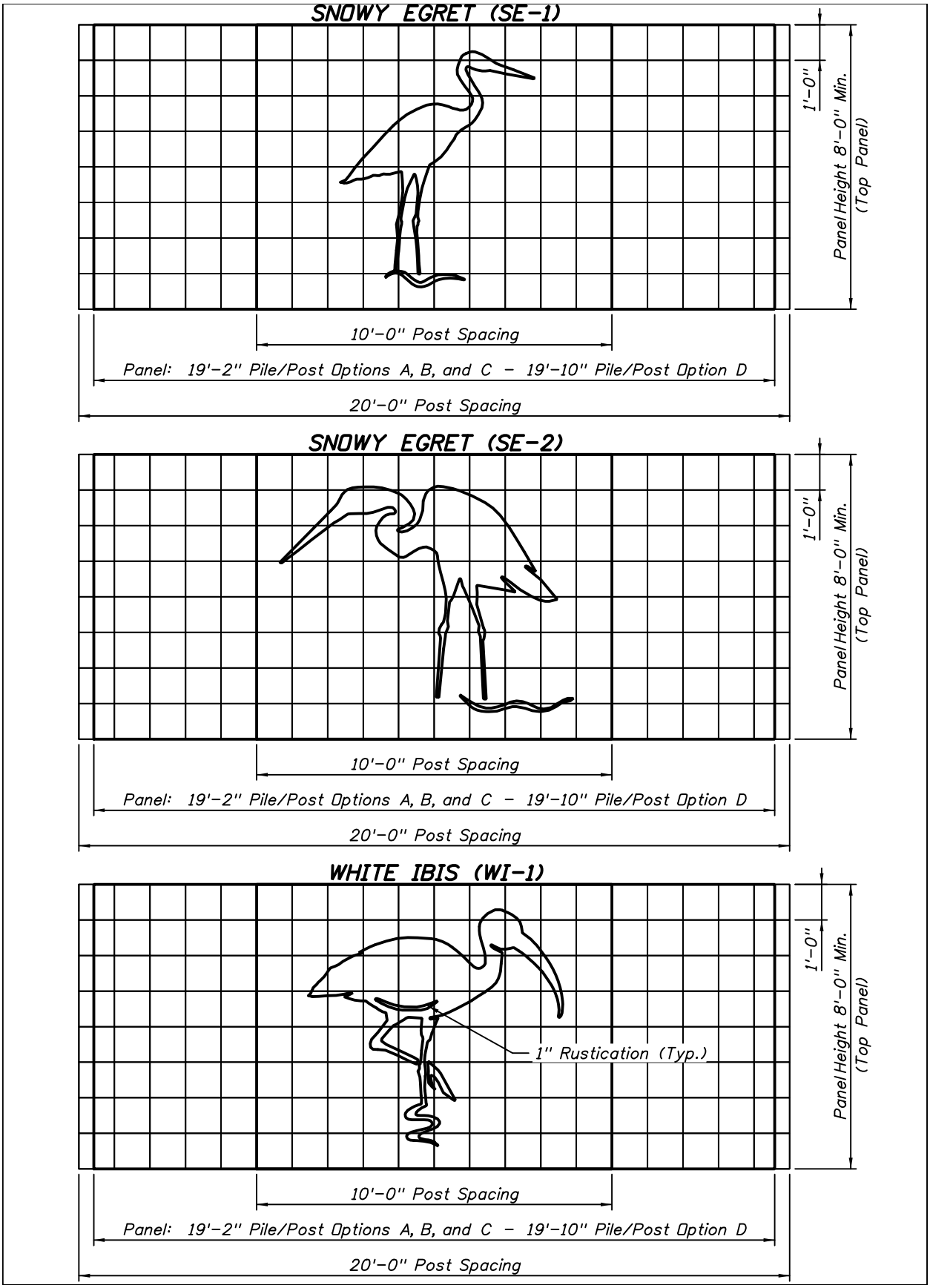
Wall Textures: Textures may be specified for either the back or front face of wall. All textures depicted in Index 5201 except Type "H" may be used for either the back face or front face of the wall. The Type "H" Texture is limited to front face only. Textures on the front face shall be formed. Textures on the back face are to be rolled or pressed, therefore the random pattern types may be more suitable on the back face.

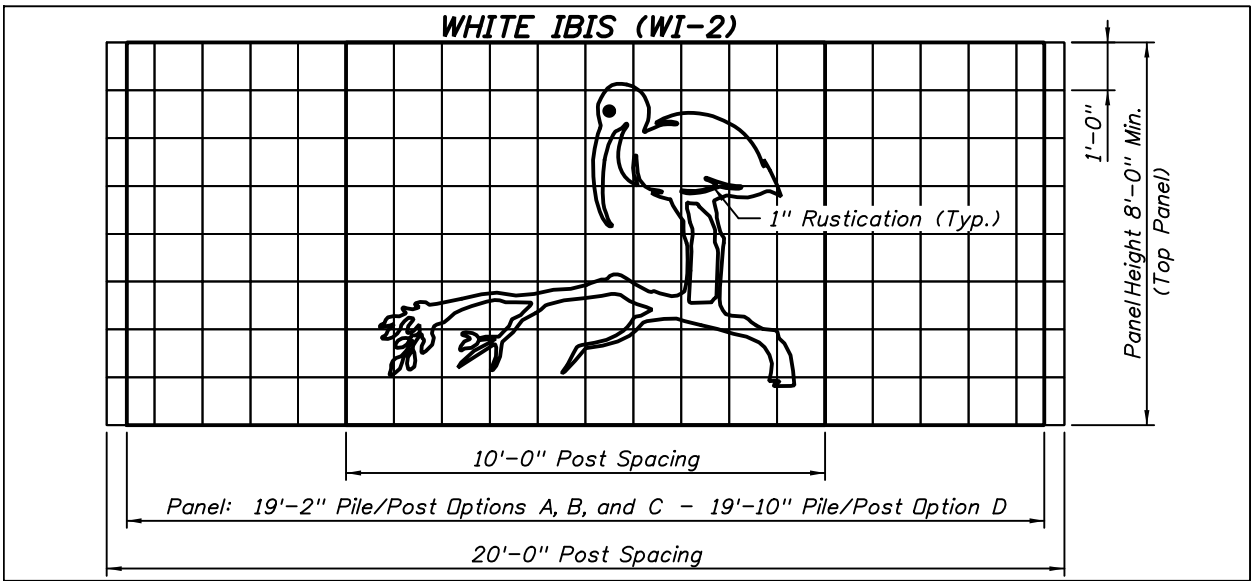
Graphics: Wall graphics may be formed into the wall panels. When required, graphic locations shall be shown in the Control Drawings. The following possible standard graphic options are depicted in the FDOT Structures Bar Menu (and/or CADD cell updates) as Sound Barrier Graphics CADD cells:

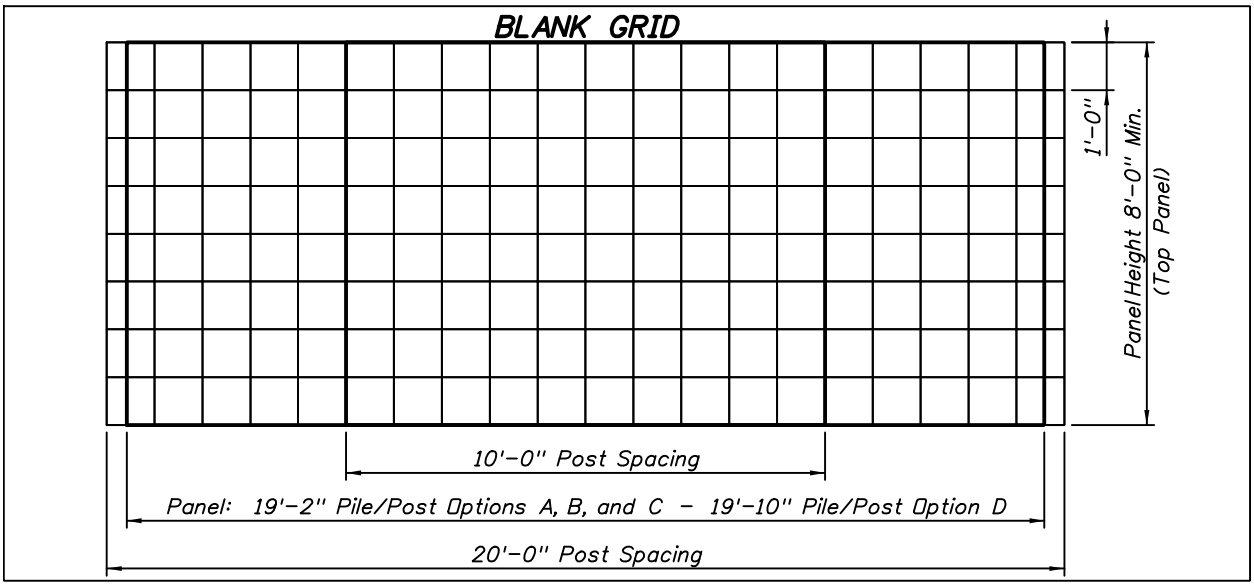

BROWN PELICAN (BP-1)
1" Rustication (Typ.)
1'-0"
Panel Height 8'-0" Min.
(Top Panel)
10'-0" Post Spacing
Panel: 19'-2" Pile/Post Options A, B, and C - 19'-10" Pile/Post Option D
20'-0" Post Spacing
BROWN PELICAN (BP-2)
1" Rustication (Typ.)
1'-0"
Panel Height 8'-0" Min.
(Top Panel)
10'-0" Post Spacing
Panel: 19'-2" Pile/Post Options A, B, and C - 19'-10" Pile/Post Option D
20'-0" Post Spacing
BROWN PELICAN (BP-3)
1" Rustication (Typ.)
1'-0"
Panel Height 8'-0" Min.
(Top Panel)
10'-0" Post Spacing
Panel: 19'-2" Pile/Post Options A, B, and C - 19'-10" Pile/Post Option D
20'-0" Post Spacing


FLAMINGO (F-1)
1'-0"
Panel Height 8'-0" Min.
(Top Panel)
1" Rustication (Typ.)
10'-0" Post Spacing
Panel: 19'-2" Pile/Post Options A, B, and C - 19'-10" Pile/Post Option D
20'-0" Post Spacing
FLAMINGO (F-2)
1'-0"
Panel Height 8'-0" Min.
(Top Panel)
1" Rustication (Typ.)
10'-0" Post Spacing
Panel: 19'-2" Pile/Post Options A, B, and C - 19'-10" Pile/Post Option D
20'-0" Post Spacing
SAIL BOAT (SB-1)
1'-0"
Panel Height 8'-0" Min.
(Top Panel)
1" Rustication (Typ.)
10'-0" Post Spacing
Panel: 19'-2" Pile/Post Options A, B, and C - 19'-10" Pile/Post Option D
20'-0" Post Spacing


LAUGHING GULL (LG-1)
1'-0"
Panel Height 8'-0" Min.
(Top Panel)
1" Rustication (Typ.)
10'-0" Post Spacing
Panel: 19'-2" Pile/Post Options A, B, and C - 19'-10" Pile/Post Option D
20'-0" Post Spacing
LAUGHING GULL (LG-2)
1'-0"
Panel Height 8'-0" Min.
(Top Panel)
1" Rustication (Typ.)
10'-0" Post Spacing
Panel: 19'-2" Pile/Post Options A, B, and C - 19'-10" Pile/Post Option D
20'-0" Post Spacing
LAUGHING GULL (LG-3)
1'-0"
Panel Height 8'-0" Min.
(Top Panel)
1" Rustication (Typ.)
10'-0" Post Spacing
Panel: 19'-2" Pile/Post Options A, B, and C - 19'-10" Pile/Post Option D
20'-0" Post Spacing


SNOWY EGRET (SE-1)
1'-0"
Panel Height 8'-0" Min.
(Top Panel)
10'-0" Post Spacing
Panel: 19'-2" Pile/Post Options A, B, and C - 19'-10" Pile/Post Option D
20'-0" Post Spacing
SNOWY EGRET (SE-2)
1'-0"
Panel Height 8'-0" Min.
(Top Panel)
10'-0" Post Spacing
Panel: 19'-2" Pile/Post Options A, B, and C - 19'-10" Pile/Post Option D
20'-0" Post Spacing
WHITE IBIS (WI-1)
1'-0"
Panel Height 8'-0" Min.
(Top Panel)
1" Rustication (Typ.)
10'-0" Post Spacing
Panel: 19'-2" Pile/Post Options A, B, and C - 19'-10" Pile/Post Option D
20'-0" Post Spacing





Using the Blank Grid shown above, the Designer may create other graphics as project requirements dictate. General considerations in creating graphics are as follows:

Wall graphics should be fully detailed in the plans and shall be simple.

Wall graphics should be as large as possible (approximately 8 ft. in height).

Input from local communities should be considered when determining graphic types.

Post Caps: Indicate in the "PROJECT AESTHETIC REQUIREMENTS" Data Table if Post Caps are required. These should only be considered when enhanced aesthetics are necessary.

Guardrails and delineators may be required at the back face of wall along local streets.

Plan Content Requirements

Prepare Control Drawings containing the following information and include them in the plans.

Plan View

- Sound Barrier Alignment / Location
- Begin/End Sound Barrier Stationings and Offsets
- Offset definition, usually from baseline to front face of Sound Barrier
- Step Locations
- Fire Access Hole Stations
- Drainage Hole Stations
- Adjacent Utilities

Elevation

- Ground line Elevations
- Top of Sound Barrier Elevations
- Bottom of Sound Barrier Elevations
- Fire Access Holes
- Drainage Holes
- Adjacent Utilities
- Locations and names of Sound Barrier Graphics

Reference in the plans Index 5202 or Index 5203 only when flush or recessed panels are required. Reference all pile/post connection options in Index 5205 except that Index 5205 "Option D" may be excluded when project aesthetics requirements dictate.

List all applicable proprietary panel/post & foundations/systems in Notes 1 and 2 in the companion Data Table to Index 5200 based on project requirements. Approved proprietary Sound Barriers are shown on the Qualified Product List at the following web address:

www.dot.state.fl.us/specificationsoffice/

Prepare project specific graphics details when required using the Blank Grid Sound Barrier Graphics CADD cell and include them in the plans. Designate each individual project specific graphic with a unique name for identification and cross reference purposes.

Complete the following Data Tables and include them in the plans. See Introduction I.3 for more information regarding use of Data Tables.

SOUND BARRIERS DATA TABLES

PROJECT AESTHETIC REQUIREMENTS							Table Date 7-01-08
WALL NOS:	REQUIRED: (YES/NO)			REQUIRED TEXTURES (3):			FLUSH PANEL/ RECESSED PANEL/ EITHER
	GRAPHICS (1)	COLORED COATINGS (2)	PRECAST POST CAP (4)	PANELS:		POSTS:	
				FRONT FACE	BACK FACE	FRONT FACE	

(1) See Control Drawings.
(2) Coat all exposed faces of wall with (sacrificial/non-sacrificial) anti-graffiti coating or Class 5 Applied Finish Coating. The color shall be per Federal Color Chart, Federal Standard No. 595B, Table _____, Color _____.
(3) See Index 5201.
(4) See Index 5207. Coat post caps the same color as posts, with a Class 5 Applied Finish Coating.

SUMMARY OF QUANTITIES - WALL AREA				Table Date 1-01-06
WALL NO.	STATION TO STATION	TOP OF WALL ELEV. (FT)	BOTTOM OF WALL ELEV. (FT)	AREA (SF)
			TOTAL:	

LIMITS OF ANTI-GRAFFITI COATING			Table Date 1-01-06
WALL NO.	STATION TO STATION	FRONT FACE/ BACK FACE/ BOTH	AREA (SF)
		TOTAL:	

NOTES:

1. The Contractor may choose the Standard Precast 20'-0" Panel Option depicted herein or one of the following QPL approved proprietary sound barrier panels used with FDOT standard posts and foundations:
   1). _____
   2). _____
   3). _____

   QPL approved proprietary sound barrier panels not listed above may be approved by the Engineer when all project aesthetic requirements can be met. Refer to the following web site address for the Qualified Products List for Sound Barrier Panels:

   www.dot.state.fl.us/specificationsoffice/

2. The Contractor may also choose one of the following QPL approved proprietary sound barrier systems (panels and foundation):
   1). _____
   2). _____
   3). _____

   QPL approved proprietary sound barrier systems not listed above may be approved by the Engineer when all project aesthetic requirements can be met. Refer to the following web site address for the Qualified Products List for Sound Barrier Systems:

   www.dot.state.fl.us/specificationsoffice/

3. Sound barriers shall meet the project aesthetic requirements as depicted in the above table and elsewhere in the plans.

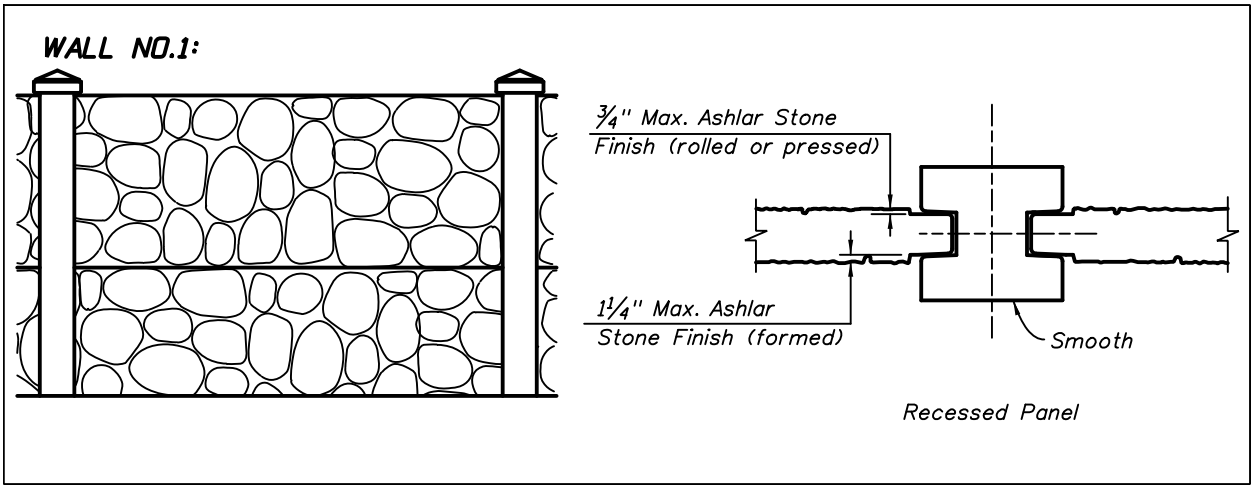
4. Front Face indicates roadway side of wall. Back Face indicates non-roadway side of wall.

Payment

Item number	Item description	Unit Measure
534-72-101	Sound Barrier-Inc Foundation, Permanent	SF
534-72-102	Sound Barrier-Inc Foundation, Temporary	SF

Example

Wall No. 1 is to be a recessed panel type wall consistent with Index 5203. The Front Face Panel Texture is to be Ashlar Stone (formed). The Back Face Panel Texture is also to be Ashlar Stone (rolled or pressed). The Front Face of Post Texture is to be smooth. The wall will not have any graphics. The posts will have Type C precast caps. The color of the wall is to be Sandalwood Brown. A steel post is not acceptable.



Wall No. 2 is to be a flush panel type wall consistent with Index 5202. The Front Face of Panel and Post is to be Trapezoid Vertical Fins with Fractured Face (Colorado Drag). The Back Face Panel texture is to be Pea Gravel (Rolled or Pressed). The wall has graphics. The color of the wall is to be Sandalwood Brown. A steel post is not acceptable. Post caps are not required.

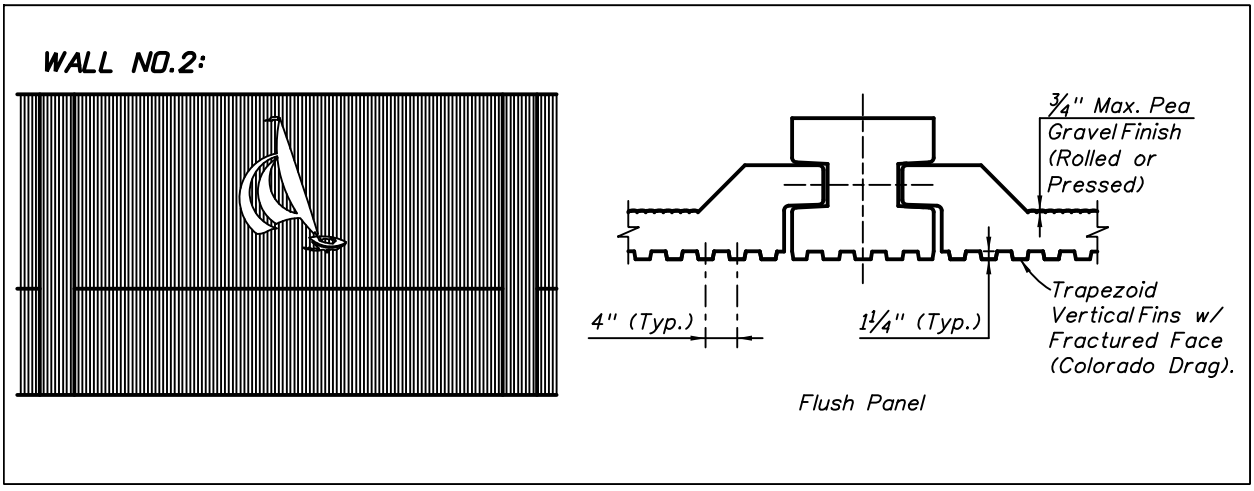


TABLE OF VARIABLES, CADD CELL 05200 "SOUND BARRIER DATA TABLE"

PROJECT AESTHETIC REQUIREMENTS							
WALL NOS.	REQUIRED: (YES/NO)			REQUIRED TEXTURES (3):			FLUSH PANEL/ RECESSED PANEL/ EITHER
	GRAPHICS (1)	COLORED COATINGS (2)	PRECAST POST CAPS (4)	PANELS:		POSTS:	
				FRONT FACE	BACK FACE	FRONT FACE	
1	NO	YES	Type "C"	Type "B"	Type "B"	* Type "A"	RECESSED PANEL
2	YES	YES	NO	Type "H"	Type "F"	* Type "H"	FLUSH PANEL

* Pile/Post Connection Option D, as detailed on Index No. 5205, Sheet 5 of 7 is not permitted.
(1) See Control Drawings.
(2) Coat all exposed faces of wall with (sacrificial/non-sacrificial) anti-graffiti coating or Class 5 Applied Finish Coating. The color shall be per Federal Color Chart, Federal Standard No. 595B, Table IV, similar to Color 33446.
(3) See Index No. 5201.
(4) See Index 5207. Coat post caps the same color as posts with a Class 5 Applied Finish Coating.

Index 5210 Traffic Railing/Sound Barrier (8'-0")

Design Criteria

NCHRP Report 350 TL-4; ***AASHTO LRFD Bridge Design Specifications***, 4th Edition; ***Structures Design Guidelines (SDG)***

Design Assumptions and Limitations

The Traffic Railing / Sound Barrier (8'-0") is the basic non-proprietary crash tested traffic railing / sound barrier combination for use on FDOT bridges and retaining walls. It can also be used for ground mounted applications within the clear zone when used in conjunction with the foundations presented in Indexes 5212, 5213 and 5214. This railing is first and foremost a traffic railing that also serves as a sound barrier. To preserve the crashworthiness of the design, this railing must be used in accordance with the requirements of ***SDG*** 6.7 for all applications.

For bridge applications, design bridge decks supporting Traffic Railing / Sound Barriers (8'-0") in accordance with the requirements of ***SDG*** 4.2. For bridge decks up to a maximum thickness of 9", the two Bars 5S1 placed in the bridge deck may substitute for the longitudinal deck steel located within the limits of Bars 5V, provided that the total area of longitudinal deck steel beneath the railing, as required by calculation, is not reduced.

Form liners providing a textured finish are permitted on the outside face of the Traffic Railing / Sound Barrier (8'-0") with the following provisions: (1) The maximum amplitude of the form liner on the lower 2'-8" section shall be limited to 1" depth; (2) Any form liner used above 2'-8", must provide a thickened concrete section to maintain 2" cover. Full details of this thickened section and the form liner shall be provided in the plans. Form liners complying with the requirements of ***SDG*** 6.7 are allowed on the upper vertical portion of the inside face of the Traffic Railing / Sound Barrier but are not recommended.

When the Traffic Railing / Sound Barrier (8'-0") terminates on the bridge, the End Taper shall be located at an open joint. When the Traffic Railing / Sound Barrier (8'-0") terminates on the Approach Slab, the End Taper shall terminate at Begin or End Approach Slab as shown.

Indexes 520, 5212, 5213, 5214, 5215, 20900 and 20910 contain details for the use of Traffic Railing / Sound Barriers (8'-0") on retaining walls, approach slabs and footings.

Project specific details are required for the use of 10'-0" and 12'-0" tall Traffic Railing / Sound Barriers on footings. Base these details on Indexes 5210 and 5211.

For treatment of Traffic Railing / Sound Barriers (8'-0") on skewed bridges see Index 490.

Details are available for increasing the crashworthiness of this Traffic Railing / Sound Barrier to ***NCHRP Report 350*** Test Level 5. Contact the Structures Design Office for more information.

Plan Content Requirements

In the Structures Plans:

In the Materials Note on the General Notes Sheet, specify the concrete class in accordance with the superstructure environment classification. See ***SDG*** 1.4.

Show and label the Traffic Railing / Sound Barrier (8'-0") on the Plan and Elevation, Typical Section, Superstructure, Approach Slab and Finish Grade Elevations Cross Section sheets, Retaining Wall Control Drawings, and other sheets as required. Include cross references to ***Design Standards*** Index 5210 and 20900 or 20910 as appropriate.

When the Traffic Railing / Sound Barrier (8'-0") ends on a bridge, provide an End Taper and terminate the low end of the End Taper at an open joint in the traffic railing, preferably at the end of a span. Continue the bridge mounted traffic railing along the remainder of the bridge.

When the Traffic Railing / Sound Barrier (8'-0") ends on an Approach Slab, provide an End Taper and terminate the low end of the End Taper at Begin or End Approach Slab. Provide an Index 400 Detail J Guardrail Approach Transition, Index 410 Concrete Barrier Wall or crash cushion at the low end of the End Taper.

On the Superstructure section sheets, show the two Bars 5S1 placed in the bridge deck within the Bars 5V along with the rest of the deck steel.

All concrete and Bars 5P, 5R, 5S and 5V required to construct the Traffic Railing / Sound Barrier are included in the Estimated Traffic Railing Quantities. Do not include Traffic Railing / Sound Barrier concrete in the estimated concrete quantities, or Bars 5P, 5R, 5S and 5V in the reinforcing bar lists and estimated reinforcing steel quantities for supporting bridge decks, approach slabs or retaining walls.

In the Roadway Plans when the Traffic Railing / Sound Barrier (8'-0") is used on retaining walls:

In the Materials Note on the General Notes Sheet, specify the concrete class in accordance with the retaining wall environment classification. See ***SDG*** 1.4.

Show and label the Traffic Railing / Sound Barrier (8'-0") on the Retaining Wall Control Drawings, and other sheets as required. Include cross references to ***Design Standards*** Index 5210 and 520, 5212 and/or 5300 as appropriate.

When the Traffic Railing / Sound Barrier (8'-0") ends on a retaining wall, provide an End Taper and terminate the low end of the End Taper at an open joint in the traffic railing. Continue the retaining wall mounted traffic railing along the remainder of the retaining wall.

In the Roadway Plans when the Traffic Railing / Sound Barrier (8'-0") is used for ground mounted applications:

In the Materials Note on the General Notes Sheet, specify the concrete class in accordance with the substructure or retaining wall environment classification. See ***SDG*** 1.4.

Show and label the Traffic Railing / Sound Barrier (8'-0") on the Plan and Profile, Cross Section and other sheets as required. Include cross references to ***Design Standards*** Index 5210, 5213, 5214 and 5215 as appropriate.

When the approach end of the Traffic Railing / Sound Barrier (8'-0") ends along the roadway within the clear zone, use one of the following treatments:

- Provide an End Taper and Index 400 Detail J Guardrail Approach Transition, Index 410 Concrete Barrier Wall or crash cushion at the low end of the End Taper.
- Flare the full height Traffic Railing / Sound Barrier (8'-0") out beyond the clear zone. Flare rates vary based on both design speed and highway application (i.e., Interstate, urban or rural installations). See ***Design Standards*** and ***PPM*** for applicable flare rates.
- Terminate the full height Traffic Railing / Sound Barrier (8'-0") within the clear zone and shield the end with a wide crash cushion. Ensure the traffic face of the wide crash cushion is offset at least 24-inches from vertical face of Traffic Railing / Sound Barrier (8'-0").

When the trailing end of the Traffic Railing / Sound Barrier (8'-0") ends along the roadway within the clear zone of adjacent traffic, and the trailing end is not within the clear zone of opposing traffic, the Traffic Railing / Sound Barrier (8'-0") can remain full height all the way to the end or the End Taper can be used. Provide Index 400 Guardrail or Index 410 Concrete Barrier Wall as required to shield hazards beyond the end of the Traffic Railing/ Sound Barrier.

Include project specific details for 10'-0" and 12'-0" tall Traffic Railing / Sound Barriers.

Payment

Item number	Item description	Unit Measure
521-5-20	Concrete Traffic Railing-Bridge, F Shaped With Sound Barrier Wall 8' Height	LF
521-7-1	Concrete Traffic Railing Barrier Retaining Wall System, F Shape With Sound Barrier Wall, 8' Height	LF
521-72-20	Shoulder Concrete Barrier Wall, F Shaped, With 8' Sound Wall	LF
521-72-21	Shoulder Concrete Barrier Wall, F Shaped, With 10' Sound Wall	LF
521-72-22	Shoulder Concrete Barrier Wall, F Shaped, With 12' Sound Wall	LF
521-72-23	Shoulder Concrete Barrier Wall, F Shaped, With 14' Sound Wall	LF

Index 5211 Traffic Railing/Sound Barrier (14'-0")

Design Criteria

NCHRP Report 350 TL-4; ***AASHTO LRFD Bridge Design Specifications***, 4th Edition; ***Structures Design Guidelines (SDG)***

Design Assumptions and Limitations

The Traffic Railing / Sound Barrier (14'-0") is a non-proprietary traffic railing / sound barrier combination that is based on the crash tested Traffic Railing / Sound Barrier (8'-0"). It can only be used for ground mounted applications, usually within the clear zone, and cannot be used on bridges or retaining walls. This railing is first and foremost a traffic railing that also serves as a sound barrier. To preserve the crashworthiness of the design, this railing must be used in accordance with the requirements of ***SDG*** 6.7 for all applications.

Work this Standard Index 5210 - Traffic Railing / Sound Barrier (8'-0") and one or more of the following:

Index 5213 - Traffic Railing / Sound Barrier T-Shaped Spread Footing,
Index 5214 - Traffic Railing / Sound Barrier L-Shaped Spread Footing or
Index 5215 - Traffic Railing / Sound Barrier Trench Footing

Form liners providing a textured finish are permitted on the outside face of the Traffic Railing / Sound Barrier (14'-0") with the following provisions: (1) The maximum amplitude of the form liner on the lower 2'-8" section shall be limited to 1" depth; (2) Any form liner used above 2'-8", must provide a thickened concrete section to maintain 2" cover. Full details of this thickened section and the form liner shall be provided in the plans. Form liners complying with the requirements of ***SDG*** 6.7 are allowed on the upper vertical portion of the inside face of the Traffic Railing / Sound Barrier but are not recommended.

Project specific details are required for the use of 10'-0" and 12'-0" tall Traffic Railing / Sound Barriers on footings. Base these details on Indexes 5210 and 5211.

Plan Content Requirements

In the Roadway Plans when the Traffic Railing / Sound Barrier (14'-0") is used for ground mounted applications:

In the Materials Note on the General Notes Sheet, specify the use of Class II or IV concrete in accordance with the substructure or retaining wall environment classification. See ***SDG*** 1.4.

Show and label the Traffic Railing / Sound Barrier (14'-0") on the Plan and Profile, Cross Section and other sheets as required. Include cross references to ***Design Standards*** Index 5211 and 5212, 5213, 5214 and 5215 as appropriate.

When the approach end of the Traffic Railing / Sound Barrier (14'-0") ends along the roadway within the clear zone, use one of the following treatments:

- Provide a Traffic Railing / Sound Barrier (8'-0") End Taper adjacent to the Traffic Railing / Sound Barrier (14'-0") End Taper. Continue the footing for Traffic Railing/Sound Barrier (14'-0") End Taper as the foundation for the Traffic Railing/Sound Barrier (8'-0") End Taper. Provide an Index 400 Detail J Guardrail Approach Transition, Index 410 Concrete Barrier Wall or crash cushion at the low end of the Traffic Railing / Sound Barrier (8'-0") End Taper.
- Provide a Traffic Railing / Sound Barrier (8'-0") End Taper adjacent to the full height Traffic Railing / Sound Barrier (14'-0"). Continue the footing for Traffic Railing/Sound Barrier (14'-0") as the foundation for the Traffic Railing/Sound Barrier (8'-0") End Taper. Provide an Index 400 Detail J Guardrail Approach Transition, Index 410 Concrete Barrier Wall or crash cushion at the low end of the Traffic Railing / Sound Barrier (8'-0") End Taper.
- Flare the full height Traffic Railing / Sound Barrier (14'-0") out beyond the clear zone. Flare rates vary based on both design speed and highway application (i.e., Interstate, urban or rural installations). See ***Design Standards*** and ***PPM*** for applicable flare rates.
- Terminate the full height Traffic Railing / Sound Barrier (14'-0") within the clear zone and shield the end with a wide crash cushion. Ensure the traffic face of the wide crash cushion is offset at least 24-inches from vertical face of Traffic Railing / Sound Barrier (14'-0").

When the trailing end of the Traffic Railing / Sound Barrier (14'-0") ends along the roadway within the clear zone of adjacent traffic, and the trailing end is not within the clear zone of opposing traffic, the Traffic Railing / Sound Barrier (14'-0") can remain full height all the way to the end or the End Taper can be used. Provide Index 400 Guardrail or Index 410 Concrete Barrier Wall as required to shield hazards beyond the end of the Traffic Railing / Sound Barrier.

Include project specific details for 10'-0" and 12'-0" tall Traffic Railing / Sound Barriers.

Payment

Item number	Item description	Unit Measure
521-72-23	Shoulder Concrete Barrier Wall, F Shaped, With 14' Sound Wall	LF

Index 5212 Traffic Railing/Sound Barrier (8'-0") Junction Slab

Design Criteria

See Instructions for Index 5210.

Design Assumptions and Limitations

Use this Standard with Index 5210 when the Traffic Railing / Sound Barrier (8'-0") is installed on a retaining wall.

Plan Content Requirements

See Instructions for Index 5210.

Payment

Item number	Item description	Unit Measure
521-7-1	Concrete Traffic Railing Barrier Retaining Wall System, F Shape With Sound Barrier Wall, 8' Height	LF

Index 5213 Traffic Railing/Sound Barrier T-Shaped Spread Footing

Design Criteria

See Instructions for Index 5210 and/or Index 5211.

Design Assumptions and Limitations

Use this Standard with Index 5210 and/or 5211 when the Traffic Railing / Sound Barrier (8'-0") and/or (14'-0") is installed on a T-Shaped spread footing.

Project specific details are required for the use of 10'-0" and 12'-0" tall Traffic Railing / Sound Barriers. Base these details on Indexes 5210 and 5211.

Plan Content Requirements

See Instructions for Index 5210 and/or Index 5211.

Include project specific details for 10'-0" and 12'-0" tall Traffic Railing / Sound Barriers.

Payment

Item number	Item description	Unit Measure
521-72-20	Shoulder Concrete Barrier Wall, F Shaped, With 8' Sound Wall	LF
521-72-21	Shoulder Concrete Barrier Wall, F Shaped, With 10' Sound Wall	LF
521-72-22	Shoulder Concrete Barrier Wall, F Shaped, With 12' Sound Wall	LF
521-72-23	Shoulder Concrete Barrier Wall, F Shaped, With 14' Sound Wall	LF

See also Instructions for Index 5210 and/or Index 5211.

Index 5214 Traffic Railing/Sound Barrier L-Shaped Spread Footing

Design Criteria

See Instructions for Index 5210 and/or Index 5211.

Design Assumptions and Limitations

Use this Standard with Index 5210 and/or 5211 when the Traffic Railing / Sound Barrier (8'-0") and/or (14'-0") is installed on a L-Shaped spread footing.

Project specific details are required for the use of 10'-0" and 12'-0" tall Traffic Railing / Sound Barriers. Base these details on Indexes 5210 and 5211.

Plan Content Requirements

See Instructions for Index 5210 and/or Index 5211.

Include project specific details for 10'-0" and 12'-0" tall Traffic Railing / Sound Barriers.

Payment

Item number	Item description	Unit Measure
521-72-20	Shoulder Concrete Barrier Wall, F Shaped, With 8' Sound Wall	LF
521-72-21	Shoulder Concrete Barrier Wall, F Shaped, With 10' Sound Wall	LF
521-72-22	Shoulder Concrete Barrier Wall, F Shaped, With 12' Sound Wall	LF
521-72-23	Shoulder Concrete Barrier Wall, F Shaped, With 14' Sound Wall	LF

See also Instructions for Index 5210 and/or Index 5211.

Index 5215 Traffic Railing/Sound Barrier Trench Footing

Design Criteria

See Instructions for Index 5210 and/or Index 5211.

Design Assumptions and Limitations

Use this Standard with Index 5210 and/or 5211 when the Traffic Railing / Sound Barrier (8'-0") and/or (14'-0") is installed on a trench footing.

Project specific details are required for the use of 10'-0" and 12'-0" tall Traffic Railing / Sound Barriers. Base these details on Indexes 5210 and 5211.

Plan Content Requirements

See Instructions for Index 5210 and/or Index 5211.

Include project specific details for 10'-0" and 12'-0" tall Traffic Railing / Sound Barriers.

Payment

Item number	Item description	Unit Measure
521-72-20	Shoulder Concrete Barrier Wall, F Shaped, With 8' Sound Wall	LF
521-72-21	Shoulder Concrete Barrier Wall, F Shaped, With 10' Sound Wall	LF
521-72-22	Shoulder Concrete Barrier Wall, F Shaped, With 12' Sound Wall	LF
521-72-23	Shoulder Concrete Barrier Wall, F Shaped, With 14' Sound Wall	LF

See also Instructions for Index 5210 and/or Index 5211.

Index 5300 Permanent Retaining Wall Systems

Design Criteria

AASHTO LRFD Bridge Design Specifications, 4th Edition; ***Structures Design Guidelines (SDG)***; ***PPM*** Vol. 1, Chapter 30; AASHTO-AGC-ARTBA Task Force 27 (Ground Modification Techniques), ***Insitu Soil Improvement Techniques***, January 1990.

A combination MSE wall mounted, precast coping / cast-in-place traffic railing similar to the design included in the standard was successfully crash tested at Terre Armee International (France). See report "Field Test of a "GBA" Safety Barrier Erected on a Reinforced Earth Wall", May, 1982.

Design Assumptions and Limitations

See the "Design Criteria" note on the Standard and ***PPM*** Vol. 1, Chapter 30.

This Index provides recommended details of various conditions typically encountered at the interface of retaining walls and other components. Work this Index with project specific details for End Bents, drainage structures and other adjacent features, structures or components.

Plan Content Requirements

In the Structures or Roadway Plans:

Prepare Control Plans in accordance with the requirements of ***PPM*** Vol. 1, Chapter 30, and include them in the plans.

Complete the following Data Tables using the following instructions and include the Data Tables on the retaining wall supplemental detail sheets. See Introduction I.3 for more information regarding use of Data Tables.

1. Complete the Notes and add/modify/delete as necessary.
2. List each wall in Note 3 separately, showing applicable wall systems.
3. Complete the "Geotechnical Information" table based on project soil conditions. See ***SDG*** Chapter 3 for required design based internal friction angle and unit weight of Reinforced Soil and Random Backfill.
4. Complete the "Retaining Wall Variables" and "Soil Reinforcement Lengths for External Stability" tables based on project requirements. The Wall Heights in the "Soil Reinforcement Lengths for External Stability" table refer to the height above the leveling pad, measured to the top of the wall coping. See ***SDG*** Chapter 3 Figures for details.
5. Transverse Differential Settlement is only applicable for widening of existing embankments.

PERMANENT RETAINING WALL SYSTEM DATA TABLES

GEOTECHNICAL INFORMATION						Table Date 7-01-06
		Reinforced Soil & Random Backfill	Loose Fine Sand	Firm Fine Sand	Loose Clayey Fine Sand	Firm Clayey Fine Sand
Depth Below Existing Ground Line (ft.)	Wall No. 1	——				
	Wall No. 2	——				
Effective Unit Weight (pcf)						
Cohesion (psf)		0				
Internal Friction Angle						

NOTE:
If the unit weight and/or internal friction angle of the fill proposed by the Contractor differs from that shown above, the Project Engineer will contact both the District Geotechnical Engineer and the Wall Designer for a possible redesign.

RETAINING WALL VARIABLES				Table Date 7-01-08
Wall No.	Wall Settlement			
	Long Term Settlement (in.)	Short Term Settlement (in.)	Differential Settlement	
			Longitudinal (%) (ft./100ft.)	Transverse (in.)
1				N/A
2				N/A

NOTE:
Design walls for the settlements noted in the table.
Long term settlement is measured from the end of wall fill placement.
Transverse differential settlement is measured from the face of wall to the end of the soil reinforcement.

SOIL REINFORCEMENT LENGTHS FOR EXTERNAL STABILITY												Table Date 7-01-06
Wall No. 1	Wall Height (ft.)											
	Reinforcement Length (ft.)											
	Factored Bearing Resistance (psf)											
Wall No. 2	Wall Height (ft.)											
	Reinforcement Length (ft.)											
	Factored Bearing Resistance (psf)											

NOTES:
1. The reinforcement strap lengths shown above are the minimum lengths required for external stability. The reinforcement lengths used in the construction of the retaining walls will be the longer of that required for external or internal stability (determined by proprietary wall companies).
2. The Factored Bearing Resistances shown above are the critical (lowest) values from all the load cases analyzed using LRFD methodology.

NOTES:

1. Concrete facing panel surfaces treatment will be _____ .

2. If required, the soil reinforcement and fasteners for the abutment back wall will be designed and furnished by the proprietary wall company. The soil reinforcement will be designed to resist a factored horizontal load of _____ kips/ft. of back wall width. The cost of soil reinforcement and fasteners will be included in the cost of the Retaining Wall System.

3. Applicable FDOT Wall Types for each wall location are listed below. See the Qualified Products List for approved Wall Systems and Design Standards Index No. 5300 for allowable Wall Type substitutions.
   Wall No. 1 - FDOT Wall Type _____
   Wall No. 2 - FDOT Wall Type _____

4. See Design Standards Index. No. 5300 for General Notes and Details.

Payment

Item number	Item description	Unit Measure
521-6-3	Concrete Parapet, Retaining Wall Mounted with Sidewalk	LF
521-6-4	Concrete Parapet, Retaining Wall Mounted with Sidewalk and 8' Sound Wall	LF
521-7-1	Concrete Traffic Railing Barrier, Retaining Wall System, F Shape with Sound Barrier Wall, 8' Height	LF
521-8-AA	Concrete Traffic Railing Barrier, Retaining Wall System Mounted With Sleeper Slab	LF
548-12	Retaining Wall System, Permanent, Excluding Barrier	SF
548-14	Retaining Wall System, Permanent - Widening, Attached To Existing Wall	SF

Index 5301 Temporary Retaining Wall Systems

Design Criteria

AASHTO LRFD Bridge Design Specifications, 4th Edition; ***Structures Design Guidelines (SDG)***; ***PPM*** Vol. 1, Chapter 30; AASHTO-AGC-ARTBA Task Force 27 (Ground Modification Techniques), Insitu Soil Improvement Techniques, January 1990.

Design Assumptions and Limitations

See the "Design Criteria" note on the Standard and ***PPM*** Vol. 1, Chapter 30.

This Index provides recommended details of various conditions typically encountered at the interface of temporary retaining walls and other components. Work this Index with project specific details for End Bents, drainage structures and other adjacent features, structures or components.

Plan Content Requirements

In the Structures or Roadway Plans:

Prepare Control Plans in accordance with the requirements of ***PPM*** Vol. 1, Chapter 30, and include them in the plans.

Complete the following Data Tables using the following instructions and include the Data Tables on the retaining wall supplemental detail sheets. See Introduction I.3 for more information regarding use of Data Tables.

1. Complete the Notes and add/modify/delete as necessary.
2. List each wall in Note 3 separately, showing applicable wall systems.
3. Complete the "Geotechnical Information" table based on project soil conditions. See ***SDG*** Chapter 3 for required design based internal friction angle and unit weight of Reinforced Soil and Random Backfill.
4. Complete the "Retaining Wall Variables" and "Soil Reinforcement Lengths for External Stability" tables based on project requirements. The Wall Heights in the "Soil Reinforcement Lengths for External Stability" table refer to the height above the leveling pad, measured to the top of the wall coping. See ***SDG*** Chapter 3 Figures for details.

TEMPORARY RETAINING WALL SYSTEM DATA TABLES

NOTES:

1. See the Qualified Products List for approved Wall Systems (Type 3).
2. See Design Standards Index No. 5301 for General Notes and Details.

GEOTECHNICAL INFORMATION						Table Date 7-01-06
		Reinforced Soil & Random Backfill	Loose Fine Sand	Firm Fine Sand	Loose Clayey Fine Sand	Firm Clayey Fine Sand
Depth Below Existing Ground Line (ft.)	Wall No. 1	——				
	Wall No. 2	——				
Effective Unit Weight (pcf)						
Cohesion (psf)		0				
Internal Friction Angle						

NOTE:
If the unit weight and/or internal friction angle of the fill proposed by the Contractor differs from that shown above, the Project Engineer will contact both the District Geotechnical Engineer and the Wall Designer for a possible redesign.

RETAINING WALL VARIABLES				Table Date 1-01-08
Wall No.	Wall Settlement			Air Contaminants Classification
	Long Term Settlement (in.)	Short Term Settlement (in.)	Differential Settlement (%) (ft./100ft.)	
1				
2				

NOTE:
Design walls for the settlements noted in the table.
Long term settlement is measured from the beginning of wall construction.

SOIL REINFORCEMENT LENGTHS FOR EXTERNAL STABILITY											Table Date 7-01-06
Wall No. 1	Wall Height (ft.)										
	Reinforcement Length (ft.)										
	Factored Bearing Resistance (psf)										
Wall No. 2	Wall Height (ft.)										
	Reinforcement Length (ft.)										
	Factored Bearing Resistance (psf)										

NOTES:
1. The reinforcement strap lengths shown above are the minimum lengths required for external stability. The reinforcement lengths used in the construction of the retaining walls will be the longer of that required for external or internal stability (determined by proprietary wall companies).
2. The Factored Bearing Resistances shown above are the critical (lowest) values from all the load cases analyzed using LRFD methodology.

Payment

Item number	Item description	Unit Measure
548-13	Retaining Wall System, Temporary, Excluding Barrier	SF

Index 11310 Cantilever Sign Structure

Design Criteria

AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, 5th Edition (LTS-5).; ***Structures Manual***, Volume 9, FDOT Modifications to LTS-5.; ***Structures Manual*** Introduction I.6 References; ***Structures Design Guidelines (SDG)***.

Design Assumptions and Limitations

See notes on the ***Design Standard***, ***Structures Manual*** Volume 9 and ***SDG***.

Use this ***Design Standard*** in conjunction with the FDOT Cantilever Overhead Sign Program.

Plan Content Requirements

See ***PPM***, Volume 1, Chapters 7 and 29.

Complete the appropriate Cantilever Sign Structures Data Table and include it in the plans. There is a choice of two tables, one for a sign structure with a flat slab foundation and the other for a sign structure with a drilled shaft foundation. Much of the data for inclusion in the table may be found in the FDOT Cantilever Overhead Sign Program output. Include Design Wind Speed and soils information. See Introduction I.3 for more information regarding use of Data Tables.

Table for use with a Spread Footing Foundation:

CANTILEVER SIGN STRUCTURES DATA TABLE

SIGN NO.	STATION / OFFSET	DIMENSIONS				PANELS	MEMBER SIZES			BACKRAKE
		A	B		C	N	D (CHORD)	E (WEB)	F (UPRIGHT)	G
		ft	ft	in	in	#	O. D. x Wall Thk. (in)	Angle (in)	O. D. x Wall Thk. (in)	in

NOTES:
1. Design Wind Speed = mph
2. Bolts (except Anchor Bolts) are

FOUNDATION NOTES:
1. Design based on Borings taken
   sealed by
2. Assumptions and Values used in design:
   Soil Type
   Soil Layer Thickness = ft.
   Soil Friction Angle = deg.
   Soil Weight = pcf
   Design Water Table is ft. below surface

NOTE - Work with Index 11310.

CANTILEVER SIGN STRUCTURES DATA TABLE (CONT.)

SIGN NO.	GUSSET PLATES															TRUSS CONNECTION									SPLICE			
	GA	GB	GC		GD		GE		GF		GG		GH		GJ	GK	TA	TB	TC	TD	TE	TF	TG	TH	TJ	SA	SB	SC	SD
	in	in	ft	in	ft	in	ft	in	ft	in	ft	in	ft	in	ft	in	in	#	#	in	in	in	in	in	in	Angle (in)	#	in	#

CANTILEVER SIGN STRUCTURES DATA TABLE (CONT.)

SIGN NO.	BASE CONNECTION										ANCHOR		FOOTING DIMENSIONS										FOOTING REINF.				PED. REINF.	
	BA	BB	BC	BD	BE		BF	BG	BH	BJ	BK		FA		FB		FC		FD		FE		FF	FG	FH	FJ	FK	FL
	in	#	in	in	ft	in	in	in	in	in	ft	in	ft	in	ft	in	ft	in	ft	in	ft	in	size	size	size	size	in	# / Size

Table for use with a Drilled Shaft Foundation:

CANTILEVER SIGN STRUCTURES DATA TABLE

SIGN NO.	STATION / OFFSET	DIMENSIONS A (ft)	DIMENSIONS B (ft)	DIMENSIONS B (in)	DIMENSIONS C (in)	PANELS N (#)	MEMBER SIZES D (CHORD) O. D. x Wall Thk. (in)	MEMBER SIZES E (WEB) Angle (in)	MEMBER SIZES F (UPRIGHT) O. D. x Wall Thk. (in)	BACKRAKE G (in)

NOTES:
1. Design Wind Speed = mph
2. Bolts (except Anchor Bolts) are

FOUNDATION NOTES:
1. Design based on Borings taken sealed by
2. Assumptions and Values used in design:
   Soil Type
   Soil Layer Thickness = ft.
   Soil Friction Angle = deg.
   Soil Weight = pcf
   Design Water Table is ft. below surface

NOTE – Work with Index 11310.

CANTILEVER SIGN STRUCTURES DATA TABLE (CONT.)

SIGN NO.	GUSSET PLATES GA (in)	GB (in)	GC (ft)	GC (in)	GD (ft)	GD (in)	GE (ft)	GE (in)	GF (ft)	GF (in)	GG (ft)	GG (in)	GH (ft)	GH (in)	GJ (ft)	GJ (in)	GK (in)	TRUSS CONNECTION TA (in)	TB (#)	TC (#)	TD (in)	TE (in)	TF (in)	TG (in)	TH (in)	TJ (in)	SPLICE SA Angle (in)	SB (#)	SC (in)	SD (#)

CANTILEVER SIGN STRUCTURES DATA TABLE (CONT.)

SIGN NO.	BASE CONNECTION BA (in)	BB (#)	BC (in)	BD (in)	BE (ft)	BE (in)	BF (in)	BG (in)	BH (in)	BJ (in)	ANCHOR BK (ft)	BK (in)	FOOTING – DRILLED SHAFT FA (ft)	FA (in)	FB (ft)	FB (in)	FC (# / Size)	FD (ft)	FD (in)

ALTERNATE
DRILLED SHAFT
FOUNDATION

Payment

Item number	Item description	Unit Measure
700-23-ABC	Overhead Truss Cantilever Sign	AS

Index 11320 Span Sign Structure

Design Criteria

AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, 5th Edition (LTS-5); ***Structures Manual*** Volume 9, FDOT Modifications to LTS-5; ***Structures Manual*** Introduction, I.6 References; ***Structures Design Guidelines (SDG)***.

Design Assumptions and Limitations

See notes on the ***Design Standard***, ***Structures Manual***, Volume 9 and ***SDG***.

Use this ***Design Standard*** in conjunction with the FDOT Span Overhead Sign Program.

Plan Content Requirements

See ***PPM*** Volume 1, Chapters 7 and 29.

Complete the Span Sign Structures Data Table and include it in the plans. Much of the data for inclusion in the table may be found in the FDOT Span Overhead Sign Program output. Include Design Wind Speed and soils information. See Introduction I.3 for more information regarding use of Data Tables.

SPAN SIGN STRUCTURES DATA TABLE														
SIGN#	STATION	DIMENSIONS			PNLS	MEMBER SIZES						SPLICE		
		A	B	C	D	E	F (CHORD)	G (WEB)	H (LEFT UPRIGHT)	J (RIGHT UPRIGHT)	K (CAMBER)	SA	SB	SC
		ft	ft	ft	#	in	O. D. x Wall Thk. (in)	Angle (in)	O. D. x Wall Thk. (in)	O. D. x Wall Thk. (in)	in	Angle (in)	#	in

SPAN SIGN STRUCTURES DATA TABLE (CONT.)																												
SIGN#	ALTERNATE SPLICE						GUSSET PLATES																					
	PA	PB	PC	PD	PE	PF	GA	GB	GC		GD		GE		GF		GG		GH		GJ		GK		GL			
	in	in	in	in	in	#	in	in	ft	in	ft	in	ft	in	ft	in	ft	in	ft	in	ft	in	ft	in	in			

SPAN SIGN STRUCTURES DATA TABLE (CONT.)																
SIGN#	LEFT UPRIGHT CONNECTION								RIGHT UPRIGHT CONNECTION							
	LA	LB	LC	LD	LE	LF	LG	LH	RA	RB	RC	RD	RE	RF	RG	RH
	in	#	in	in	in	in	in	in	in	#	in	in	in	in	in	in

SPAN SIGN STRUCTURES DATA TABLE (CONT.)																						
SIGN#	LEFT BASE CONNECTION										RIGHT BASE CONNECTION											
	BA	BB	BC	BD	BE		BF	BG	BH	BJ	CA	CB	CC	CD	CE		CF	CG	CH	CJ		
	in	#	in	in	ft	in		in	in	in	in	#	in	in	ft	in		in	in	in	in	

SPAN SIGN STRUCTURES DATA TABLE (CONT.)															
SIGN#	LEFT DRILLED SHAFT							RIGHT DRILLED SHAFT							
	DA		DB		DC	DD	DE	FA		FB		FC	FD	FE	
	ft	in	ft	in	# / size	in	in	ft	in	ft	in	# / size	in	in	

NOTES:
1. Design Wind Speed = mph
2. Bolts (except Anchor Bolts and Alt. Splice Bolts) are
3. Erection is the Contractor's responsibility. To facilitate erection, the Contractor should consider using two vertical lift points, each located near a panel point approximately 20 to 25% of the truss length from each end.
4. 'DC' and 'FC' shall include quantity and size of reinforcing steel.

FOUNDATION NOTES:
1. Design based on Borings taken sealed by
2. Assumptions and Values used in design:
   Soil Type
   Soil Layer Thickness = ft.
   Soil Friction Angle = deg.
   Soil Weight = pcf
   Design Water Table is ft. below surface

NOTE – Work with Index 11320.

Payment

Item number	Item description	Unit Measure
700-22-ABC	Overhead Truss Span Sign	AS

Index 11860 Single Column Ground Signs

Design Criteria

AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, 5th Edition (LTS-5); ***Structures Manual*** Volume 9, FDOT Modifications to LTS-5; ***Structures Manual*** Introduction, I.6 References.

Design Assumptions and Limitations

See notes on the ***Design Standard*** and ***Structures Manual*** Volume 9.

Plan Content Requirements

See ***PPM*** Volume 1, Chapters 7 and 29.

Payment

Item number	Item description	Unit Measure
700-20-ABC	Single Post Sign	AS

Index 17502 High Mast Lighting

Design Criteria

AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, 5th Edition (LTS-5); ***Structures Manual*** Volume 9, FDOT Modifications to LTS-5; ***Structures Manual*** Introduction, I.6 References.

Design Assumptions and Limitations

See notes on the ***Design Standard*** and ***Structures Manual*** Volume 9.

Plan Content Requirements

See ***PPM*** Volume 1, Chapters 7 and 29.

Payment

Item number	Item description	Unit Measure
715-19-ABC	High Mast Light Pole	AS

Index 17515 Standard Roadway Aluminum Lighting

Design Criteria

AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, 5th Edition (LTS-5); ***Structures Manual*** Volume 9, FDOT Modifications to LTS-5; ***Structures Manual*** Introduction, I.6 References.

Design Assumptions and Limitations

See notes on the ***Design Standard*** and ***Structures Manual*** Volume 9.

Plan Content Requirements

See ***PPM***, Volume 1, Chapters 7 and 29.

Payment

Item number	Item description	Unit Measure
715-41-ABC	Light Pole	EA

Index 17723 Steel Strain Pole

Design Criteria

AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, 5th Edition (LTS-5); ***Structures Manual*** Volume 9, FDOT Modifications to LTS-5; ***Structures Manual*** Introduction, I.6 References.

Design Assumptions and Limitations

See notes on the ***Design Standard*** and ***Structures Manual*** Volume 9.

Plan Content Requirements

See ***PPM*** Volume 1, Chapters 7 and 29.

Payment

Item number	Item description	Unit Measure
649-1-ABC	Steel Strain Pole	EA

Index 17743 Standard Mast Arm "D","E" & "F" Assemblies

Design Criteria

AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, 5th Edition (LTS-5); ***Structures Manual*** Volume 9, FDOT Modifications to LTS-5; ***Structures Manual*** Introduction, I.6 References.

Design Assumptions and Limitations

See notes on the ***Design Standard*** and ***Structures Manual*** Volume 9.

Plan Content Requirements

Complete the following Standard Mast Arm Assemblies Data Table and include it in the plans. See Introduction I.3 for more information regarding use of Data Tables.

STANDARD MAST ARM ASSEMBLIES DATA TABLE																		
STRUCTURE ID NUMBERS	ASSEMBLY NUMBERS (1)	FIRST ARM			SECOND ARM			UF (deg)	LL (deg)	POLE				SPECIAL DRILLED SHAFT (4)			
		ARM TYPE	FAA (2) (ft.)	FBA (2) (in.)	ARM TYPE	FAA (2) (ft.)	FBA (2) (in.)			POLE TYPE	UAA (3) (ft.)	UB (ft.)	UCA (3) (in.)	DA (ft.)	DB (ft.)	RA	RB

TABLE NOTES:

1. Assembly Number Legend

   Single Arm:
   Arm Type - Pole Type = D# - S#
   = E# - T#
   = F# - W#

   Double Arm:
   First Arm Type - Second Arm Type - Pole Type = D# - D# - S#
   = E# - E# - T#
   = F# - F# - W#

2. If an entry appears in columns "FAA" and "FBA", a shorter arm is required. This is obtained by removing length from the arm tip. For these cases the mast arm length shall be shortened from "FA" to "FAA" and the tip diameter shall be increased from "FB" to "FBA".

3. If an entry appears in columns "UAA" and "UCA", a shorter pole is required. This is obtained by removing length from the pole tip. For these cases the pole height shall be shortened from "UA" to "UAA" and the pole tip diameter shall be increased from "UC" to "UCA".

4. The foundations for Standard Mast Arm Assemblies are pre-designed and are based upon the following conservative soil criteria which covers the great majority of soil types found in Florida. Only complete the "Special Drilled Shaft" data information if site conditions dictate drilled shafts with additional foundation capacity.

   Classification = Cohesionless (Fine Sand)
   Friction Angle = 30 Degrees (30°)
   Unit Weight = 50 lbs. / cu. ft. (assumed saturated)

GENERAL NOTES:

1. Work this sheet with the Signal Designer's "Mast Arm Tabulation". See "Mast Arm Tabulation" for special instructions that include non-standard Handhole location, paint color, terminal compartment requirement, and pedestrian features.

2. Work with Index Nos. 17743 and 17745.

Payment

Item number	Item description	Unit Measure
649-3A-BCC	Steel Mast Arm Assembly	EA

Index 17745 Mast Arm Assemblies

Design Criteria

AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, 5th Edition (LTS-5); ***Structures Manual*** Volume 9, FDOT Modifications to LTS-5; ***Structures Manual*** Introduction, I.6 References.

Design Assumptions and Limitations

See notes on the ***Design Standard*** and ***Structures Manual*** Volume 9.

Plan Content Requirements

Complete the following Special Mast Arm Assemblies Data Table and include it in the plans. See Introduction I.3 for more information regarding use of Data Tables.

SPECIAL MAST ARM ASSEMBLIES DATA TABLE

NUMBER OF LOCATIONS	STRUCTURE NUMBER	FIRST ARM				FIRST ARM EXTENSION				SECOND ARM				SECOND ARM EXTENSION				POLE						
		FA(ft)	FB(in)	FC(in)	FD(in)	FE(ft)	FF(in)	FG(in)	FH(in)	SA(ft)	SB(in)	SC(in)	SD(in)	SE(ft)	SF(in)	SG(in)	SH(in)	UA(ft)	UB(ft)	UC(in)	UD(in)	UE(in)	UF(deg)	UG(ft)

SPECIAL MAST ARM ASSEMBLIES DATA TABLE (CONT.)

STRUCTURE NUMBER	FIRST ARM CONNECTION (in) First Arm Camber Angle = 2 Degrees													SECOND ARM CONNECTION (in) Second Arm Camber Angle = 2 Degrees												
	#Bolts	HT	FJ	FK	FL	FM	FN	FO	FP	FQ	FR	FS	FT	#Bolts	HT	SJ	SK	SL	SM	SN	SO	SP	SQ	SR	SS	ST

SPECIAL MAST ARM ASSEMBLIES DATA TABLE (CONT.)

STRUCTURE NUMBER	POLE BASE CONNECTION (in)							SHAFT AND REINF.				LUMINAIRE AND LUMINAIRE CONNECTION										
	#Bolts	BA	BB	BC	BD	BE	BF	DA(ft)	DB(ft)	RA	RB	LA(ft)	LB(ft)	LC(in)	LD(in)	LE	LF(ft)	LG(in)	LH(in)	LJ(in)	LK(in)	LL(deg)

NOTES:
1. Work with Index 17745.
2. Design Wind Speed = mph
3. Contractor shall coordinate anchor bolt requirements with fabricator.
4. Contractor shall identify Structures Numbers and submit detailed shop drawings.

FOUNDATION NOTES:
1. Design based on Borings taken
   sealed by
2. Assumptions and Values used in design:
   Soil Type
   Soil Layer Thickness = ft.
   Soil Friction Angle = deg.
   Soil Weight = pcf
   Design Water Table is ft. below surface

Payment

Item number	Item description	Unit Measure
649-3A-BCC	Steel Mast Arm Assembly	EA

Index 17749 Damping Device for Miscellaneous Structures

Design Criteria

Design, Testing and Specification of a Mechanical Damping Device for Mast Arm Traffic Signal Structures; Ronald Cook & David Bloomquist, University of Florida, January 2000. FDOT Report BC-050.

Section 11.7 of the ***Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals***, 5th Edition (LTS-5).

Design Assumptions and Limitations

This device is generally for retrofits in certain unusual applications, generally Mast Arm Signal Structures, where excessive vibration has been observed. Contact the Structures Design Office for further guidance.

The following note is taken from ***Design Standard*** Index 17745:

11) If a Mast Arm damping device is required by the Engineer, it shall be installed within eight feet of the Mast Arm tip.

Plan Content Requirements

Not typically for new construction. Contact the Structures Design Office for further guidance.

Payment

Contact the Structures Design Office for further guidance.

Index 20005 Prestressed Beam Temporary Bracing

Design Criteria

AASHTO LRFD Bridge Design Specifications, 4th Edition; ***Structures Detailing Manual (SDM)***; ***Structures Design Guidelines (SDG)***

Design Assumptions and Limitations

Index 20005 depicts notes and details that are schematic for use in the development of shop drawings for temporary I-beam bracing. Use this standard for all superstructures with Florida-I, AASHTO, Florida Bulb-T and non-FDOT standard prestressed concrete beams. Use this standard with Indexes 20010, 20036, 20045, 20063, 20072, 20078, 20120, 20130, 20140, 20150, 20160, 20172, 20178, 20199, 20500, 20501, 20510 and 20511.

Companion MicroStation CADD cell 20005 includes the "TABLE OF TEMPORARY BRACING VARIABLES", the "TABLE OF WIND LOAD VARIABLES", the "TABLE OF ASSUMED CONSTRUCTION LOADS (UNFACTORED)", and the "BEAM TEMPORARY BRACING NOTES". These tables are to be completed and included in the plans along with the provided bracing notes. The FDOT Beam Stability MathCAD program may be used to determine the variables to be input into these tables. See ***SDG*** Chapters 2 and 4 for more information and requirements.

The assumed weight for the finishing machine is left to the discretion of the designer, but suggested total weights for the finishing machine are 10 kips for bridge widths less than 45 feet and 20 kips otherwise.

Plan Content Requirements

In the Structures Plans:

Complete the following "TABLE OF WIND LOAD VARIABLES", “TABLE OF ASSUMED CONSTRUCTION LOADS (UNFACTORED)” and “TABLE OF TEMPORARY BRACING VARIABLES” and include them in the plans for all bridges with prestressed concrete I-beam superstructures. Use additional sheets when the actual number of spans exceeds the capacity of a single plan sheet using the standard tables. Supplemental details and modifications are permitted if special conditions require dimensions, details or notes. However, the tables themselves should not be modified. See Introduction I.3 for more information regarding use of Data Tables.

The forces that are entered into the columns for beam end and intermediate horizontal bracing forces in the 'TABLE OF TEMPORARY BRACING VARIABLES' shall be the horizontal reaction forces at each brace point. Forces should not be resolved into a diagonal component, regardless of any inclination of the actual bracing. These forces are to be used by the Contractor to design bracing members and connections.

If intermediate span braces are not required, enter "N/A" in the "Horizontal Force At Each Intermediate Span Brace" and "Overturning Force At Each Intermediate Span Brace" columns for each span in which intermediate span braces are not required.

Include the 'BEAM TEMPORARY BRACING NOTES' in the plans.

TABLE OF WIND LOAD VARIABLES	Table Date 1-01-10
WIND SPEED, BASIC (MPH)	
WIND SPEED, CONSTRUCTION INACTIVE (MPH)	
WIND SPEED, CONSTRUCTION ACTIVE (MPH)	
VELOCITY PRESSURE EXPOSURE COEFFICIENT	
GUST EFFECT FACTOR	

TABLE OF ASSUMED CONSTRUCTION LOADS (UNFACTORED)	Table Date 1-01-10
BUILD-UP (PLF)	
FORM WEIGHT (PSF)	
FINISHING MACHINE TOTAL WEIGHT (KIP)	
FINISHING MACHINE WHEEL LOCATION BEYOND EDGE OF DECK OVERHANG (IN.)	
DECK WEIGHT (PSF)	
LIVE LOAD (PSF)	
LIVE LOAD AT EXTREME DECK EDGE (PLF)	

TABLE OF TEMPORARY BRACING VARIABLES						Table Date 1-01-10	
SPAN NO.	L_B, MAXIMUM UNBRACED LENGTH (FT)	HORIZONTAL FORCE AT EACH BEAM END AND ANCHOR BRACE (KIP)	HORIZONTAL FORCE AT EACH INTERMEDIATE SPAN BRACE (KIP)	OVERTURNING FORCE AT EACH BEAM END AND ANCHOR BRACE (KIPxFT)	OVERTURNING FORCE AT EACH INTERMEDIATE SPAN BRACE (KIPxFT)	BRACE ENDS PRIOR TO CRANE RELEASE?	TOTAL NUMBER OF BRACES
						YES/NO	
						YES/NO	
						YES/NO	
						YES/NO	

BEAM TEMPORARY BRACING NOTES:
Based on investigation of the beam stability, temporary bracing as shown in the 'TABLE OF TEMPORARY BRACING VARIABLES' and Design Standard Index No. 20005 is required. The Table and following information is provided to aid the Contractor in design of beam temporary bracing:

1. Design the bracing members and connections to transfer both compressive and tensile forces equal to the horizontal forces given in the 'TABLE OF TEMPORARY BRACING VARIABLES'. Also design bracing members and connections to be capable of resisting the overturning forces given in the Table, non-simultaneously with horizontal forces. Assume that horizontal bracing forces are applied perpendicular to the beam web at mid-height of the beam, and assume that overturning bracing forces are applied at the centerline of the beam at the top of the top flange.
2. The horizontal brace forces have been determined by application of the Construction Inactive Wind Load as listed in the 'TABLE OF WIND LOAD VARIABLES'. The overturning brace forces have been determined by application of the Construction Active Wind Load as listed in the 'TABLE OF WIND LOAD VARIABLES' plus the assumed construction loads shown in the 'TABLE OF ASSUMED CONSTRUCTION LOADS'. It is the Contractor's responsibility to re-calculate the bracing requirements if the actual construction loads exceed the assumed loads shown, or if the finishing machine wheel location from the edge of the deck overhang exceeds the value listed.
3. The temporary bracing at the ends of the beams shall be installed prior to crane release if indicated in the 'TABLE OF TEMPORARY BRACING VARIABLES'. Beams shall not be left un-braced during non-work hours. Bracing at the ends of the beams shall remain in place until the diaphragm concrete reaches 2500 psi. The temporary intermediate bracing, if required, shall remain in place until bridge deck concrete reaches 2500 psi.
4. The exposure period (defined as the time period for which temporary load cases of the superstructure exist) is assumed to be less than one year. Horizontal bracing forces, as specified in the 'TABLE OF TEMPORARY BRACING VARIABLES', are not valid if the exposure period is more than one year; for this case the Contractor shall re-calculate bracing requirements.
5. Horizontal and overturning forces are factored per the Strength III limit state for construction.

Payment

The cost of temporary bracing is incidental to the cost of the prestressed beams it is used with. No separate payment is made.

Example Problem

The following example shows the data required for completion of the Data Table for the Prestressed Beam Temporary Bracing Index No. 20005. This case shows a Florida-I 78 Beam (Index No. 20078). The example assumes a three equal span bridge designed for the following conditions:

Girder Span: 182’-0"

Girder Spacing: 6’-0"

Number of Girder Lines: 7

Deck Thickness: 8½”

Deck Overhang: 3’-0"

Skew Angle: 45°

Bridge Height: 60’-0"

Construction Inactive Wind Load: 44.0 psf (150 mph reduced by 0.6 to 90 mph)

Construction Active Wind Load (20 MPH): 2.2 psf (girder only), 1.1 psf (bridge with forms in place)

Based on beam stability calculations, (1) intermediate brace point would be sufficient, but the bracing force would be very large. Therefore, the bracing requirements will be calculated based on (2) intermediate brace points.

The maximum unbraced length is: 182’-0" / 3 = 60’-8"

TABLE OF WIND LOAD VARIABLES	Table Date 1-01-10
WIND SPEED, BASIC (MPH)	150
WIND SPEED, CONSTRUCTION INACTIVE (MPH)	90
WIND SPEED, CONSTRUCTION ACTIVE (MPH)	20
VELOCITY PRESSURE EXPOSURE COEFFICIENT	1.137
GUST EFFECT FACTOR	0.85

TABLE OF ASSUMED CONSTRUCTION LOADS (UNFACTORED)	Table Date 1-01-10
BUILD-UP (PLF)	50
FORM WEIGHT (PSF)	20
FINISHING MACHINE TOTAL WEIGHT (KIP)	20
FINISHING MACHINE WHEEL LOCATION BEYOND EDGE OF DECK OVERHANG (IN.)	2½
DECK WEIGHT (PSF)	113.3
LIVE LOAD (PSF)	20
LIVE LOAD AT EXTREME DECK EDGE (PLF)	75

TABLE OF TEMPORARY BRACING VARIABLES — Table Date 1-01-10

SPAN NO.	L_B, MAXIMUM UNBRACED LENGTH (FT)	HORIZONTAL FORCE AT EACH BEAM END AND ANCHOR BRACE (KIP)	HORIZONTAL FORCE AT EACH INTERMEDIATE SPAN BRACE (KIP)	OVERTURNING FORCE AT EACH BEAM END AND ANCHOR BRACE (KIPxFT)	OVERTURNING FORCE AT EACH INTERMEDIATE SPAN BRACE (KIPxFT)	BRACE ENDS PRIOR TO CRANE RELEASE?	TOTAL NUMBER OF BRACES
1	60.67	8.69	23.90	27.31	63.75	NO	24
2	60.67	8.69	23.90	27.31	63.75	NO	24
3	60.67	8.69	23.90	27.31	63.75	NO	24

BEAM TEMPORARY BRACING NOTES:

Based on investigation of the beam stability, temporary bracing as shown in the 'TABLE OF TEMPORARY BRACING VARIABLES' and Design Standard Index No. 20005 is required. The Table and following information is provided to aid the Contractor in design of beam temporary bracing:

1. Design the bracing members and connections to transfer both compressive and tensile forces equal to the horizontal forces given in the 'TABLE OF TEMPORARY BRACING VARIABLES'. Also design bracing members and connections to be capable of resisting the overturning forces given in the Table, non-simultaneously with horizontal forces. Assume that horizontal bracing forces are applied perpendicular to the beam web at mid-height of the beam, and assume that overturning bracing forces are applied at the centerline of the beam at the top of the top flange.
2. The horizontal brace forces have been determined by application of the Construction Inactive Wind Load as listed in the 'TABLE OF WIND LOAD VARIABLES'. The overturning brace forces have been determined by application of the Construction Active Wind Load as listed in the 'TABLE OF WIND LOAD VARIABLES' plus the assumed construction loads shown in the 'TABLE OF ASSUMED CONSTRUCTION LOADS'. It is the Contractor's responsibility to re-calculate the bracing requirements if the actual construction loads exceed the assumed loads shown, or if the finishing machine wheel location from the edge of the deck overhang exceeds the value listed.
3. The temporary bracing at the ends of the beams shall be installed prior to crane release if indicated in the 'TABLE OF TEMPORARY BRACING VARIABLES'. Beams shall not be left un-braced during non-work hours. Bracing at the ends of the beams shall remain in place until the diaphragm concrete reaches 2500 psi. The temporary intermediate bracing, if required, shall remain in place until bridge deck concrete reaches 2500 psi.
4. The exposure period (defined as the time period for which temporary load cases of the superstructure exist) is assumed to be less than one year. Horizontal bracing forces, as specified in the 'TABLE OF TEMPORARY BRACING VARIABLES', are not valid if the exposure period is more than one year; for this case the Contractor shall re-calculate bracing requirements.
5. Horizontal and overturning forces are factored per the Strength III limit state for construction.

Index 20010 Series Prestressed Florida-I Beams

Design Criteria

AASHTO LRFD Bridge Design Specifications, 4th Edition; ***Structures Detailing Manual (SDM)***; ***Structures Design Guidelines (SDG)***

Design Assumptions and Limitations

Index 20010 is the lead standard for the Prestressed Florida-I Beam standard series which includes Indexes 20010 through 20078. Use this standard with Indexes 20005, 20036, 20045, 20054, 20063, 20072, 20078, 20199, 20510 and 20511.

These standards must be supplemented with project specific information including a Table of Beam Variables, Strand Pattern Details and a Strand Debonding Legend which must be completed and included in the Structures Plans. These standards and the supplemental project specific information that is included in the plans provide sufficient information to permit beam fabrication without the submittal of shop drawings.

Data tables for associated Indexes 20005, 20199, 20510 and 20511 must also be completed and included in the plans.

A Framing Plan is required for bridges meeting the criteria stated in the ***SDM***.

When used in conjunction with the typical adjacent diaphragm details described in the ***SDM***, the prestressed beams in these Standard Drawings are generally assumed to act as simple spans under both Dead Load and Live Load even where the deck is detailed to be continuous across the intermediate supports. For detailing purposes, Prestressed Florida-I Beams are assumed to be erected plumb.

When the total initial tensioning force of the fully bonded strands required by design exceeds the values shown below, shield additional strands at the end of the beam when possible. The end reinforcement may only be redesigned to accommodate an increased vertical splitting force when approved by the State Structures Design Office. If approval is granted, Index 20010 and the appropriate Standard Detail Drawings must then be modified for inclusion in the contract documents and signed and sealed by the EOR.

To limit vertical splitting forces in the webs of beams, the maximum prestress force at the beam ends from fully bonded strands must be limited to the following:

Index No.	Beam Type	Max. Bonded Prestress Force	Last Revision Date
20036	Florida-I 36	1450 Kips	07/01/09
20045	Florida-I 45	1670 Kips	07/01/09
20054	Florida-I 54	1740 Kips	07/01/09
20063	Florida-I 63	1740 Kips	07/01/09
20072	Florida-I 72	1980 Kips	07/01/09
20078	Florida-I 78	2230 Kips	07/01/09

Do not apply losses when calculating the Bonded Prestress Force.

Embedded Bearing Plates are required for all beams. If the beam grade exceeds 2%, provide Beveled Bearing Plates at each end of the beam as shown in Index 20511.

See additional instructions in the ***SDG***.

Plan Content Requirements

In the Structures Plans:

Complete the following "FLORIDA-I BEAM - TABLE OF BEAM VARIABLES" and include it in the plans. Use additional sheets when the actual number of beams or strand patterns exceeds the capacity of a single plan sheet using the standard table. Supplemental details and modifications are permitted if special conditions require dimensions, details or notes. However, the "FLORIDA-I BEAM - TABLE OF BEAM VARIABLES" itself should not be modified. See Introduction I.3 for more information regarding use of Data Tables.

Report elastic and time dependent shortening effects (DIM R) at mid-height of the beam @ 120 days. The average of the calculated values for the top and bottom of the beam may be used.

Show strands in the outermost positions of the two lowest rows to support Bars D.

Round Angle Φ up to the nearest degree.

Specify shear stirrup spacing V1 for Bars 5K to the nearest inch.

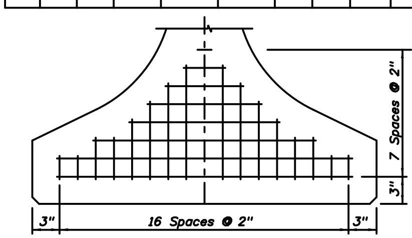
Prepare a Framing Plan for bridges meeting the criteria stated in the ***SDM***.

When intermediate diaphragms are required by design, show them on the Framing Plan. Tabulate insert locations with respect to the beam ends and beam faces. Include length adjustments for beams placed on grade and for elastic and time dependent shortening effects. Show Type 33 No. 8 reinforcing bars with 3" thread lengths for attachment to the inserts on the intermediate diaphragm details. Include these bars in the Superstructure Reinforcing Bar list.

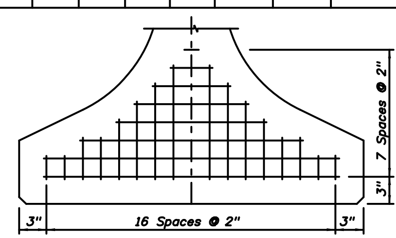
FLORIDA-I BEAM - TABLE OF BEAM VARIABLES

Table Date 7-01-09

LOCATION		BEAM TYPE	CONCRETE PROPERTIES			STND. PTRN. TYPE	END ELEV. COND.	PLAN VIEW CASE		BRG. PLATE MARK ***		END OF BEAM & BEARING DIMENSIONS **						BEAM DIMENSIONS *		REINFORCING STEEL															
SPAN NO.	BEAM NO.		CLASS	STRENGTHS (psi)								ANGLE Φ		DIM P	DIM J	DIM K1	DIM K2			3C1	3C2	3D1		3D2		3D3	4M1	4M2	4M3	5K	NO. OF SPACES BARS 5K				SP. BARS 5K *
				28 Day	Release			END 1	END 2	END 1	END 2	END 1	END 2					DIM L	DIM R	C	C	A	B	A	B	NO.	D	D	NO.	NO.	S1	S2	S3	S4	V1



TYPE ① __ STRANDS



TYPE ② __ STRANDS

STRAND DESCRIPTION: Use ____ Diameter, Grade ___, ___ ___ Strands stressed at ___ kips each. Area per strand equals ___ sq. in.

STRAND PATTERNS

STRAND DEBONDING LEGEND

- • – fully bonded strands.
- ⊙ – strands debonded _'-__" from end of beam.
- ⊡ – strands debonded _'-__" from end of beam.
- △ – strands debonded _'-__" from end of beam.
- ◇ – strands debonded _'-__" from end of beam.

NOTE: On beams with skewed ends, the debonded length shall be measured along the shielded strand.

NOTE: Work this sheet with Design Standards Index Nos. 20010 and the applicable "Florida-I Beam Standard Details" Index.

DIMENSION NOTES

* All longitudinal beam dimensions shown on this sheet with a single asterisk (*) are measured along the centerline of beam. Dimension "R" is calculated at mid-height of the beam.

** End beam bearing dimensions "J" and "K" are measured perpendicular to ℄ Bearing along the bottom of the beam.

BEARING PLATES

*** See Index No. 20511 and the Bearing Plate Data Table for details.

Payment

Item number	Item description	Unit Measure
450-2-AAA	Prestressed Beams: Florida I-Beam	LF

Example Problem

The following example shows the data required for completion of a Florida-I Beam Table of Beam Variables. The example assumes a three span bridge with Florida-I 45 Beams designed for the following conditions:

Live Load: HL-93

No intermediate Diaphragms

Stay-in-Place Metal Forms:

Allowance of 20 PSF non-composite dead load over the projected plan area of the forms (this includes the unit weight of metal forms and the concrete required to fill the form flutes).

Environment (Superstructure): Moderately Aggressive

Bridge Characteristics:

Length: 276 ft.
Width: 51'-1" (out-to-out)
Clear Roadway: 48 ft.

Superstructure:

Three simple spans of prestressed concrete beams with 8-inch composite deck slab (plus ½" sacrificial deck thickness)

Span: 87'-0", 102'-0", 87'-0"

Sidewalk: None

Horizontal Alignment: Straight

Vertical Alignment: 0.00% Grade

Skew Angle: 15 degrees (Right)

Beam Design:

Beam: Florida-I 45 Beam

Spacing:

11'-3", 87' Span (5 Beams)
9'-0", 102' Span (6 Beams)

Design Span Length:

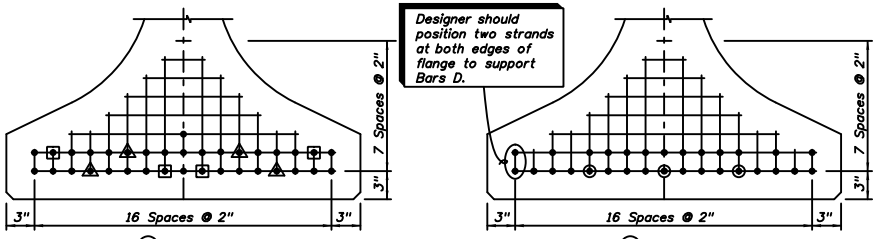
84'-6" (Spans 1 & 3)
99'-8" (Span 2)

Sample Drawing

FLORIDA-I BEAM – TABLE OF BEAM VARIABLES

Table Date 7-01-09

LOCATION			CONCRETE PROPERTIES			STND. PTRN. TYPE	END ELEV. COND.	PLAN VIEW CASE		BRG. PLATE MARK ***		END OF BEAM & BEARING DIMENSIONS **					BEAM DIMENSIONS *		REINFORCING STEEL														
SPAN NO.	BEAM NO.	BEAM TYPE	CLASS	STRENGTHS (psi)				END 1	END 2	END 1	END 2	ANGLE ∅ END 1	ANGLE ∅ END 2	DIM P	DIM J	DIM K1	DIM K2	DIM L	DIM R	3C1	3C2	3D1		3D2		3D3	4M1	4M2	4M3	5K	NO. OF SPACES BARS 5K				SP. BARS 5K *
				28 Day	Release															C	C	A	B	A	B	NO.	D	D	NO.	NO.	S1	S2	S3	S4	V1
1	1-5	45	V	6500	5000	2	1	2	2	1-1	1-2	75°	75°	–	7½"	1'-3½"	1'-1½"	85'-10½"	1"	1'-6¼"	1'-6¼"	8¾"	1'-3½"	8¾"	1'-3½"	50	3'-9½"	3'-9½"	73	148	16	35	–	2	6"
2	1-6	45	V	6500	5000	1	1	2	2	2-1	2-2	75°	75°	–	7½"	1'-1½"	1'-1½"	101'-0¾"	1¼"	1'-6¼"	1'-6¼"	8¾"	1'-3½"	8¾"	1'-3½"	60	3'-9½"	3'-9½"	88	136	10	13	10	14	6"
3	1-5	45	V	6500	5000	2	1	2	2	3-1	3-2	75°	75°	–	7½"	1'-1½"	1'-3½"	85'-10½"	1"	1'-6¼"	1'-6¼"	8¾"	1'-3½"	8¾"	1'-3½"	50	3'-9½"	3'-9½"	73	148	16	35	–	2	6"



TYPE ① 35 STRANDS

TYPE ② 30 STRANDS

STRAND DESCRIPTION: Use 0.6 Diameter, Grade 270, Low Relaxation Strands stressed at 44 kips each. Area per strand equals 0.217 sq. in.

STRAND PATTERNS

STRAND DEBONDING LEGEND

- • – fully bonded strands.
- ⊙ – strands debonded 10'-0" from end of beam.
- ⊡ – strands debonded 20'-0" from end of beam.
- ◬ – strands debonded 25'-0" from end of beam.

NOTE: On beams with skewed ends, the debonded length shall be measured along the shielded strand.

NOTE: Work this sheet with Design Standards Index Nos. 20010 and the applicable "Florida-I Beam Standard Details" Index.

DIMENSION NOTES

* All longitudinal beam dimensions shown on this sheet with a single asterisk (*) are measured along the centerline of beam. Dimension "R" is calculated at mid-height of the beam.

** End beam bearing dimensions "J" and "K" are measured perpendicular to ℄ Bearing along the bottom of the beam.

BEARING PLATES

*** See Index No. 20511 and the Bearing Plate Data Table for details.

REVISIONS

DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

DRAWN BY: XXX MM-YY
CHECKED BY: XXX MM-YY
DESIGNED BY: XXX MM-YY
CHECKED BY: XXX MM-YY

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID

SHEET TITLE: SAMPLE

PROJECT NAME:

REF. DWG. NO.

SHEET NO.

Index 20110 Series AASHTO and Bulb-T Beams

Design Criteria

AASHTO LRFD Bridge Design Specifications, 4th Edition; ***Structures Detailing Manual (SDM)***; ***Structures Design Guidelines (SDG)***

Design Assumptions and Limitations

Index 20110 is the lead standard for the Typical AASHTO and Bulb-T Beam standard series which includes Indexes 20110 through 20178. Use this standard with Indexes 20005, 20120, 20130, 20140, 20150, 20160, 20172, 20178, 20199, 20500 and 20501.

These standards must be supplemented with project specific information including a Table of Beam Variables, Strand Pattern Details and a Strand Debonding Legend which must be completed and included in the Structures Plans. These standards and the supplemental project specific information that is included in the plans provide sufficient information to permit beam fabrication without the submittal of shop drawings.

Data tables for associated Indexes 20005, 20199, 20500 and 20501 must also be completed and included in the plans.

A Framing Plan is required for bridges meeting the criteria stated in the ***SDM***.

When used in conjunction with the typical adjacent diaphragm details described in the ***SDM***, the prestressed beams in these Standard Drawings are generally assumed to act as simple spans under both Dead Load and Live Load even where the deck is detailed to be continuous across the intermediate supports. For detailing purposes, AASHTO and Bulb-T Beams are assumed to be erected plumb.

When the total initial tensioning force of the fully bonded strands required by design exceeds the values shown below, shield additional strands at the end of the beam when possible. The end reinforcement may only be redesigned to accommodate an increased vertical splitting force when approved by the State Structures Design Office. If approval is granted, Index 20110 and the appropriate Standard Detail Drawings must then be modified for inclusion in the contract documents and signed and sealed by the EOR.

To limit vertical splitting forces in the webs of beams, the maximum prestress force at the beam ends from fully bonded strands must be limited to the following:

Index No.	Beam Type	Max. Bonded Prestress Force	Last Revision Date
20120	AASHTO Type II	755 Kips	07/01/05
20130	AASHTO Type III	1100 Kips	07/01/05
20140	AASHTO Type IV	1470 Kips	07/01/05
20150	AASHTO Type V	1630 Kips	07/01/05or later
20160	AASHTO Type VI	1815 Kips	07/01/05or later
20172	Florida Bulb-T 72	1470 Kips	07/01/05 or later
20178	Florida Bulb-T 78	1730 Kips	07/01/05 or later

Do not apply losses when calculating the Bonded Prestress Force.

Embedded Bearing Plates are required for all AASHTO Type V and VI beams and Florida Bulb-T beams at each end of the beam as shown on Index 20501. If the beam grade exceeds 2%, provide Embedded Bearing Plates and Beveled Bearing Plates at each end of the beam as shown on Index 20501.

See additional instructions in the ***SDG***.

Plan Content Requirements

In the Structures Plans:

Complete the appropriate "TABLE OF BEAM VARIABLES" based on the beam being used and include it in the plans. Use additional sheets when the actual number of beams or strand patterns exceeds the capacity of a single plan sheet using the standard table. Supplemental details and modifications are permitted if special conditions require dimensions, details or notes. However, the "TABLE OF BEAM VARIABLES" itself should not be modified. See Introduction I.3 for more information regarding use of Data Tables.

Report elastic and time dependent shortening effects (DIM R) at the top of the beam @ 120 days. The average of the calculated values for the top and bottom of the beam may be used.

Show strands in the outermost positions of the two lowest rows to support Bars D.

Round Angle Φ up to the nearest degree.

Specify shear stirrup spacings V1, V2 and V3 for Bars 4K or 5K to the nearest inch.

Prepare a Framing Plan for bridges meeting the criteria stated in the ***SDM***.

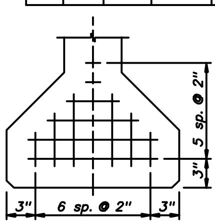
When intermediate diaphragms are required by design, show them on the Framing Plan. Tabulate insert locations with respect to the beam ends and beam faces. Include length adjustments for beams placed on grade and for elastic and time dependent shortening effects. Show Type 33 No. 8 reinforcing bars with 3" thread lengths for attachment to the inserts on the intermediate diaphragm details. Include these bars in the Superstructure Reinforcing Bar list.

Table 20120 - AASHTO Type II Beam - Table of Beam Variables

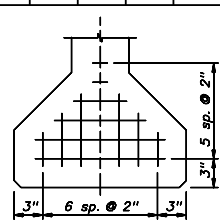
AASHTO TYPE II BEAM – TABLE OF BEAM VARIABLES

Table Date 1-01-06

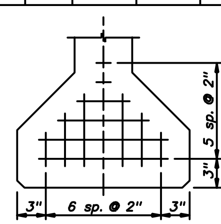
LOCATION		CONCRETE PROPERTIES			STND. PTRN.	END ELEV.	PLAN VIEW CASE		BRG. PLATE MARK ***		END OF BEAM & BEARING DIMENSIONS **						BEAM DIMENSIONS *		REINFORCING STEEL											
SPAN	BEAM	CLASS	STRENGTHS (psi)								ANGLE ϕ		DIM P	DIM J	DIM K1	DIM K2			3D1		3D2		4K	NO. OF SPACES BARS 4K				SPACING BARS 4K *		
NO.	NO.		28 Day	Release	TYPE	COND.	END 1	END 2	END 1	END 2	END 1	END 2					DIM L	DIM R	B	Length	B	Length	NO.	S1	S2	S3	S4	V1	V2	V3	V4



TYPE ① __ STRANDS



TYPE ② __ STRANDS



TYPE ③ __ STRANDS

STRAND DESCRIPTION: Use ____ Diameter, Grade ___, ___ ___ Strands stressed at ___ kips each. Area per strand equals ___ sq. in.

STRAND PATTERNS

STRAND DEBONDING LEGEND

- • – fully bonded strands.
- ⊙ – strands debonded _'–__" from end of beam.
- ⊡ – strands debonded _'–__" from end of beam.
- △ – strands debonded _'–__" from end of beam.
- ◇ – strands debonded _'–__" from end of beam.

NOTE: On beams with skewed ends the debonded length shall be measured along the debonded strand.

NOTE: Work this sheet with Design Standards Index Nos. 20110 and 20120.

DIMENSION NOTES

* All longitudinal beam dimensions shown on this sheet with a single asterisk (*) are measured along the top of beam at the centerline of beam.

** End of beam bearing dimensions "J" and "K" are measured along the bottom of the beam.

BEARING PLATES

*** Mark indicates beveled bearing plate and embedded bearing plate required. See Index No. 20501 for details.

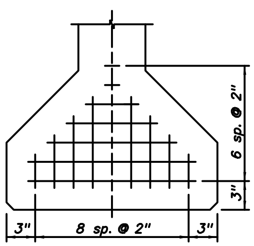
Table 20130 - AASHTO Type III Beam - Table of Beam Variables

AASHTO TYPE III BEAM - TABLE OF BEAM VARIABLES

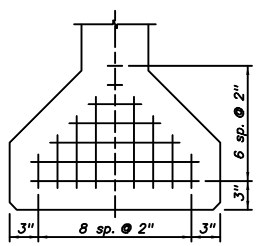
Table Date 1-01-06

LOCATION		CONCRETE PROPERTIES			STND. PTRN.	END ELEV.	PLAN VIEW CASE		BRG. PLATE MARK ***		END OF BEAM & BEARING DIMENSIONS **						BEAM DIMENSIONS *		REINFORCING STEEL											
SPAN	BEAM	CLASS	STRENGTHS (psi)								ANGLE ϕ		DIM P	DIM J	DIM K1	DIM K2			3D1		3D2		4K	NO. OF SPACES BARS 4K				SPACING BARS 4K *			
NO.	NO.		28 Day	Release	TYPE	COND.	END 1	END 2	END 1	END 2	END 1	END 2					DIM L	DIM R	B	Length	B	Length	NO.	S1	S2	S3	S4	V1	V2	V3	V4

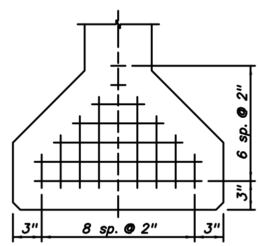
NOTE: Work this sheet with Design Standards Index Nos. 20110 and 20130.



TYPE ① __ STRANDS



TYPE ② __ STRANDS



TYPE ③ __ STRANDS

STRAND DESCRIPTION: Use ____ Diameter, Grade ___, ___ ___ Strands stressed at ___ kips each. Area per strand equals ___ sq. in.

STRAND PATTERNS

STRAND DEBONDING LEGEND

• - fully bonded strands.

⊙ - strands debonded _'-__" from end of beam.

⊡ - strands debonded _'-__" from end of beam.

△ - strands debonded _'-__" from end of beam.

◇ - strands debonded _'-__" from end of beam.

NOTE: On beams with skewed ends the debonded length shall be measured along the debonded strand.

DIMENSION NOTES

* All longitudinal beam dimensions shown on this sheet with a single asterisk (*) are measured along the top of beam at the centerline of beam.

** End of beam bearing dimensions "J" and "K" are measured along the bottom of the beam.

BEARING PLATES

*** Mark indicates beveled bearing plate and embedded bearing plate required. See Index No. 20501 for details.

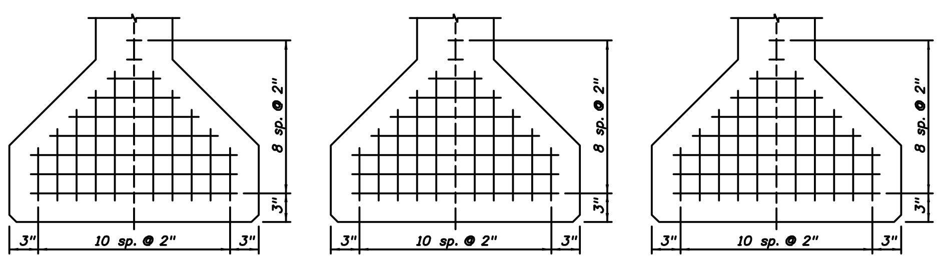
Table 20140 - AASHTO Type IV Beam - Table of Beam Variables

AASHTO TYPE IV BEAM - TABLE OF BEAM VARIABLES

Table Date 1-01-06

LOCATION		CONCRETE PROPERTIES			STND.	END	PLAN VIEW		BRG. PLATE		END OF BEAM & BEARING DIMENSIONS **						BEAM		REINFORCING STEEL												
SPAN	BEAM	CLASS	STRENGTHS (psi)		PTRN.	ELEV.	CASE		MARK ***		ANGLE ϕ		DIM P	DIM J	DIM K1	DIM K2	DIMENSIONS *		3D1		3D2		4K	NO. OF SPACES BARS 4K				SPACING BARS 4K *			
NO.	NO.		28 Day	Release	TYPE	COND.	END 1	END 2	END 1	END 2	END 1	END 2					DIM L	DIM R	B	Length	B	Length	NO.	S1	S2	S3	S4	V1	V2	V3	V4

NOTE: Work this sheet with Design Standards Index Nos. 20110 and 20140.



TYPE ① __ STRANDS TYPE ② __ STRANDS TYPE ③ __ STRANDS

STRAND DESCRIPTION: Use ____ Diameter, Grade ___, ___ ___ Strands stressed at ___ kips each. Area per strand equals ___ sq. in.

STRAND PATTERNS

STRAND DEBONDING LEGEND

- • – fully bonded strands.
- ⊙ – strands debonded _'-__" from end of beam.
- ⊡ – strands debonded _'-__" from end of beam.
- △ – strands debonded _'-__" from end of beam.
- ◇ – strands debonded _'-__" from end of beam.

NOTE: On beams with skewed ends the debonded length shall be measured along the debonded strand.

DIMENSION NOTES

* All longitudinal beam dimensions shown on this sheet with a single asterisk (*) are measured along the top of beam at the centerline of beam.

** End of beam bearing dimensions "J" and "K" are measured along the bottom of the beam.

BEARING PLATES

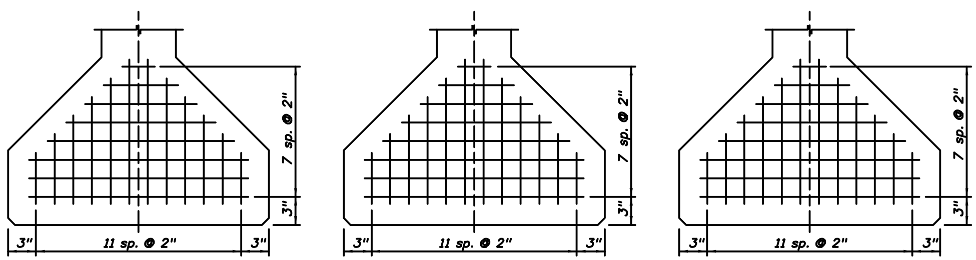
*** Mark indicates beveled bearing plate and embedded bearing plate required. See Index No. 20501 for details.

Table 20150 - AASHTO Type V Beam - Table of Beam Variables

AASHTO TYPE V BEAM – TABLE OF BEAM VARIABLES

Table Date 1-01-06

LOCATION		CONCRETE PROPERTIES			STND.	END	PLAN VIEW		BRG. PLATE		END OF BEAM & BEARING DIMENSIONS **						BEAM		REINFORCING STEEL															
SPAN	BEAM	CLASS	STRENGTHS (psi)		PTRN.	ELEV.	CASE		MARK ***		ANGLE ϕ		DIM P	DIM J	DIM K1	DIM K2	DIMENSIONS *		3D1		3D2		4M1	4M2	4M3	5K	NO. OF SPACES BARS 5K				SPACING BARS 5K *			
NO.	NO.		28 Day	Release	TYPE	COND.	END 1	END 2	END 1	END 2	END 1	END 2					DIM L	DIM R	B	Length	B	Length	Length	Length	NO.	NO.	S1	S2	S3	S4	V1	V2	V3	V4



TYPE ① __ STRANDS　　TYPE ② __ STRANDS　　TYPE ③ __ STRANDS

STRAND DESCRIPTION: Use ____ Diameter, Grade ___, ___ ___ Strands stressed at ___ kips each. Area per strand equals ___ sq. in.

STRAND PATTERNS

NOTE: Work this sheet with Design Standards Index Nos. 20110 and 20150.

STRAND DEBONDING LEGEND

- • – fully bonded strands.
- ⊙ – strands debonded _'-__" from end of beam.
- ⊡ – strands debonded _'-__" from end of beam.
- △ – strands debonded _'-__" from end of beam.
- ◇ – strands debonded _'-__" from end of beam.

NOTE: On beams with skewed ends the debonded length shall be measured along the debonded strand.

DIMENSION NOTES

* All longitudinal beam dimensions shown on this sheet with a single asterisk (*) are measured along the top of beam at the centerline of beam.

** End of beam bearing dimensions "J" and "K" are measured along the bottom of the beam.

BEARING PLATES

*** Mark indicates beveled bearing plate required. Embedded bearing plates are required on all beams. See Index No. 20501 for details.

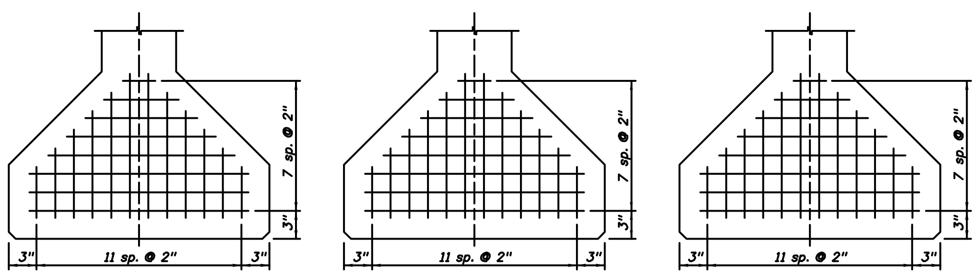
Table 20160 - AASHTO Type VI Beam - Table of Beam Variables

AASHTO TYPE VI BEAM – TABLE OF BEAM VARIABLES

Table Date 1-01-06

LOCATION		CONCRETE PROPERTIES			STND.	END	PLAN VIEW		BRG. PLATE		END OF BEAM & BEARING DIMENSIONS **						BEAM		REINFORCING STEEL																	
SPAN	BEAM	CLASS	STRENGTHS (psi)		PTRN.	ELEV.	CASE		MARK ***		ANGLE ϕ		DIM P	DIM J	DIM K1	DIM K2	DIMENSIONS *		3D1		3D2		4M1	4M2	4M3	5K	NO. OF SPACES BARS 5K				SPACING BARS 5K *			
NO.	NO.		28 Day	Release	TYPE	COND.	END 1	END 2	END 1	END 2	END 1	END 2					DIM L	DIM R	B	Length	B	Length	Length	Length	NO.	NO.	S1	S2	S3	S4	V1	V2	V3	V4

NOTE: Work this sheet with Design Standards Index Nos. 20110 and 20160.



TYPE ① __ STRANDS   TYPE ② __ STRANDS   TYPE ③ __ STRANDS

STRAND DESCRIPTION: Use ____ Diameter, Grade ___, ___ ___ Strands stressed at ___ kips each. Area per strand equals ___ sq. in.

STRAND PATTERNS

STRAND DEBONDING LEGEND

- • – fully bonded strands.
- ⊙ – strands debonded _'-__" from end of beam.
- ⊡ – strands debonded _'-__" from end of beam.
- △ – strands debonded _'-__" from end of beam.
- ◇ – strands debonded _'-__" from end of beam.

NOTE: On beams with skewed ends the debonded length shall be measured along the debonded strand.

DIMENSION NOTES

* All longitudinal beam dimensions shown on this sheet with a single asterisk (*) are measured along the top of beam at the centerline of beam.

** End of beam bearing dimensions "J" and "K" are measured along the bottom of the beam.

BEARING PLATES

*** Mark indicates beveled bearing plate required. Embedded bearing plates are required on all beams. See Index No. 20501 for details.

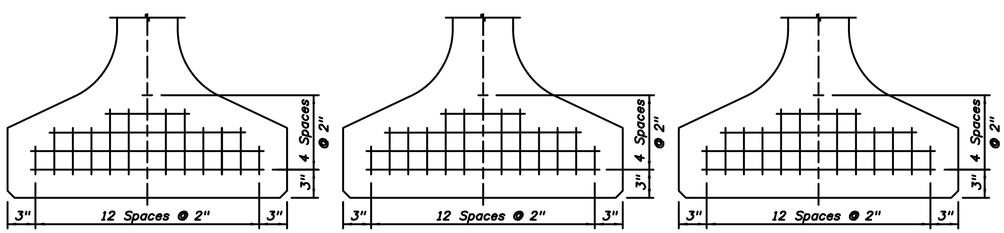
Table 20172 - Florida Bulb-T 72 Beam - Table of Beam Variables

FLORIDA BULB-T 72 BEAM - TABLE OF BEAM VARIABLES

Table Date 1-01-06

LOCATION		CONCRETE PROPERTIES			STND. PTRN. TYPE	END ELEV. COND.	PLAN VIEW CASE		BRG. PLATE MARK ***		END OF BEAM & BEARING DIMENSIONS **						BEAM DIMENSIONS *		REINFORCING STEEL															
SPAN NO.	BEAM NO.	CLASS	STRENGTHS (psi)								ANGLE ϕ		DIM P	DIM J	DIM K1	DIM K2			3D1		3D2		4M1	4M2	4M3	5K	NO. OF SPACES BARS 5K				SPACING BARS 5K *			
			28 Day	Release			END 1	END 2	END 1	END 2	END 1	END 2					DIM L	DIM R	B	Length	B	Length	Length	Length	NO.	NO.	S1	S2	S3	S4	V1	V2	V3	V4

NOTE: Work this sheet with Design Standards Index Nos. 20110 and 20172.



TYPE ① __ STRANDS   TYPE ② __ STRANDS   TYPE ③ __ STRANDS

STRAND DESCRIPTION: Use ____ Diameter, Grade ___, ___ ___ Strands stressed at ___ kips each. Area per strand equals ___ sq. in.

STRAND PATTERNS

STRAND DEBONDING LEGEND

- • - fully bonded strands.
- ⊙ - strands debonded _'-__" from end of beam.
- ⊡ - strands debonded _'-__" from end of beam.
- △ - strands debonded _'-__" from end of beam.
- ◇ - strands debonded _'-__" from end of beam.

NOTE: On beams with skewed ends the debonded length shall be measured along the shielded strand.

DIMENSION NOTES

* All longitudinal beam dimensions shown on this sheet with a single asterisk (*) are measured along the top of beam at the centerline of beam.

** End beam bearing dimensions "J" and "K" are measured along the bottom of the beam.

BEARING PLATES

*** Mark indicates beveled bearing plate required. Embedded bearing plates are required on all beams. See Index No. 20501 for details.

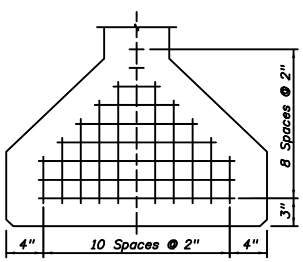
Table 20178 - Florida Bulb-T 78 Beam - Table of Beam Variables

FLORIDA BULB-T 78 BEAM - TABLE OF BEAM VARIABLES

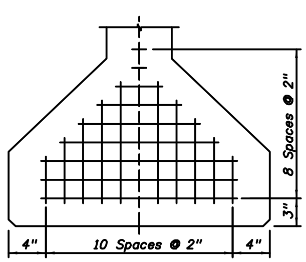
Table Date 1-01-06

LOCATION		CONCRETE PROPERTIES			STND.	END	PLAN VIEW		BRG. PLATE		END OF BEAM & BEARING DIMENSIONS **						BEAM		REINFORCING STEEL															
SPAN	BEAM	CLASS	STRENGTHS (psi)		PTRN.	ELEV.	CASE		MARK ***		ANGLE ϕ		DIM P	DIM J	DIM K1	DIM K2	DIMENSIONS *		3D1		3D2		4M1	4M2	4M3	5K	NO. OF SPACES BARS 5K				SPACING BARS 5K *			
NO.	NO.		28 Day	Release	TYPE	COND.	END 1	END 2	END 1	END 2	END 1	END 2					DIM L	DIM R	B	Length	B	Length	Length	Length	NO.	NO.	S1	S2	S3	S4	V1	V2	V3	V4

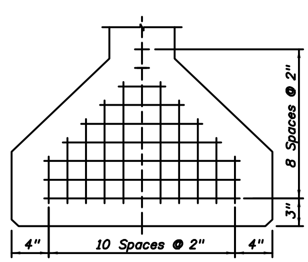
NOTE: Work this sheet with Design Standards Index Nos. 20110 and 20178.



TYPE ① __ STRANDS



TYPE ② __ STRANDS



TYPE ③ __ STRANDS

STRAND DESCRIPTION: Use ____ Diameter, Grade ___, ___ ___ Strands stressed at ___ kips each. Area per strand equals ___ sq. in.

STRAND PATTERNS

STRAND DEBONDING LEGEND

- • – fully bonded strands.
- ⊙ – strands debonded _'-__" from end of beam.
- ⊡ – strands debonded _'-__" from end of beam.
- △ – strands debonded _'-__" from end of beam.
- ◇ – strands debonded _'-__" from end of beam.

NOTE: On beams with skewed ends the debonded length shall be measured along the shielded strand.

DIMENSION NOTES

* All longitudinal beam dimensions shown on this sheet with a single asterisk (*) are measured along the top of beam at the centerline of beam.

** End beam bearing dimensions "J" and "K" are measured along the bottom of the beam.

BEARING PLATES

*** Mark indicates beveled bearing plate required. Embedded bearing plates are required on all beams. See Index No. 20501 for details.

Payment

Item number	Item description	Unit Measure
450-1-AAA	Prestressed Beams	LF

Example Problem

The following example shows the data required for completion of an AASHTO Beam Table of Variables. The example assumes a three span bridge with AASHTO Type IV Beams designed for the following conditions:

Live Load: HL-93

No intermediate Diaphragms

Future Wearing Surface: Design includes allowance for 15 PSF.

Stay-in-Place Metal Forms: Design includes allowance for 20 PSF non-composite dead load over the projected plan area of the forms for the unit weight of metal forms and concrete required to fill the form flutes.

Environment (Superstructure): Moderately Aggressive

Bridge Characteristics:

Length: 276 ft.

Width: 51'-0" (out-to-out)

Clear Roadway: 48 ft.

Superstructure:

Three simple spans of prestressed concrete beams with 8-inch composite deck slab

Span: 87'-0", 102'-0", 87'-0"

Sidewalk: None

Horizontal Alignment: Straight

Vertical Alignment: 0.00% Grade

Skew Angle: 15 degrees (Right)

Beam Design:

Beam: Type IV

Spacing:

8.40', 87' Span (6 Beams)

7.00', 102' Span (7 Beams)

Design Span Length:

84'-6" (Spans 1 & 3)

99'-6" (Span 2)

Composite Dead Load (per girder):

87 ft. Span: 226 PLF

102 ft. Span: 199 PLF

Non-Composite Dead Load (per girder):

87 ft. Span: 1849 PLF

102 ft. Span: 1672 PLF

Bonded Strand Development Multiplier = 1.60

Tension Stress Limits at Release as per ***SDG***

Live Load Distribution Factors (interior beam):

Shear: 87 ft. Span - 0.877

102 ft. Span - 0.775

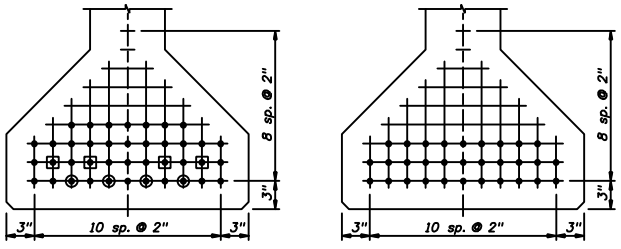
Moment: 87 ft. Span - 0.713

102 ft. Span - 0.600

Sample Drawing

AASHTO TYPE IV BEAM – TABLE OF BEAM VARIABLES — Table Date 1-01-06

LOCATION		CONCRETE PROPERTIES			STND.	END	PLAN VIEW		BRG. PLATE		END OF BEAM & BEARING DIMENSIONS **						BEAM		REINFORCING STEEL											
SPAN	BEAM	CLASS	STRENGTHS (psi)		PTRN.	ELEV.	CASE		MARK ***		ANGLE ∅		DIM P	DIM J	DIM K1	DIM K2	DIMENSIONS *		3D1		3D2		4K	NO. OF SPACES BARS 4K				SPACING BARS 4K *			
NO.	NO.		28 Day	Release	TYPE	COND.	END 1	END 2	END 1	END 2	END 1	END 2					DIM L	DIM R	B	Length	B	Length	NO.	S1	S2	S3	S4	V1	V2	V3	V4
1	1 to 6	IV	5500	4500	2	1	2	2	–	–	75°	75°	–	8"	1'–3¼"	1'–2½"	86'–0¼"	1¾"	1'–10¾"	6'–1"	1'–10¾"	6'–1"	159	30	30	–	1	6"	9"	–	9⅛"
2	1 to 7	IV	5500	4500	1	1	2	2	–	–	75°	75°	–	8"	1'–2½"	1'–2½"	101'–0¾"	2¼"	1'–10¾"	6'–1"	1'–10¾"	6'–1"	185	40	33	–	1	6"	9"	–	1'–0⅜"
3	1 to 6	IV	5500	4500	2	1	2	2	–	–	75°	75°	–	8"	1'–2½"	1'–3¼"	86'–0¼"	1¾"	1'–10¾"	6'–1"	1'–10¾"	6'–1"	159	30	30	–	1	6"	9"	–	9⅛"



TYPE ① 40 STRANDS TYPE ② 31 STRANDS

STRAND DESCRIPTION: Use ½" Diameter, Grade 270, Low Relaxation Strands stressed at 31.0 kips each. Area per strand equals 0.153 sq. in.

STRAND PATTERNS

NOTE: Work this sheet with Design Standards Index Nos. 20110 and 20140.

STRAND DEBONDING LEGEND
- • – fully bonded strands.
- ⊙ – strands debonded 20'–0" from end of beam.
- ⊡ – strands debonded 10'–0" from end of beam.

NOTE: On beams with skewed ends the debonded length shall be measured along the debonded strand.

DIMENSION NOTES
- * All longitudinal beam dimensions shown on this sheet with a single asterisk (*) are measured along the top of beam at the centerline of beam.
- ** End of beam bearing dimensions "J" and "K" are measured along the bottom of the beam.

BEARING PLATES
- *** Mark indicates beveled bearing plate and embedded bearing plate required. See Index No. 20501 for details.

REVISIONS

DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

DRAWN BY: XXX MM-YY
CHECKED BY: XXX MM-YY
DESIGNED BY: XXX MM-YY
CHECKED BY: XXX MM-YY

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID

SHEET TITLE: SAMPLE
PROJECT NAME:
REF. DWG. NO.
SHEET NO.

Index 20199 Build-Up and Deflection Data for AASHTO, Bulb-T and Florida-I Beams

Design Criteria

AASHTO LRFD Bridge Design Specifications, 4th Edition; ***Structures Detailing Manual (SDM)***; ***Structures Design Guidelines (SDG)***

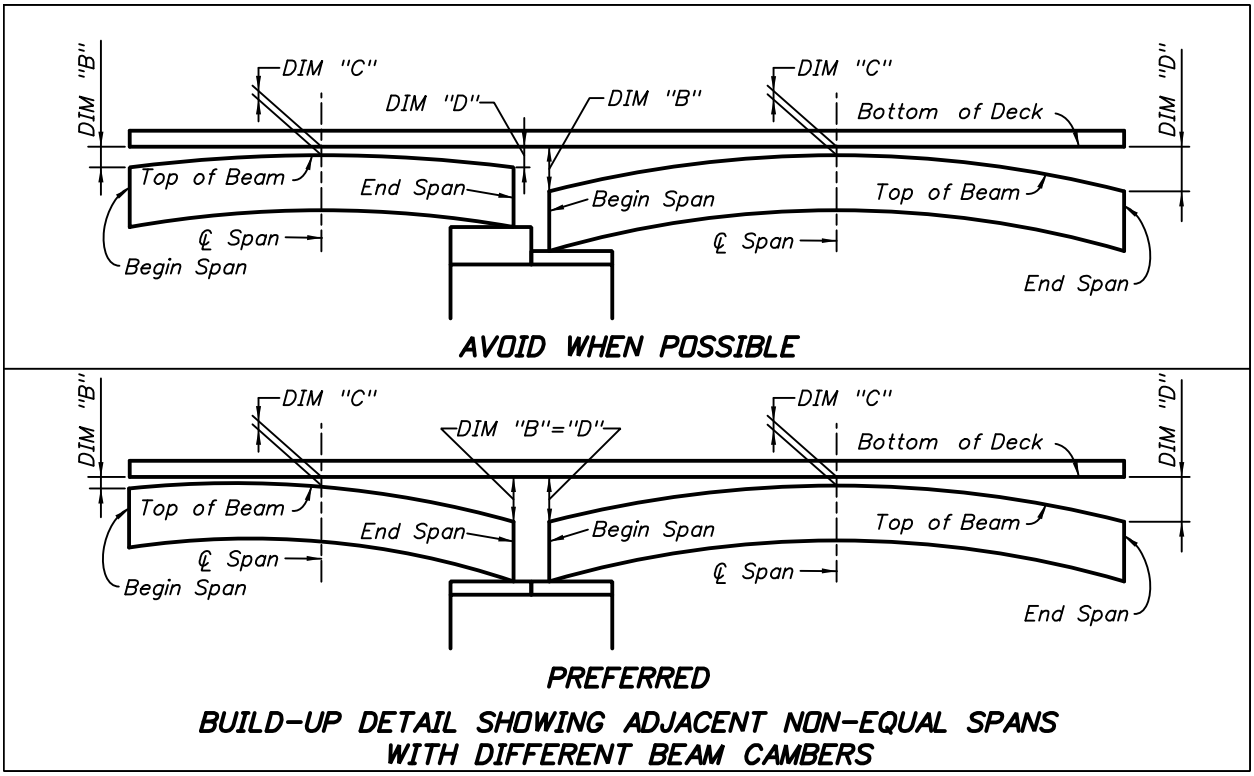
Design Assumptions and Limitations

Use this standard in conjunction with Indexes 20010, 20036, 20045, 20054, 20063, 20072, 20078, 20110, 20120, 20130, 20140, 20150, 20160, 20172 and/or 20178.

Unless otherwise required as a design parameter, beam camber for computing the theoretical build-up must be based on 120-day old beam concrete.

Consider the effects of horizontal curvature with bridge deck cross slope when determining the minimum theoretical build-up over the tip of the inside flange.

For a given size and type of beam, beam camber and associated DIM "B" and DIM "D" will vary due to span lengths and beam spacings. DIM "B" and DIM "D" will also vary from span to span along the length of a bridge due to deck geometry. To provide for better aesthetics and potentially easier detailing of the supporting pedestals, where possible adjust the values of DIM "B" and DIM "D" over equal height beams in adjacent spans so as to allow the beam bottom flanges to line up. DIM "B" and DIM "D" do not necessarily have to be the same value for a single beam. See the following sketch:



BUILD-UP DETAIL SHOWING ADJACENT NON-EQUAL SPANS WITH DIFFERENT BEAM CAMBERS

Plan Content Requirements

Complete the following "Build-Up and Deflection Data Table for AASHTO, Bulb-T and Florida-I Beams" and include it on the superstructure detail sheets. See Introduction I.3 for more information regarding use of Data Tables.

BUILD-UP & DEFLECTION DATA TABLE FOR AASHTO, BULB-T AND FLORIDA-I BEAMS							Table Date 7-01-09
LOCATION		REQUIRED THEORETICAL BUILD-UP OVER ℄ BEAM			NET BEAM CAMBER (PRESTRESS - DEAD LOAD OF BEAM) @ 120 DAYS	DEAD LOAD DEFLECTION DURING DECK POUR @ 120 DAYS DIM "A"	BUILD-UP CASE NO.
SPAN NO.	BEAM NO.	AT BEGIN SPAN DIM "B"	AT ℄ SPAN DIM "C"	AT END SPAN DIM "D"			

Payment

Include estimated build-up concrete quantities with the estimated deck concrete quantities. Do not break out estimated build-up concrete quantities.

Index 20210 Series Florida U Beams

Design Criteria

AASHTO LRFD Bridge Design Specifications, 4th Edition; ***Structures Detailing Manual (SDM)***; ***Structures Design Guidelines (SDG)***

Design Assumptions and Limitations

Index 20210 is the lead standard for the Florida-U Beam standard series which includes Indexes 20210 through 20272. Use this standard with Indexes 20248, 20254, 20263, 20272, 20299 and 20502.

The standard Florida U Beams are applicable for spans with skewed end conditions less than or equal to 15 degrees. For beams with skewed end conditions greater than 15 degrees the EOR shall develop a custom design and details using the standards as a basis.

These standards must be supplemented with project specific information including a Table of Beam Variables, Strand Pattern Details and a Strand Debonding Legend which must be completed and included in the Structures Plans. These standards and the supplemental project specific information that is included in the plans provide sufficient information to permit beam fabrication without the submittal of shop drawings.

Data tables for associated Indexes 20299 and 20502 must also be completed and included in the plans.

Florida-U Beams are typically placed parallel to the cross slope of the bridge deck.

A Framing Plan is required for bridges meeting the criteria stated in the ***SDM***.

The prestressed beams in these Standard Drawings are generally assumed to act as simple spans under both Dead Load and Live Load even where the deck is detailed to be continuous across the intermediate supports.

When the total initial tensioning force of the fully bonded strands required by design exceeds the values shown below, shield additional strands at the end of the beam when possible. The end reinforcement may only be redesigned to accommodate an increased vertical splitting force when approved by the State Structures Design Office. If approval is granted, Index 20210 and the appropriate Standard Detail Drawings must then be modified for inclusion in the contract documents and signed and sealed by the EOR.

To limit vertical splitting forces in the webs of beams, the maximum prestress force at the beam ends from fully bonded strands must be limited to the following:

Index No.	Beam Type	Max. Bonded Prestress Force	Last Revision Date
20248	Florida U 48	2790 Kips	07/01/05
20254	Florida U 54	2790 Kips	07/01/05
20263	Florida U 63	3070 Kips	07/01/05
20272	Florida U 72	3070 Kips	07/01/05

Stay-In-Place Metal Forms are required to be used to form the deck within the individual Florida-U Beams.

Due to the absence of external end diaphragms between individual Florida U Beams, a thickened deck edge beam at deck expansion joints is required to support wheel loads. Generally, the depth of the Edge Beam shall extend from the top of the deck to the bottom face of the top flanges of the Florida U Beams.

Plan Content Requirements

In the Structures Plans:

Complete the following "FLORIDA U BEAM - TABLE OF BEAM VARIABLES" and include it in the plans. Use additional sheets when the actual number of beams or strand patterns exceeds the capacity of a single plan sheet using the standard table. Supplemental details and modifications are permitted if special conditions require dimensions, details or notes. However, the "FLORIDA U BEAM - TABLE OF BEAM VARIABLES" itself should not be modified. See Introduction I.3 for more information regarding use of Data Tables.

Report elastic and time dependent shortening effects (DIM R) at the top of the beam @ 120 days. The average of the calculated values for the top and bottom of the beam may be used.

Round Angle Φ up to the nearest degree.

Specify shear stirrup spacings V1 and V2 for Bars 5K to the nearest inch.

Show fully bonded strands in the following locations to support Bars D:

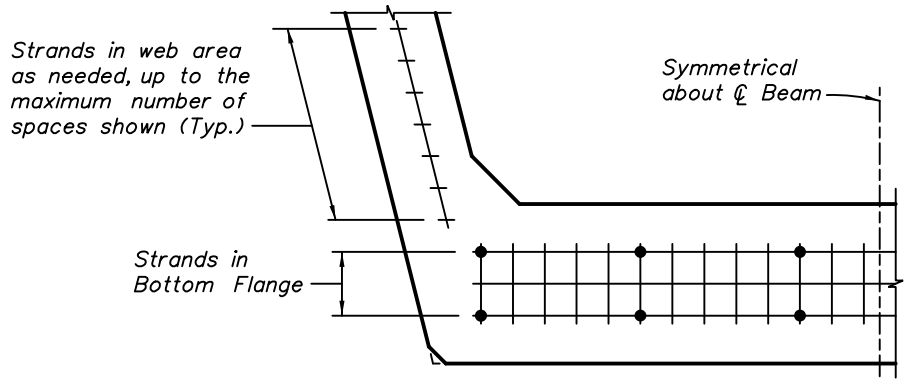


FIGURE 1 (Showing Strand Pattern Only)

Prepare a Framing Plan for bridges meeting the criteria stated in the ***SDM***.

Show Stay-In-Place Metal Form details for the forms within the individual Florida-U Beams.

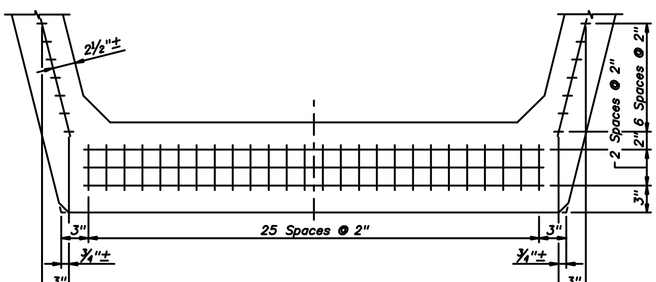
Design and detail a thickened deck edge beam at deck expansion joints between individual Florida U Beams.

FLORIDA U BEAM – TABLE OF BEAM VARIABLES

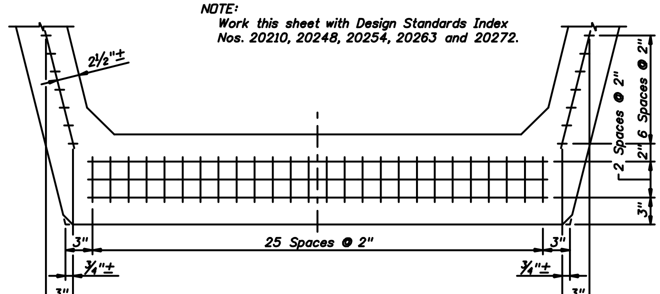
Table Date 1-01-06

FUB TYPE	LOCATION		CONCRETE PROPERTIES			STND. PTRN. TYPE	END ELEV. COND.	PLAN VIEW CASE		BRG. PLATE MARK ***		END OF BEAM AND BEARING DIMENSIONS **						BEAM DIMENSIONS *		REINFORCING STEEL									
	SPAN NO.	BEAM NO.	CLASS	STRENGTHS (psi)								ANGLE ϕ		DIM P	DIM J	DIM K1	DIM K2	DIM L	DIM R	4G	4H	4M	5K	NO. OF SPACES BARS 5K & 4M			SPACING BARS 5K & 4M *		
				28 Day	Release			END 1	END 2	END 1	END 2	END 1	END 2							NO.	NO.	NO.	NO.	S1	S2	S3	V1	V2	V3

NOTE:
Work this sheet with Design Standards Index Nos. 20210, 20248, 20254, 20263 and 20272.



TYPE ① __ STRANDS



TYPE ② __ STRANDS

STRAND DESCRIPTION: Use ______ Diameter, Grade ______, ______ ______ Strands stressed at ______ kips each. Area per strand equals _____ sq. in.

STRAND PATTERN

DIMENSION NOTES

* All longitudinal beam dimensions shown on this sheet with a single asterisk (*) are measured along the top of beam at the centerline of beam.

** End of beam bearing dimensions "J" and "K" are measured along the bottom of the beam.

BEARING PLATES

*** Mark indicates beveled bearing plate and embedded bearing plate required. See Index No. 20502 for details.

STRAND DEBONDING LEGEND

• – fully bonded strands.
⊙ – strands debonded _'-__" from end of beam.
⊡ – strands debonded _'-__" from end of beam.
(triangle) – strands debonded _'-__" from end of beam.
(diamond) – strands debonded _'-__" from end of beam.

NOTE: On beams with skewed ends the debonded length shall be measured along the shielded strand.

Payment

Item number	Item description	Unit Measure
450-4-AAA	Prestressed Beam - FL U-Beam	LF

Example Problem

The following example shows the data required for completion of a Florida U Beam Table of Beam Variables. The example assumes a two span bridge with Florida U 72 Beams designed for the following conditions:

Live Load: HL-93

Future Wearing Surface: Design includes allowance for 15 PSF.

Stay-in-Place Metal Forms: Design includes allowance for 20 PSF non-composite dead load over the projected plan area of the forms for the unit weight of metal forms and concrete required to fill the form flutes.

Environment (Superstructure): Moderately Aggressive

Bridge Characteristics:

Length: 249'-4"

Width: 59'-1" (out-to-out)

Clear Roadway: 56'-0"

Superstructure:

Two simple spans of prestressed concrete beams with 8-inch composite deck slab

Span: 124'-8", 124'-8"

Sidewalk: None

Horizontal Alignment: Straight

Vertical Alignment: 0.00% Grade

Skew Angle: 0 degrees

Beam Design:

Beam: Florida U 72 Beam

Spacing: 21'-0"

Design Span Length: 122'-4"

Composite Dead Load

(per girder): 603 PLF

Non-Composite Dead Load:

124'-8" Span: 4163 PLF

Diaphragm Dead Load:

End: 8.6 kips each

Intermediate: 4.3 kips each

Bonded Strand Development Multiplier = 1.60

Tension Stress Limits at Release as per ***SDG*** Live Load Distribution Factors (interior beam):

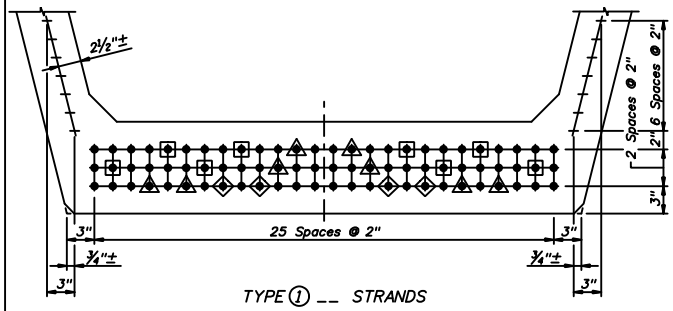
Shear: 1.50

Moment: 1.50

Sample Drawing

FLORIDA U BEAM - TABLE OF BEAM VARIABLES — Table Date 1-01-06

FUB TYPE	LOCATION		CONCRETE PROPERTIES			STND. PTRN.	END ELEV.	PLAN VIEW CASE		BRG. PLATE MARK ***		END OF BEAM AND BEARING DIMENSIONS **						BEAM DIMENSIONS *		REINFORCING STEEL										
	SPAN NO.	BEAM NO.	CLASS	STRENGTHS (psi) 28 Day	STRENGTHS (psi) Release	TYPE	COND.	END 1	END 2	END 1	END 2	ANGLE ∅ END 1	ANGLE ∅ END 2	DIM P	DIM J	DIM K1	DIM K2	DIM L	DIM R	4G NO.	4H NO.	4M NO.	5K NO.	NO. OF SPACES BARS 5K & 4M S1	S2	S3	SPACING BARS 5K & 4M * V1	V2	V3
72	1	1 to 3	VI	8500	6000	1	1	1	1			90°	90°	0"	10½"	1'-2¾"	1'-2"	124'-3½"	2½"	42	84	382	410	30	21	1	9"	1'-0"	1'-1¾"
72	2	1 to 3	VI	8500	6000	1	1	1	1			90°	90°	0"	10½"	1'-2"	1'-2¾"	124'-3½"	2½"	42	84	382	410	30	21	1	9"	1'-0"	1'-1¾"



TYPE ① __ STRANDS

NOTE:
Work this sheet with Design Standards Index Nos. 20210, 20248, 20254, 20263 and 20272.

DIMENSION NOTES

* All longitudinal beam dimensions shown on this sheet with a single asterisk (*) are measured along the top of beam at the centerline of beam.

** End of beam bearing dimensions "J" and "K" are measured along the bottom of the beam.

BEARING PLATES

*** Mark indicates beveled bearing plate and embedded bearing plate required. See Index No. 20502 for details.

STRAND DEBONDING LEGEND

- • – fully bonded strands.
- ⊡ – strands debonded 21'-0" from end of beam.
- △ – strands debonded 24'-0" from end of beam.
- ◇ – strands debonded 27'-6" from end of beam.

NOTE: On beams with skewed ends the debonded length shall be measured along the shielded strand.

STRAND DESCRIPTION: Use 0.60" Diameter, Grade 270, Low Relaxation Strands stressed at 43.94 kips each. Area per strand equals 0.217 sq. in.

STRAND PATTERN

REVISIONS

DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

DRAWN BY: XXX MM-YY
CHECKED BY: XXX MM-YY
DESIGNED BY: XXX MM-YY
CHECKED BY: XXX MM-YY

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID

SHEET TITLE: SAMPLE
PROJECT NAME:
REF. DWG. NO.
SHEET NO.

Index 20299 Build-Up and Deflection Data for Florida U Beams

Design Criteria

AASHTO LRFD Bridge Design Specifications, 4th Edition; ***Structures Detailing Manual (SDM)***; ***Structures Design Guidelines (SDG)***

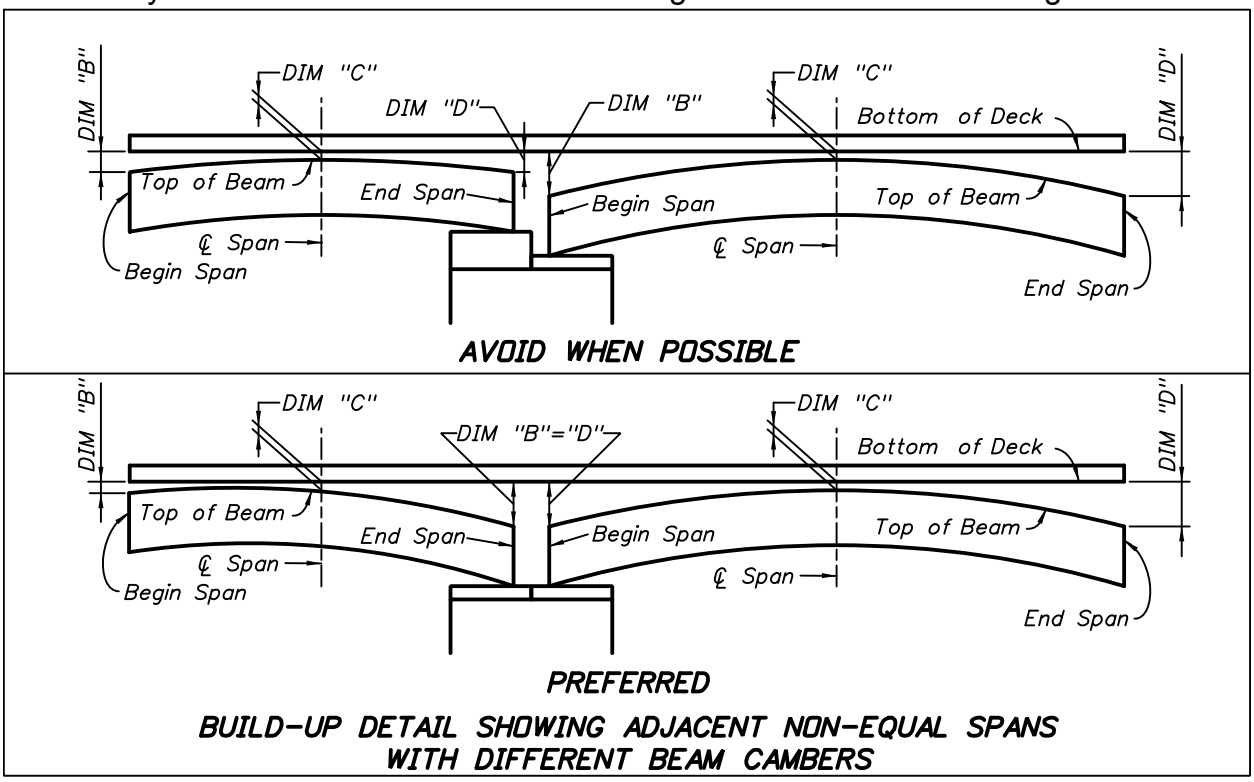
Design Assumptions and Limitations

Use this standard in conjunction with Indexes 20210, 20248, 20254, 20263 and 20272.

Unless otherwise required as a design parameter, beam camber for computing the theoretical build-up must be based on 120-day old beam concrete.

Consider the effects of horizontal curvature with bridge deck cross slope when determining the minimum theoretical build-up over the tip of the inside flange.

For a given size and type of beam, beam camber and associated DIM "B" and DIM "D" will vary due to span lengths and beam spacings. DIM "B" and DIM "D" will also vary from span to span along the length of a bridge due to deck geometry. To provide for better aesthetics and potentially easier detailing of the supporting pedestals, where possible adjust the values of DIM "B" and DIM "D" over equal height beams in adjacent spans so as to allow the beam bottom flanges to line up. DIM "B" and DIM "D" do not necessarily have to be the same value for a single beam. See the following sketch:



Plan Content Requirements

Complete the following "Build-Up and Deflection Data Table for Florida-U Beams" and include it on the superstructure detail sheets. See Introduction I.3 for more information regarding use of Data Tables.

BUILD-UP & DEFLECTION DATA TABLE FOR FLORIDA U BEAMS										Table Date 1-01-09
LOCATION		REQUIRED THEORETICAL BUILD-UP OVER ℄ LEFT FLANGE			REQUIRED THEORETICAL BUILD-UP OVER ℄ RIGHT FLANGE			NET BEAM CAMBER (PRESTRESS - DEAD LOAD OF BEAM) @ 120 DAYS	DEAD LOAD DEFLECTION DURING DECK POUR @ 120 DAYS DIM "A"	BUILD-UP CASE NO.
SPAN NO.	BEAM NO.	AT BEGIN SPAN DIM "B"	AT ℄ SPAN DIM "C"	AT END SPAN DIM "D"	AT BEGIN SPAN DIM "B"	AT ℄ SPAN DIM "C"	AT END SPAN DIM "D"			

Payment

Include estimated build-up concrete quantities with the estimated deck concrete quantities. Do not break out estimated build-up concrete quantities.

Index 20310 Series Inverted-T Beams

Design Criteria

AASHTO LRFD Bridge Design Specifications, 4th Edition; ***Structures Detailing Manual (SDM)***; ***Structures Design Guidelines (SDG)***

Design Assumptions and Limitations

Index 20310 is the lead standard for the Inverted-T Beam standard series which includes Indexes 20310 and 20320. Use this standard with Index 20320.

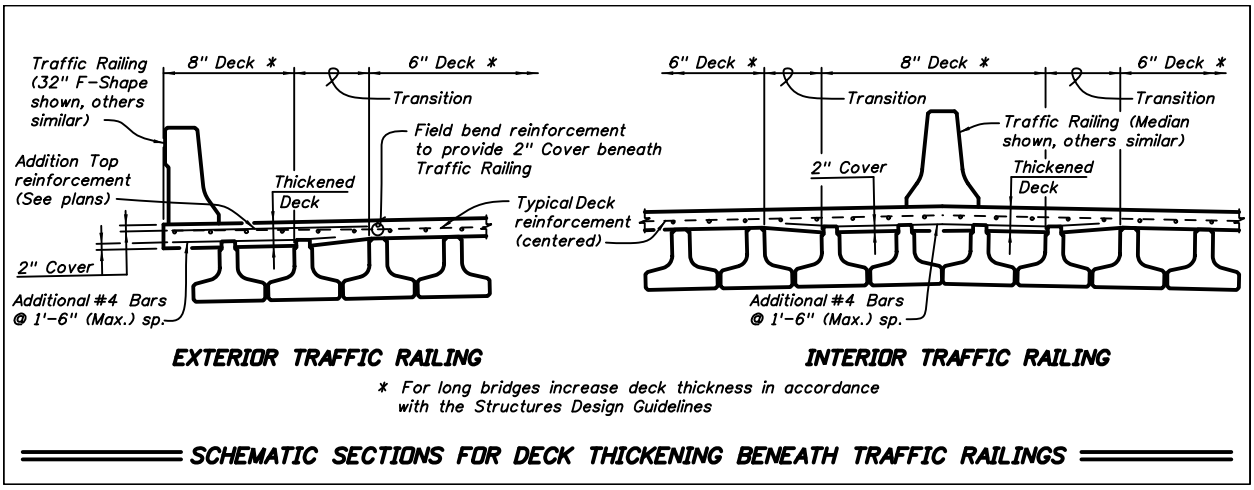
These standards must be supplemented with project specific information including a Table of Beam Variables, Strand Pattern Details and a Strand Debonding Legend which must be completed and included in the Structures Plans. These standards and the supplemental project specific information that is included in the plans provide sufficient information to permit beam fabrication without the submittal of shop drawings.

The prestressed beams in these Standard Drawings are generally assumed to act as simple spans under both Dead Load and Live Load even where the deck is detailed to be continuous across the intermediate supports.

When the total initial tensioning force of the fully bonded strands required by design exceeds 310 kips, shield additional strands at the end of the beam when possible. The end reinforcement may only be redesigned to accommodate an increased vertical splitting force when approved by the State Structures Design Office. If approval is granted, Indexes 20310 and 20320 must then be modified for inclusion in the contract documents and signed and sealed by the EOR.

The "Optional Deck Forming Notch" as shown on the beam End View on Index 20320 is intended to accommodate the use of stay-in-place ¾" thick plywood deck forms. Note that by the use of this detail, the plywood deck form follows the cambered geometry of the top of the beam. Thus the build-up due to beam camber and deck geometry extends over the entire width of the deck between the faces of the outside webs of the fascia beams. This build-up condition is different than what is seen with I-beam and U-beam superstructures where the build-up is only present directly over the top flanges of the beams. Stay-in-place metal deck forms are typically not required for Inverted-T Beam superstructures.

A 6" thick deck with a single mat of reinforcing steel is typically used with these Inverted-T Beams. Beneath and adjacent to traffic railings the deck must be thickened to 8" and supplemental reinforcing steel is required. A Framing Plan is required for all bridges to show the locations of the two different Optional Deck Forming Notch dimensions required as shown below. See the ***SDM*** for additional Framing Plan requirements for skewed or horizontally curved bridges.



See additional instructions in the ***SDG***.

Plan Content Requirements

In the Structures Plans:

Complete the following "INVERTED-T BEAM - TABLE OF BEAM VARIABLES" and include it in the plans. Use additional sheets when the actual number of beams or strand patterns exceeds the capacity of a single plan sheet using the standard table. Supplemental details and modifications are permitted if special conditions require dimensions, details or notes. However, the "INVERTED-T BEAM - TABLE OF BEAM VARIABLES" itself should not be modified. See Introduction I.3 for more information regarding use of Data Tables.

Report elastic and time dependent shortening effects (DIM R) at the top of the beam @ 120 days. The average of the calculated values for the top and bottom of the beam may be used.

Round Angle Φ up to the nearest degree.

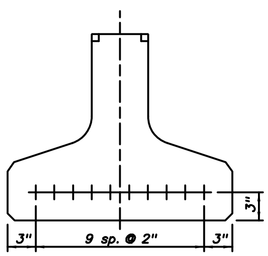
Specify shear stirrup spacings V1, V2 and V3 for Bars 4K to the nearest inch.

INVERTED-T BEAM - TABLE OF BEAM VARIABLES

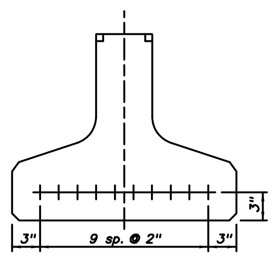
Table Date 7-01-05

LOCATION		CONCRETE PROPERTIES			STND.	PLAN VIEW		END OF BEAM AND BEARING DIMENSIONS **					BEAM DIMENSIONS *		REINFORCING STEEL													
SPAN	BEAM	CLASS	STRENGTHS (f'c)		PTRN.	CASE		ANGLE Ø		DIM J	DIM K1	DIM K2	DIM L	DIM R	5A *	3D1		3D2		4K	NO. OF SPACES BARS 4K				SPACING FOR BARS 4K *			
NO.	NO.		28 Day	Release	TYPE	END 1	END 2	END 1	END 2						Length	B	Length	B	Length	NO.	S1	S2	S3	S4	V1	V2	V3	V4

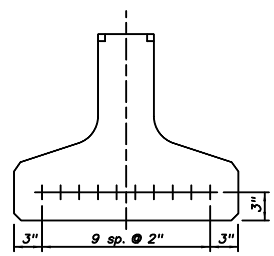
NOTE: Work this sheet with Design Standards Index Nos. 20310 and 20320.



TYPE ① __ STRANDS



TYPE ② __ STRANDS



TYPE ③ __ STRANDS

STRAND DESCRIPTION: Use ____ Diameter, Grade ___, ___ ___ Strands stressed at ___ kips each. Area per strand equals ___ sq. in.

STRAND PATTERNS

STRAND DEBONDING LEGEND

- • - fully bonded strands.
- [circled dot] - strands debonded _'-__" from end of beam.
- [boxed dot] - strands debonded _'-__" from end of beam.
- [triangle dot] - strands debonded _'-__" from end of beam.
- [diamond dot] - strands debonded _'-__" from end of beam.

NOTE: On beams with skewed ends, the debonded length shall be measured along the debonded strand.

DIMENSION NOTES

* All longitudinal beam dimensions shown on this on this sheet with a single asterisk (*) are measured along the top of beam at the centerline of beam.

** End of beam bearing dimensions "J" and "K" are measured along the bottom of the beam.

Payment

Item number	Item description	Unit Measure
450-1-250	Prestressed Beams, Inverted T, 20"	LF

Index 20350 Series Prestressed Slab Units

Design Criteria

AASHTO LRFD Bridge Design Specifications, 4th Edition; ***Structures Detailing Manual (SDM)***; ***Structures Design Guidelines (SDG)***

Design Assumptions and Limitations

Index 20350 is the lead standard for the 12" and 15" Prestressed Slab Units standard series which includes Indexes 20350 through 20365. Use this standard with Indexes 20353, 20354, 20355, 20363, 20364, 20365 and 20399.

When using this Design Standard, the designer must request, from the District Specifications Office, the Developmental Specification for Specification 346 (Dev346FRC) that includes provisions for fiber reinforced concrete. Until additional experience with this structural system is gained by the Department, the use of these standards and Developmental Specification is restricted to off system bridges only.

The standard 12" and 15" Prestressed Slab Units are applicable for spans with skewed end conditions less than or equal to 30 degrees. For spans with skewed end conditions greater than 30 degrees the EOR shall develop a custom design and details using the standards as a basis.

These standards must be supplemented with project specific information in the plans including the Slab Units - Table of Variables, Strand Pattern details and Strand Debonding Legend. Also include the Traffic Railing Reinforcing Layout Table for railing placement on horizontal curves. These standards, along with the supplemental project specific information that is included in the plans, provide sufficient information to permit slab unit fabrication without the submittal of shop drawings.

A data table for associated Index 20399 must also be completed and included in the plans.

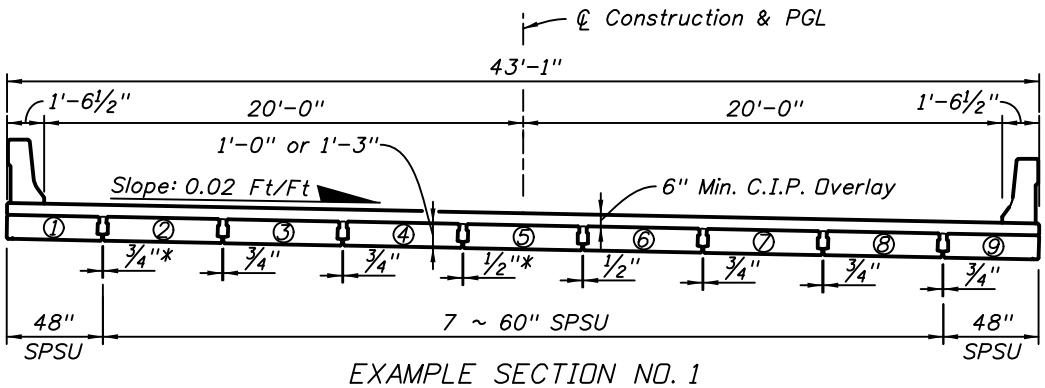
The prestressed slab units in these Standard Drawings are generally assumed to act as simple spans under both Dead Load and Live Load even where the overlay is detailed to be continuous across the intermediate supports.

Slab units are typically placed parallel to the cross slope of the bridge deck.

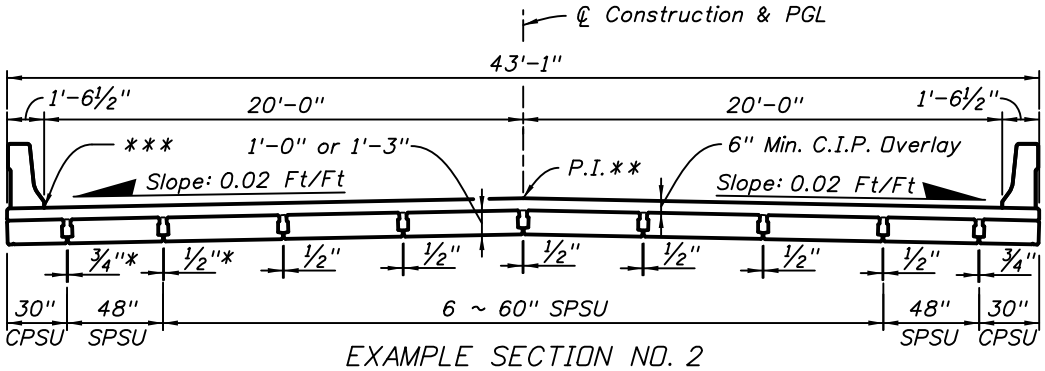
A 6" thick fiber reinforced concrete deck overlay with a single mat of reinforcing steel is typically used with these slab units. Class II or IV concrete with fiber reinforcing admixtures is required for the deck overlay.

Superstructure details in the plans shall show the locations and orientations of traffic railing reinforcing steel relative to slab unit numbers. These details shall show specific locations of dimension "X_L" as they correspond to the Standard Tables. Slab Units with traffic railing reinforcement shall be listed individually in the Standard Tables to accommodate specific "X_L" distances.

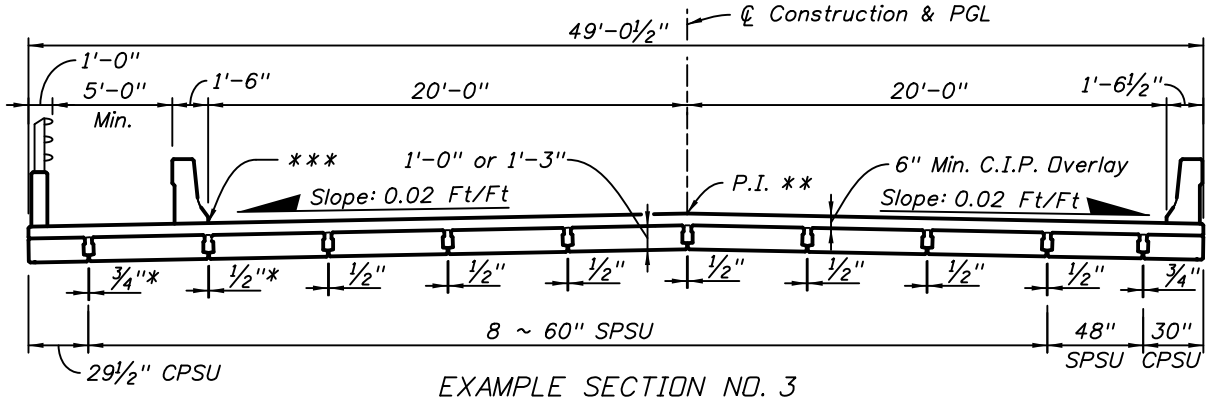
Select and position slab units of various widths to accommodate project-specific bridge widths as shown in the following example sections:



EXAMPLE SECTION NO. 1
(BRIDGE SECTION WITH CONSTANT CROSS SLOPE - SEE EXAMPLE PROBLEM)



EXAMPLE SECTION NO. 2
(SYMMETRICAL CROWNED BRIDGE SECTION)



EXAMPLE SECTION NO. 3
(ASYMMETRICAL BRIDGE SECTION WITH CROWN AND SIDEWALK)

(exterior and first interior slabs require additional detailing for parapet and traffic railing reinforcing layouts)

LEGEND:
⊕ = Slab Unit Number
SPSU = Standard Prestressed Slab Units
CPSU = Custom Prestressed Slab Units
* Gaps between slab units shall be ½" minimum to ¾" maximum to accommodate the total bridge width. Show gap width dimensions in the plans.
** Where possible, locate slab unit keyway joints under cross slope break points in the deck overlay. It is ideal for the slab cross slopes to match adjacent overlay cross slopes to minimize overlay heights and rebar lengths for traffic railing anchorage reinforcement.
*** Locate slab unit keyway joints outside the limits of traffic railing anchorage reinforcement.

See additional instructions in the ***SDG***.

Plan Content Requirements

In the Structures Plans:

Complete the following "PRESTRESSED STANDARD SLAB UNITS - TABLE OF VARIABLES" and/or "PRESTRESSED CUSTOM WIDTH SLAB UNITS - TABLE OF VARIABLES" and include with the plans where applicable. Use additional sheets when the actual number of slab units or strand patterns exceeds the capacity of a single plan sheet using the standard tables. Supplemental details and modifications to Standard Drawings and Tables are permitted if special conditions require changes to dimensions, details or notes. Include supplemental details and modifications with the plans. However, the "PRESTRESSED STANDARD SLAB UNITS - TABLE OF VARIABLES" and "PRESTRESSED CUSTOM WIDTH SLAB UNITS - TABLE OF VARIABLES" themselves should not be modified when using Standard Drawings. See Introduction I.3 for more information regarding use of Data Tables.

Report elastic and time dependent shortening effects (DIM R) at the top of the slab unit @ 120 days. The average of the calculated values for the top and bottom of the slab unit may be used.

Round Angle Φ, as defined in Index 20350, up to the nearest degree.

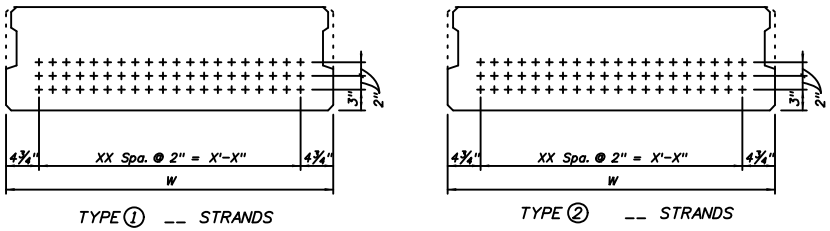
Specify shear stirrup spacings V1, V2 and V3 to the nearest inch.

Data Table 20350A - Prestressed Custom Width Slab Units - Table of Variables:

PRESTRESSED CUSTOM WIDTH SLAB UNITS - TABLE OF VARIABLES — Table Date 1-01-10

LOCATION		CONCRETE PROPERTIES			STND.	PLAN VIEW CASE		END OF UNIT **					DIM	UNIT DIMENSIONS *		REINFORCING STEEL															
SPAN NO.	SLAB UNIT NO.(S) / TYPE	CLASS	STRENGTHS (psi) 28 Day	Release	PTRN. TYPE	END 1	END 2	ANGLE Ø END 1	END 2	DIM J	DIM K1	DIM K2	W	DIM L	DIM R	4D1 DIM D	4D2 DIM D	4D3 NO.	4D3 DIM C	5Y1 DIM B	5Y2 DIM B	4K NO.	NO. OF BAR SPACES S1	S2	S3	BAR SPACING * V1	V2	V3	RAILING REINF. *** INDEX NO.	CASE	DIM X_L

NOTE: Work this sheet with Design Standard Index Nos. 20350, 20353 and 20363.



STRAND DESCRIPTION: Use ____ Diameter, Grade ___, ___ ___ Strands stressed at ___ kips each. Area per strand equals ___ sq. in.

STRAND PATTERNS

STRAND DEBONDING LEGEND

- • - fully bonded strands.
- ⊙ - strands debonded _'-__" from end of beam.
- ⊡ - strands debonded _'-__" from end of beam.
- ◬ - strands debonded _'-__" from end of beam.
- ◈ - strands debonded _'-__" from end of beam.

NOTE: On slab units with skewed ends the debonded length shall be measured along the debonded strand.

DIMENSION NOTES

* All longitudinal slab unit dimensions shown on this sheet with a single asterisk (*) are measured along the top of unit at the centerline of slab unit. Dimension "R" is calculated at mid-height of the slab unit.

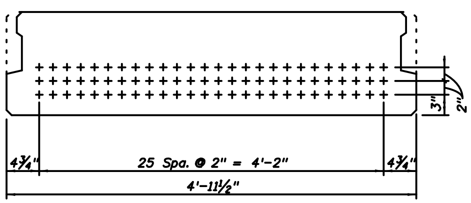
** End of slab unit bearing dimensions "J" and "K" are measured perpendicular to ℄ Bearing along the bottom of the slab unit.

*** See Index No. 20350 for modified reinforcement. See "Prestressed Slab Units - Traffic Railing Reinforcing Layout Table" for railing placement on horizontal curves. Dimension X_L is measured from the bottom left edge of the slab unit to the ℄ of the reinforcement.

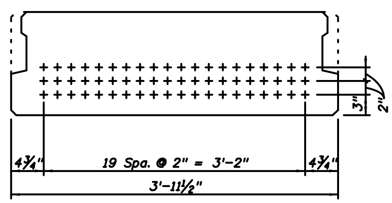
Data Table 20350B - Prestressed Standard Slab Units - Table of Variables:

PRESTRESSED STANDARD SLAB UNITS - TABLE OF VARIABLES — *Table Date 1-01-10*

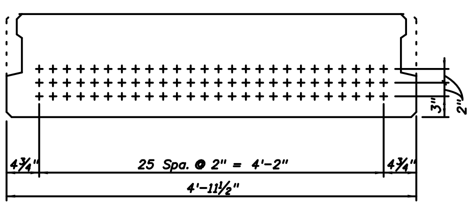
LOCATION		CONCRETE PROPERTIES			STND. PTRN.	PLAN VIEW CASE		END OF UNIT **					UNIT DIMENSIONS *		REINFORCING STEEL														
SPAN	SLAB UNIT	CLASS	STRENGTHS (psi)		PTRN.	CASE		ANGLE ϕ		DIM J	DIM K1	DIM K2			4D1	4D2	4D3	Y1	Y2	4K	NO. OF BAR SPACES			BAR SPACING *			RAILING REINF. ***		
NO.	NO.(S) / TYPE		28 Day	Release	TYPE	END 1	END 2	END 1	END 2				DIM L	DIM R	DIM D	DIM D	NO.	DIM B	DIM B	NO.	S1	S2	S3	V1	V2	V3	INDEX NO.	CASE	DIM X_L



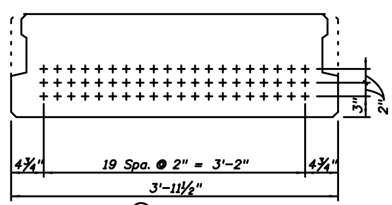
TYPE ① __ STRANDS



TYPE ③ __ STRANDS



TYPE ② __ STRANDS



TYPE ④ __ STRANDS

STRAND DESCRIPTION: Use ____ Diameter, Grade ___, ___ ___ Strands stressed at ___ kips each. Area per strand equals ___ sq. in.

STRAND PATTERNS

NOTE: Work this sheet with Design Standards Index Nos. 20350, 20354, 20355, 20364 and 20365.

STRAND DEBONDING LEGEND

- • - fully bonded strands.
- ⊙ - strands debonded _'-__" from end of beam.
- ⊡ - strands debonded _'-__" from end of beam.
- △ - strands debonded _'-__" from end of beam.
- ◇ - strands debonded _'-__" from end of beam.

NOTE: On slab units with skewed ends the debonded length shall be measured along the debonded strand.

DIMENSION NOTES

* All longitudinal slab unit dimensions shown on this sheet with a single asterisk (*) are measured along the top of unit at the centerline of slab unit. Dimension "R" is calculated at mid-height of the slab unit.

** End of slab unit bearing dimensions "J" and "K" are measured perpendicular to ℄ Bearing along the bottom of the slab unit.

*** See Index No. 20350 for modified reinforcement. See "Prestressed Slab Units - Traffic Railing Reinforcing Layout Table" for railing placement on horizontal curves. Dimension "X_L" is measured from the bottom left edge of slab unit to the ℄ reinforcement.

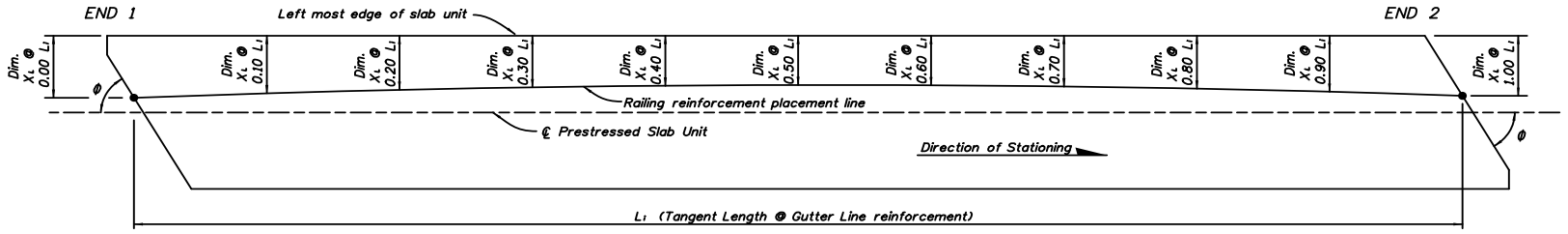
Where traffic railings are to be placed on horizontal curves, complete the following "PRESTRESSED SLAB UNITS - TRAFFIC RAILING REINFORCING LAYOUT TABLE" and include it in the plans. Use additional sheets when the actual number of slab units or strand patterns exceeds the capacity of a single plan sheet using the standard table.

PRESTRESSED SLAB UNITS – TRAFFIC RAILING REINFORCING LAYOUT TABLE							Table Date 1-01-09
Span No.							
Slab Unit No.							
Railing Index No.							
Bar Mark (Mod.)							
Dim. L_1							
Dim. X_L LOCATION (Left Edge Offset to Railing Reinforcement)							
Case (Orientation)							
0.00 L_1 (END 1)							
0.10 L_1							
0.20 L_1							
0.30 L_1							
0.40 L_1							
0.50 L_1							
0.60 L_1							
0.70 L_1							
0.80 L_1							
0.90 L_1							
1.00 L_1 (END 2)							

NOTES:
Work this Table with Index No. 20350, Sheet 2 and the Prestressed Slab Unit – Table of Variables in the Structures Plans.

Dim. X_L is measured perpendicular from the left most edge of the slab unit (looking from END 1 towards END 2) to the vertical leg of the Traffic Railing reinforcement.

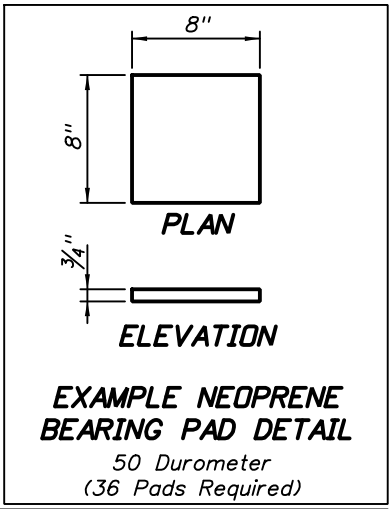
See Index No. 20350, Sheet 2 for treatment of the Railing and Parapet reinforcement and Case "Left" or "Right" placement orientation of the modified railing bars.

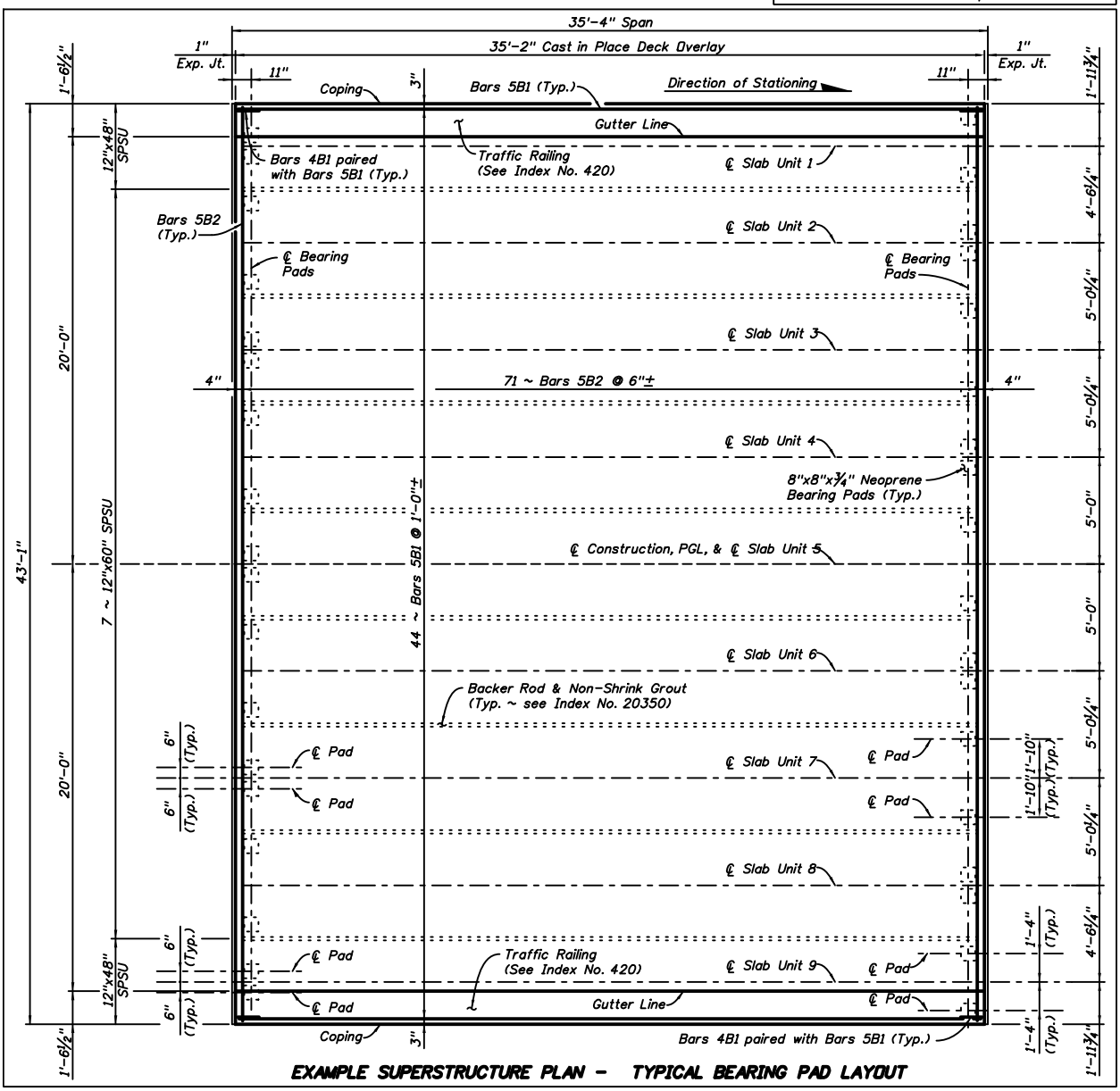


SCHEMATIC PLAN VIEW OF MODIFIED RAILING REINFORCEMENT PLACEMENT

Include bearing pad placement details in the plans. Design bearing pads on a project-specific basis to be placed as described below.

Provide four bearing pads per Prestressed Slab Unit. The first end will have two pads spaced closely with interior edges approximately 2 inches from the slab unit centerline. The opposite end will have two pads spaced farther apart with exterior edges approximately 4 inches from the exterior edge of the slab unit. Alternate the pattern for adjacent slab units as shown in the following "EXAMPLE SUPERSTRUCTURE PLAN - TYPICAL BEARING PAD LAYOUT". Show specific pad locations and dimension details in the plans.





EXAMPLE SUPERSTRUCTURE PLAN - TYPICAL BEARING PAD LAYOUT

Payment

Item number	Item description	Unit Measure
450-3-AB	Prestressed Slab Units	LF

Example Problem

The following example shows the data required for completion of Prestressed Standard Slab Units - Table of Variables CADD cell for Standard Prestressed Slab Units (Indexes 20354 & 20355). The example assumes a single span bridge designed for the following conditions:

Live Load: HL-93

Future Wearing Surface: 15 PSF

Environment (Superstructure): Slightly Aggressive

Bridge Characteristics:

Length: 35'-4" (single span)

Width: 43'-1" (coping to coping)

Clear Roadway: 40'-0" with two - 32" F shape traffic railing

Superstructure: (See EXAMPLE SECTION NO. 1)

One simple span of prestressed slab units with 6-inch composite concrete overlay and a constant cross slope of 0.02 ft/ft.

Sidewalk: None

Horizontal Alignment: Straight

Vertical Alignment: 0.0% Grade

Skew Angle: 0.0°

Slab Unit Selection: 12"x48" Prestressed Slab Units (exterior)

12"x60" Prestressed Slab Units (interior)

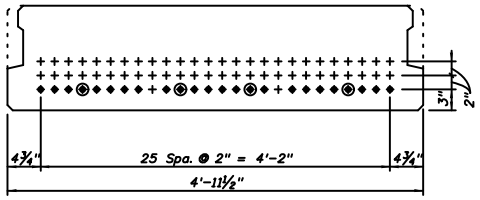
Design Span Length: 33'-6" (Centerline Bearing to Centerline Bearing)

Sample Drawing

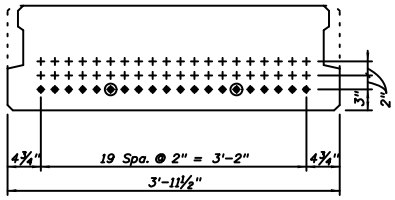
PRESTRESSED STANDARD SLAB UNITS – TABLE OF VARIABLES

Table Date 1-01-10

LOCATION		CONCRETE PROPERTIES			STND.	PLAN VIEW		END OF UNIT **					UNIT		REINFORCING STEEL														
SPAN	SLAB UNIT	CLASS	STRENGTHS (psi)		PTRN.	CASE		ANGLE Ø		DIM J	DIM K1	DIM K2	DIMENSIONS *		4D1	4D2	4D3	Y1	Y2	4K	NO. OF BAR SPACES			BAR SPACING *			RAILING REINF. ***		
NO.	NO.(S) / TYPE		28 Day	Release	TYPE	END 1	END 2	END 1	END 2				DIM L	DIM R	DIM D	DIM D	NO.	DIM B	DIM B	NO.	S1	S2	S3	V1	V2	V3	INDEX NO.	CASE	DIM X_L
1	1 / 12"x48"	IV	5500	4500	2	1	1	90°	90°	6"	11"	11"	34'-6¼"	¼"	2'-9"	2'-9"	40	3'-4½"	3'-4½"	96	9	–	11	1'-6"	–	1'-6"	420	Lt.	1'-2½"
1	2-8 / 12"x60"	IV	5500	4500	1	1	1	90°	90°	6"	11"	11"	34'-6¼"	¼"	3'-3"	3'-3"	40	4'-4½"	4'-4½"	96	9	–	11	1'-6"	–	1'-6"	–	–	–
1	9 / 12"x48"	IV	5500	4500	2	1	1	90°	90°	6"	11"	11"	34'-6¼"	¼"	2'-9"	2'-9"	40	3'-4½"	3'-4½"	96	9	–	11	1'-6"	–	1'-6"	420	Rt.	2'-9"



TYPE ① 24 STRANDS



TYPE ② 20 STRANDS

STRAND DESCRIPTION: Use 0.5" Diameter, Grade 270 Low Relaxation Strands stressed at 31.0 kips each. Area per strand equals 0.153 sq. in.

STRAND PATTERNS

NOTE: Work this sheet with Design Standards Index Nos. 20350, 20354, 20355, 20364 and 20365.

STRAND DEBONDING LEGEND

- • – fully bonded strands.
- ⊙ – strands debonded 5'-0" from end of beam.

NOTE: On slab units with skewed ends the debonded length shall be measured along the debonded strand.

DIMENSION NOTES

* All longitudinal slab unit dimensions shown on this sheet with a single asterisk (*) are measured along the top of unit at the centerline of slab unit. Dimension "R" is calculated at mid-height of the slab unit.

** End of slab unit bearing dimensions "J" and "K" are measured perpendicular to ℄ Bearing along the bottom of the slab unit.

*** See Index No. 20350 for modified reinforcement. See "Prestressed Slab Units – Traffic Railing Reinforcing Layout Table" for railing placement on horizontal curves. Dimension "X_L" is measured from the bottom left edge of slab unit to the ℄ reinforcement.

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

DRAWN BY: XXX MM-YY
CHECKED BY: XXX MM-YY
DESIGNED BY: XXX MM-YY
CHECKED BY: XXX MM-YY

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID

SHEET TITLE: SAMPLE
PROJECT NAME:
REF. DWG. NO.
SHEET NO.

Index 20399 Overlay and Deflection Data for Prestressed Slab Units

Design Criteria

AASHTO LRFD Bridge Design Specifications, 4th Edition; ***Structures Detailing Manual (SDM)***; ***Structures Design Guidelines (SDG)***

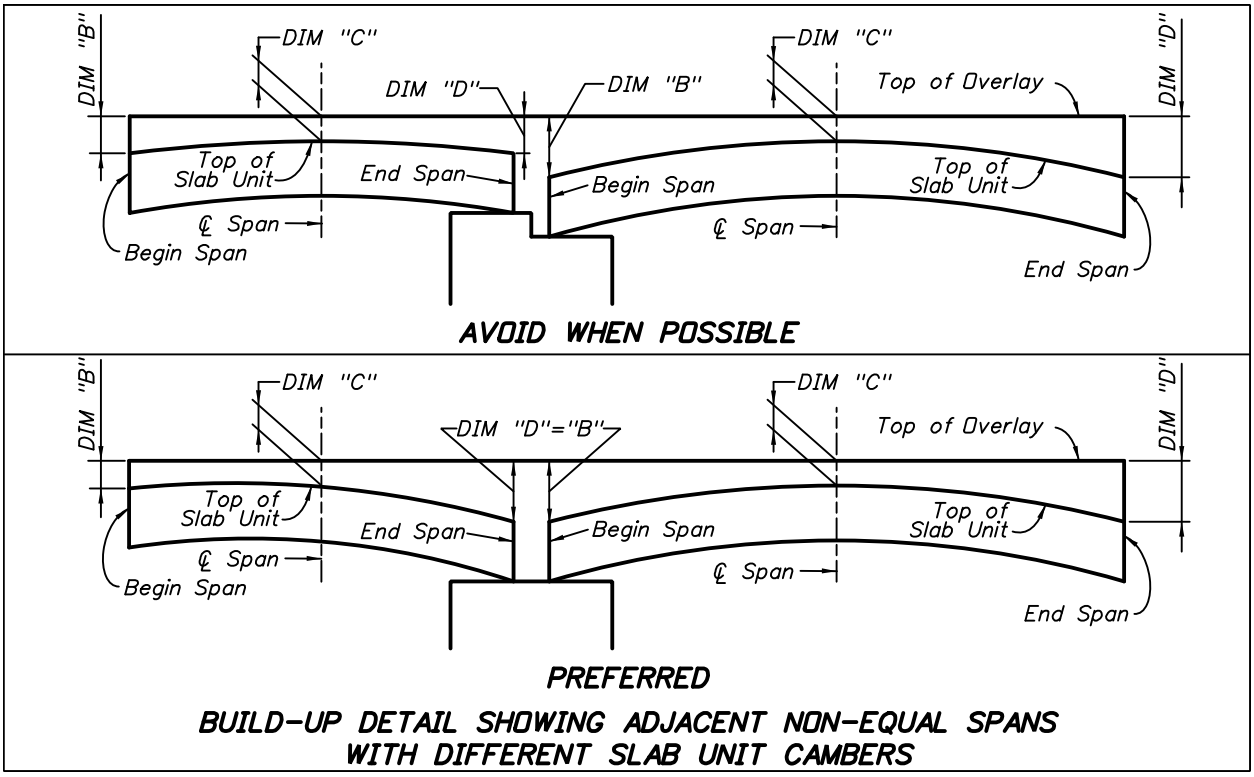
Design Assumptions and Limitations

Use this standard in conjunction with Indexes 20350, 20353, 20354, 20355, 20363, 20364 and 20365.

Unless otherwise required as a design parameter, slab unit camber for computing the theoretical overlay must be based on 120-day old concrete.

Place slab units parallel to the cross slope of the bridge. Consider the effects of horizontal curvature with bridge deck cross slope when determining the minimum theoretical overlay over the tip of the inside edge of slab units.

For a given thickness slab unit, slab unit camber and associated DIM "B" and DIM "D" will vary due to span lengths. DIM "B" and DIM "D" will also vary from span to span along the length of a bridge due to deck geometry. To provide for better aesthetics and potentially easier detailing of the supporting pedestals, where possible adjust the values of DIM "B" and DIM "D" over equal height slab units in adjacent spans so as to allow the bottoms of the slabs to line up. DIM "B" and DIM "D" do not necessarily have to be the same value for a single slab unit. See the following sketch:



Plan Content Requirements

Complete the following "Overlay and Deflection Data Table for Prestressed Slab Units" and include it on the superstructure detail sheets. See Introduction I.3 for more information regarding use of Data Tables.

OVERLAY & DEFLECTION DATA TABLE FOR PRESTRESSED SLAB UNITS							Table Date 7-01-09
LOCATION		REQUIRED THEORETICAL OVERLAY ON ℄ SLAB UNIT			NET BEAM CAMBER (PRESTRESS − DEAD LOAD OF SLAB UNIT) @ 120 DAYS	DEAD LOAD DEFLECTION DURING OVERLAY POUR @ 120 DAYS DIM "A"	OVERLAY CASE NO.
SPAN NO.	SLAB UNIT NO.	AT BEGIN SPAN DIM "B"	AT ℄ SPAN DIM "C"	AT END SPAN DIM "D"			

Payment

Item number	Item description	Unit Measure
400-2-41	Concrete Class II, Precast Deck Overlay	CY
400-4-41	Concrete Class IV, Precast Deck Overlay	CY

Index 20400 Series Precast Concrete Sheet Piles

Design Criteria

AASHTO LRFD Bridge Design Specifications, 4th Edition; ***Structures Design Guidelines (SDG)***; ***PPM*** Vol. 1

Design Assumptions and Limitations

Index 20400 is the lead standard for the Precast Concrete Sheet Piles standard series which includes Indexes 20400 through 20440. Use this standard with Indexes 20410, 20412, 20430 and 20440.

These piles are typically jetted into place rather than driven like a bearing pile.

A cast-in-place reinforced concrete bulkhead cap is required to structurally tie the tops of the concrete sheet piles together and to provide corrosion protection for the reinforcing and prestressing steel that extend from the tops of the piles.

These piles can be used for cantilevered walls or tie-backed walls. Project specific designs and details are required for tie-backs. If the length of piles required for a cantilevered wall exceeds the limits shown on Indexes 20410 and 20412, consider using tie-backs.

These piles can be used in all environments with the appropriate concrete admixtures.

The grouted keyway used in combination with plastic filter fabric (the limits of both are defined by dimension "X") are assumed to not be watertight. Thus they contain the soil behind the wall while still allowing groundwater behind the wall to weep through. No other separate weep holes are generally required. The bottom of the "X" dimension is required to be 1'-8" below the mud line.

The tip elevation of piles shall be determined by the Geotechnical Engineer.

See additional information on Index 20400.

Plan Content Requirements

In the Structures or Roadway Plans:

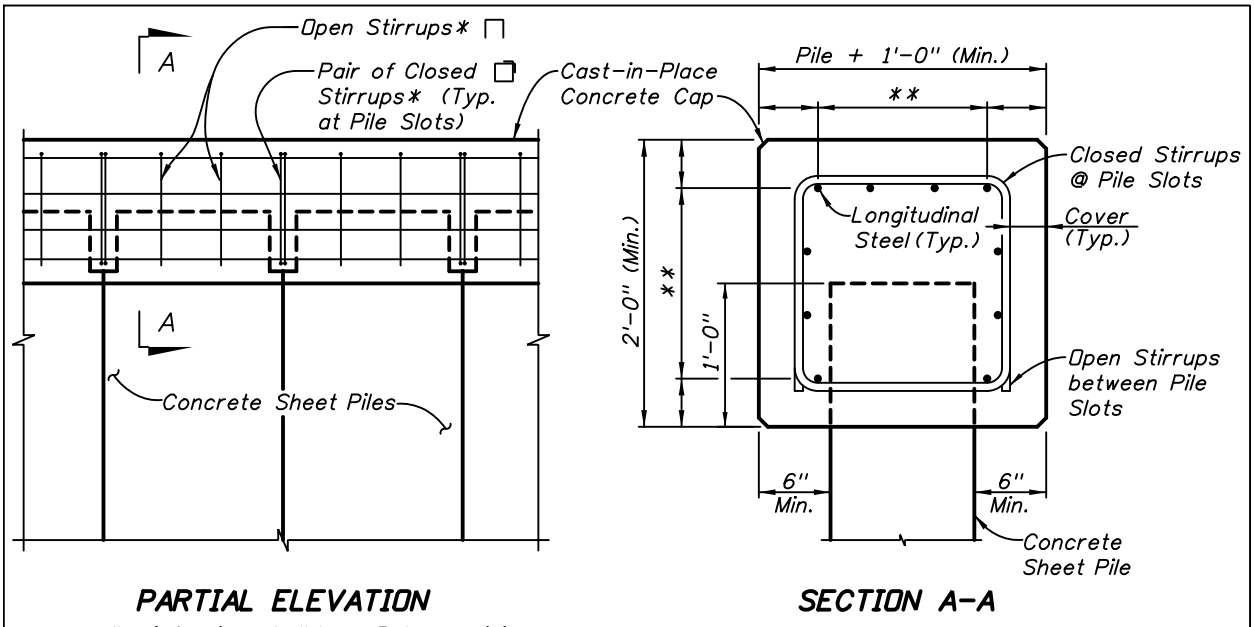
Prepare Control Plans similar to those required for retaining walls as specified in ***PPM*** Vol. 1, Chapter 30, and include them in the plans. Use combinations of straight and corner piles to accommodate project specific geometric requirements.

Show one Starter Pile location for a given wall. In the Elevation View, show the wall construction sequence proceeding away from the Starter Pile by locating the 11" by 11" corner clip on each Typical Pile on the side farthest away from the Starter Pile. Consider necessary tie-ins with adjacent structures when selecting the Starter Pile location.

Prepare project specific cast-in-place concrete bulkhead cap, tie-back and utility accommodation details and include them in the plans. See Figure 1 for typical cap details.

In the Materials Note on the General Notes Sheet, specify the concrete class for the cast-in-place cap in accordance with the retaining wall environment classification. See ***SDG*** 1.4.

Figure 1 Typical Cap Details



Complete the following "Concrete Sheet Pile Data Table" and include it on the supplemental sheets. See Introduction I.3 for more information regarding use of Data Tables.

CONCRETE SHEET PILE DATA TABLE					Table Date 7-01-06
TYPE (See Detail A)	NUMBER REQUIRED	L (Ft.)	T (In.)	X (Ft.)	∅ (Degrees)

NOTE:
Work Concrete Sheet Pile Data Table with Standard Index No. 20400.

Payment

Item number	Item description	Unit Measure
400-2-8	Concrete Class II, Bulkhead	CY
400-3-8	Concrete Class III, Bulkhead	CY
400-4-8	Concrete Class IV, Bulkhead	CY
415-1-8	Reinforcing Steel - Bulkhead	LB
415-2-8	Reinforcing Steel - Stainless, Bulkhead	LB
455-14-AA	Concrete Sheet Piling	LF

Index 20500 Composite Elastomeric Bearing Pads - Prestressed AASHTO and Bulb-T Beams

Design Criteria

AASHTO LRFD Bridge Design Specifications, 4th Edition; ***Structures Design Guidelines (SDG)***

Design Assumptions and Limitations

This standard depicts details and notes for elastomeric bearing pads for prestressed concrete AASHTO and Bulb-T beams with or without skewed end conditions.

This standard is intended for use with prestressed concrete AASHTO and Bulb-T beams, but may be used for steel girder or other bridge types with the appropriate notes and cross references.

Use this standard with Indexes 20110, 20120, 20130, 20140, 20150, 20160, 20172, 20178 and 20501.

LIMITING PARAMETERS FOR COMPOSITE ELASTOMERIC BEARING PADS USED WITH FDOT STANDARD PRESTRESSED CONCRETE BEAMS

Pad Type	Beam Type	Max. Total Service Load Reaction	Max. Service Live Load Reaction	Skew Angle Ranges	Maximum Shear Deflection (in)	Shear Modulus, (G)
A	II (AASHTO)	150 kips	65 kips	0° to 14°	0.75	110 psi
	III (AASHTO)	170 kips	70 kips	0° to 45°		
	IV (AASHTO)	200 kips	90 kips	0° to 45°		
	V & VI (AASHTO) and FLORIDA BULB-T's	235 kips	110 kips	0° to 45°		
B	II (AASHTO)	190 kips	95 kips	0° to 9°	1.0	110 psi
	III (AASHTO)	270 kips	120 kips	0° to 11°		
	IV (AASHTO)	310 kips	125 kips	0° to 16°		
	V & VI (AASHTO) and FLORIDA BULB-T's	400 kips	170 kips	0° to 12°		
C	II (AASHTO)	180 kips	85 kips	9° to 30°	1.0	150 psi
	III (AASHTO)	270 kips	120 kips	11° to 45°		
	IV (AASHTO)	310 kips	125 kips	16° to 45°		
	V & VI (AASHTO) and FLORIDA BULB-T's	400 kips	170 kips	12° to 45°		

The Service Live Load and Total Service Load Reactions can be determined from the beam design. The Shear Deflection is the product of the coefficient of thermal expansion, 65% of the thermal gradient and the length of bridge contributing to movement, plus one-half the beam creep and shrinkage at the bottom of beam. Assume beam creep and shrinkage from day 120 to day 240 (this value can be determined from data in the beam design output).

Standard elastomeric bearing pads have been designed in accordance with ***AASHTO LRFD Bridge Design Specifications***, Method "B" (2009 Interim), for a maximum static rotation (beam grade, camber and dead load rotation) of 0.0125 radians and a cyclic rotation (live load) of 0.004 radians. Live load rotations are assumed to be in the opposite direction to static rotations. Rotation does not need to be checked for standard prestressed beams provided that the top of the beveled bearing plates (when required) or the bearing seats (pedestals) are finished approximately parallel to the slope at the ends of the beam. The effects of camber (at day 120) from prestressing and dead load deflection may be neglected when determining the slope at the ends of the beam, unless the sum of these effects exceeds 0.0125 radians (1.25%). Bearing seats may be finished level for beam grades less than 0.5%, or when the combined effects of beam grade, camber and dead load rotation do not exceed 1.25%. Whenever possible, the bearing seats at each end on the beam should be detailed with the same slope. For detailing purposes, AASHTO and Bulb-T Beams are assumed to be erected plumb. See also instructions for Index 20501.

The following information is provided for custom designs or refined analysis using these pads: Pads have been designed for a live load rotation of 0.004 radians and the 0.005 radian construction tolerance in accordance with the ***AASHTO LRFD Bridge Design Specifications***, Method "B". An additional static rotation allowance of 0.0125 radians is permitted to account for beam grade, camber and dead load deflection, based on research developed under ***NCHRP Report 596***.

For design values exceeding the limiting parameters shown on this sheet, the designer must develop custom designs and details. For skew angles greater than 45°, consider round pads with elastomer and plate thicknesses similar to those shown in Index 20500.

Plan Content Requirements

In the Structures Plans:

Complete the following "BEARING PAD DATA TABLE" and "ESTIMATED BEARING PAD QUATITIES" table and include them on the supplemental sheets. See Introduction I.3 for more information regarding use of Data Tables.

The "BEARING PAD DATA TABLE" is intended for use with prestressed beam bridges, but may be modified for steel girder or other bridge types. Supplement this table with additional columns or notes as required to clearly identify the location and type of bearing pads.

BEARING PAD DATA TABLE				Table Date 1-01-08
SPAN NO(s).	BEAM NO(s).	PAD TYPE	BEAM TYPE	BEAM END *

ESTIMATED BEARING PAD QUANTITIES		Table Date 01-01-07
PAD TYPE	NUMBER REQUIRED	QUANTITY (CF)

NOTE:
Work this table with Index No. 20500 for Pad Types A, B & C and/or any project specific bearing pads.
* END 1 = Begin Bridge end of beam (Back station).
END 2 = End Bridge end of beam (Ahead station).

Payment

Item number	Item description	Unit Measure
400-147	Composite Neoprene Pads	CF

Examples

The following examples show the information required to determine the correct standard elastomeric bearing pad type to use. These examples do not assume any wind or braking loads are applied to the elastomeric bearing pads.

EXAMPLE 1

Given Information:

Superstructure Type - One Simple Span
Type IV AASHTO Beams 105'-0" long, spaced at 7'-0" centers
No longitudinal restraints except friction between the pad and the concrete substructure
Service Live Load Reaction = 90.2 kips
Total Service (Live Load + Dead Load) Reaction = 186.6 kips
Coefficient of Thermal Expansion = 0.000006/°F
Thermal Gradient = 70°F
Creep and Shrinkage at the Bottom of Beam (from day 120 to day 240) = 0.305"
Shear Deflection = (0.000006/°F x 0.65 x 70°F x 52.5' x 12"/') + 0.305"/2 = 0.325"
Beam Grade = 2.0%
Skew Angle = 0°
Service Dead Load Rotation = 0.005 radians (0.5%)

Beam Camber Rotation @ 120 days = 0.010 radians (1.0%)
Net Beam Camber Rotation after Dead Load Deflection = 0.010 - 0.005 = 0.005 radians (0.5%)

Elastomeric Bearing Pad Type Determination:

Compare the design values to the Limiting Parameters Table, Pad Type A for Type IV AASHTO Beams.

Limiting Parameters Versus Design Values:

Maximum Total Service Reaction of 200 kips versus Design Value of 186.6 kips; therefore, OK

Maximum Service Live Load Reaction of 90 kips versus Design Value of 90.2 kips; therefore say OK (close enough)

Maximum Shear Deflection of 0.75" versus Design Value of 0.325"; therefore, OK

Conclusion:

Use Elastomeric Bearing Pad Type A. No beveled plate is required. Detail beam seat with a 2% slope along the centerline of beam.

EXAMPLE 2

Given Information:

Superstructure Type - Four Simple Spans with Continuous Deck
Type IV AASHTO Beams 105'-0" long, spaced at 7'-0" centers
No longitudinal restraints except friction between the pad and the concrete substructure
Service Live Load Reaction = 90.2 kips
Total Service (live load + dead load) Reaction = 186.6 kips
Coefficient of Thermal Expansion = 0.000006/°F
Thermal Gradient = 70°F
Creep and Shrinkage at the Bottom of Beam (from day 120 to day 240) = 0.305"
Shear Deflection = (0.000006/°F x 65% x 70°F x 210' x 12"/') + 0.305"/2 = 0.841"
Beam Grade = 5%
Skew Angle = 15°
Service Dead Load Rotation = 0.005 radians (0.5%)
Beam Camber Rotation @ 120 days = 0.010 radians (1.0%)
Net Beam Camber Rotation after Dead Load Deflection = 0.010 - 0.005 = 0.005 radians (0.5%)

Elastomeric Bearing Pad Type Determination:

Compare the design values to the Limiting Parameters Table, Pad Type B for Type IV AASHTO Beams.

Limiting Parameters versus Design Values:

Maximum Total Service Reaction of 310 kips versus Design Value of 186.6 kips; therefore, OK

Maximum Service Live Load Reaction of 125 kips versus Design Value of 90.2 kips; therefore, OK

Maximum Shear Deflection of 1.0" versus Design Value of 0.841"; therefore, OK

Skew angle is between 0° and 16°; therefore, OK

Conclusion:

Use Elastomeric Bearing Pad Type B. Additionally, because beam end slope exceeds 2%, include the Design Standard 20501 "Bearing Plate Data Table" and detail bearing seats level. Neglect the effects of net beam camber in the beveled bearing plate design since rotation is less than 0.0125 radians.

Index 20501 Bearing Plate Details Prestressed AASHTO and Bulb-T Beams

Design Criteria

AASHTO LRFD Bridge Design Specifications, 4th Edition; ***Structures Detailing Manual (SDM)***; ***Structures Design Guidelines (SDG)***

Design Assumptions and Limitations

This Index contains generic details and notes for beveled and embedded bearing plates for use with Prestressed AASHTO and Florida Bulb-T beams. Completion of the "Bearing Plate Data Table" is required. Use this standard with Indexes 20110, 20120, 20130, 20140, 20150, 20160, 20172, 20178 and 20500.

Embedded Bearing Plates A are required for all AASHTO Type V, VI, and Florida Bulb-T beams. Embedded Bearing Plates A and Beveled Bearing Plates B are required for all beams on grades greater than 2%.

Plan Content Requirements

In the Structures Plans:

Bearing seats (pedestals) may be finished level for beam grades less than 0.5%. For AASHTO Type V, VI and Florida Bulb-T Beams use Embedded Bearing Plates A but do not use Beveled Bearing Plates B.

For beam grades between 0.5% and 2%, show the bearing seats (pedestals) to be finished parallel to the beam grade with no allowance for beam camber or deflection. For AASHTO Type V, VI and Florida Bulb-T Beams use Embedded Bearing Plates A but do not use Beveled Bearing Plates B.

For beam grades greater than 2%, show the bearing seats (pedestals) to be finished level and use Bearing Plates A and B for all beams.

See also instructions for Index 20500.

Complete the following "BEARING PLATE DATA TABLE" and include it in the plans when Bearing Plates are required. Fill in the table to correspond with data on the 'TABLE OF BEAM VARIABLES' using inch units for Beveled Plate dimensions 'X', 'Y' & 'Z' rounded to 1/16th of an inch. If Beveled Bearing Plates B are not required, fill in the corresponding columns with "N/A". See Introduction I.3 for more information regarding use of Data Tables.

Use the following equations to determine the Beveled Plate thicknesses for 'PLAN VIEW CASES' and 'END ELEVATION CONDITIONS' corresponding to those shown on Design

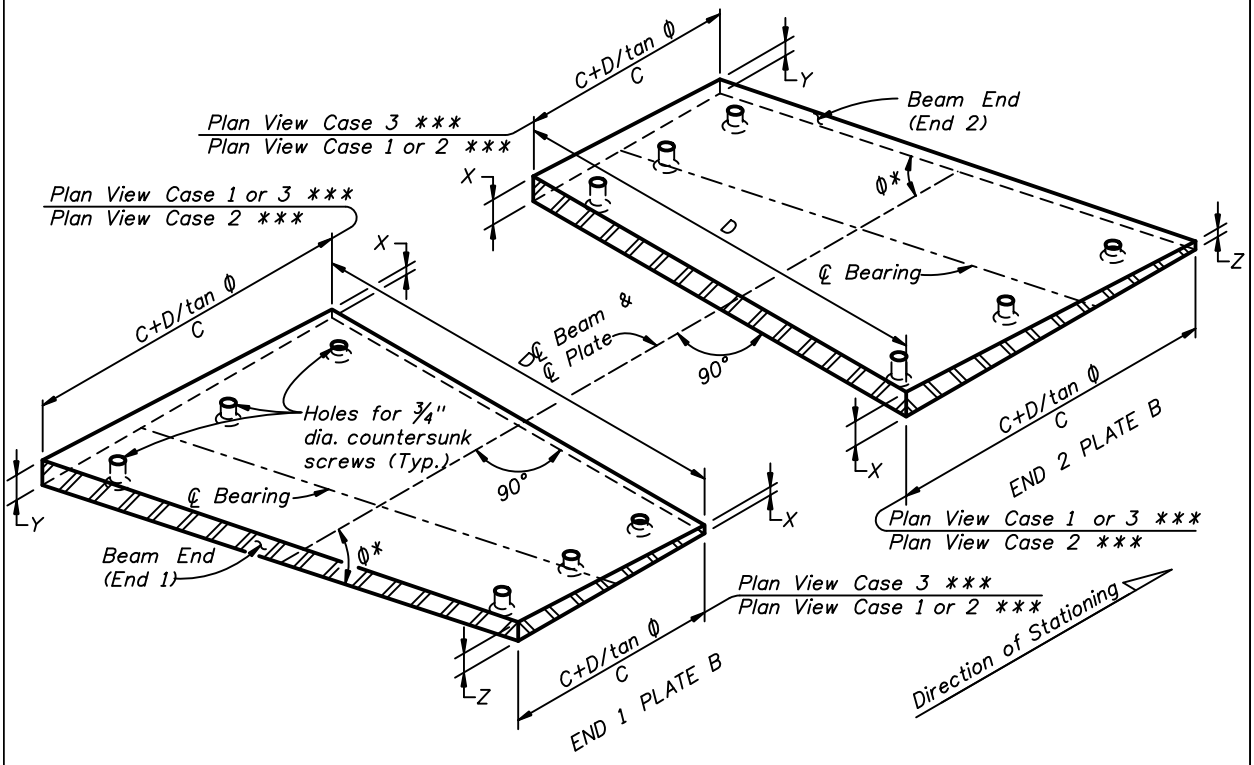
Standards Index No. 20110. The Slope parameter in these equations requires decimal units and correct sign convention:

END 1	END 2
(I) PLAN VIEW CASE 1:	
(a) END ELEVATION CONDITION 1 or 2 (Positive Slope)	
X = 0.5" + (C) x Slope	X = 0.500"
Y = Z = 0.500"	Y = Z = 0.5" + (C) x Slope
(b) END ELEVATION CONDITION 3 (Negative Slope)	
X = 0.500"	X = 0.5" - (C) x Slope
Y = Z = 0.5" - (C) x Slope	Y = Z = 0.500"
(II) PLAN VIEW CASE 2:	
(a) END ELEVATION CONDITION 1 or 2 (Positive Slope)	
X = 0.5" + (C + D / tan Φ) x Slope	X = 0.500"
Y = 0.500"	Y = 0.5" + (C) x Slope
Z = 0.5" + (D / tan Φ) x Slope	Z = 0.5" + (C + D / tan Φ) x Slope
(b) END ELEVATION CONDITION 3 (Negative Slope)	
X = 0.500"	X = 0.5" - (C + D / tan Φ) x Slope
Y = 0.5" - (C + D / tan Φ) x Slope	Y = 0.5" - (D / tan Φ) x Slope
Z = 0.5" - (C) x Slope	Z = 0.500"
(III) PLAN VIEW CASE 3:	
(a) END ELEVATION CONDITION 1 or 2 (Positive Slope)	
X = 0.5" + (C + D / tan Φ) x Slope	X = 0.500"
Y = 0.5" + (D / tan Φ) x Slope	Y = 0.5" + (C + D / tan Φ) x Slope
Z = 0.500"	Z = 0.5" + (C) x Slope
(b) END ELEVATION CONDITION 3 (Negative Slope)	
X = 0.500"	X = 0.5" - (C + D / tan Φ) x Slope
Y = 0.5" - (C) x Slope	Y = 0.500"
Z = 0.5" - (C + D / tan Φ) x Slope	Z = 0.5" - (D / tan Φ) x Slope

BEARING PLATE DATA TABLE — Table Date 1-01-08

GENERAL BEARING PLATE DATA								EMBEDDED PLATE DIMENSIONS (PLATE A) (inches)			BEVELED PLATE REQUIRED (Yes/No)	BEVELED PLATE DIMENSIONS (PLATE B) (inches)					
BRG. PLATE MARK ***	SPAN NO(s).	BEAM NO(s).	PAD TYPE	BEAM END	PLAN VIEW CASE	SLOPE (%) **	ANGLE ∅ *	C	D	C+D/TAN ∅		C	D	C+D/TAN ∅	X	Y	Z

NOTES:
* ∅ = Acute angle (≤ 90°) measured from left or right side of ℄ Beam as required.
** Slope measured along ℄ of Beam at ℄ of Bearing.
*** See "TABLE OF BEAM VARIABLES" and Index No. 20110.
See Index No. 20501 for additional notes and details.



ISOMETRIC VIEW OF BEVELED BEARING PLATES
(SKEWED PLATES SHOWN, NON-SKEWED PLATES SIMILAR)

Payment

The cost of beveled and embedded bearing plates is incidental to the cost of the prestressed beams they are used with. No separate payment is made.

Index 20502 Beveled Bearing Plate Details Prestressed Florida U-Beams

Design Criteria

AASHTO LRFD Bridge Design Specifications, 4th Edition; ***Structures Detailing Manual (SDM)***; ***Structures Design Guidelines (SDG)***

Design Assumptions and Limitations

This Index contains generic details and notes for beveled and embedded bearing plates for use with Prestressed Florida U-Beams. Completion of the "Bearing Plate Data Table" is required. Use this standard with Indexes 20210, 20248, 20254, 20263 and 20272.

Embedded Bearing Plates A and Beveled Bearing Plates B are required for all beams on grades greater than 2%.

Plan Content Requirements

In the Structures Plans:

Bearing seats (pedestals) may be finished level for beam grades less than 0.5%.

For beam grades between 0.5% and 2%, show the bearing seats (pedestals) to be finished parallel to the beam grade with no allowance for beam camber or deflection.

For beam grades greater than 2%, show the bearing seats (pedestals) to be finished level and use Bearing Plates A and B.

Complete the following "BEARING PLATE DATA TABLE" and include it in the plans when Bearing Plates are required. Fill in the table to correspond with data on the 'TABLE OF BEAM VARIABLES' using inch units for Beveled Plate dimensions 'W', 'X', 'Y' & 'Z' rounded to 1/16th of an inch. See Introduction I.3 for more information regarding use of Data Tables.

Use the average deck cross slope perpendicular to centerline of beam from End 1 and End 2, for the beam cross slope for spans with superelevation transitions.

Use the following equations to determine the Beveled Plate thicknesses for 'PLAN VIEW CASES' and 'END ELEVATION CONDITIONS' corresponding to those shown on Index 20210, when single pedestals are used beneath the beam ends. For split pedestals beneath double bearings, adjust the upper pedestal elevation to utilize the same thickness bearing plate on the left and right sides of the beam as shown below. Slope and Cross Slope parameters in these equations require decimal units and correct sign convention:

END 1	END 2
(I) PLAN VIEW CASE 1 (No Skew):	
(a) END ELEVATION CONDITION 1 (Positive Slope)	
(i) Positive Cross Slope (C.S.), Single Bearing & Left Side Double Bearing	
W = 0.5" + (C) x Slope + (D) x C.S.	W = 0.5" + (D) x C.S.
X = 0.5" + (C) x Slope	X = 0.5"
Y = 0.5"	Y = 0.5" + (C) x Slope
Z = 0.5" + (D) x C.S.	Z = 0.5" + (C) x Slope + (D) x C.S.
(ii) Negative Cross Slope (C.S.), Single Bearing & Right Side Double Bearing	
W = 0.5" + (C) x Slope	W = 0.5"
X = 0.5" + (C) x Slope - (D) x C.S.	X = 0.5" - (D) x C.S.
Y = 0.5" - (D) x C.S.	Y = 0.5" + (C) x Slope - (D) x C.S.
Z = 0.5"	Z = 0.5" + (C) x Slope
(iii) Positive Cross Slope (C.S.), Right Side Double Bearing	
W = 0.5" + (C) x Slope + (2D+E) x C.S.	W = 0.5" + (2D+E) x C.S.
X = 0.5" + (C) x Slope + (D+E) x C.S.	X = 0.5" + (D+E) x C.S.
Y = 0.5" + (D+E) x C.S.	Y = 0.5" + (C) x Slope + (D+E) x C.S.
Z = 0.5" + (2D+E) x C.S.	Z = 0.5" + (C) x Slope + (2D+E) x C.S.
(iv) Negative Cross Slope (C.S.), Left Side Double Bearing	
W = 0.5" + (C) x Slope - (D+E) x C.S.	W = 0.5" - (D+E) x C.S.
X = 0.5" + (C) x Slope - (2D+E) x C.S.	X = 0.5" - (2D+E) x C.S.
Y = 0.5" - (2D+E) x C.S.	Y = 0.5" + (C) x Slope - (2D+E) x C.S.
Z = 0.5" - (D+E) x C.S.	Z = 0.5" + (C) x Slope - (D+E) x C.S.
(b) END ELEVATION CONDITION 3 (Negative Slope)	
(i) Positive Cross Slope (C.S.), Single Bearing & Left Side Double Bearing	
W = 0.5" + (D) x C.S.	W = 0.5" - (C) x Slope + (D) x C.S.
X = 0.5"	X = 0.5" - (C) x Slope
Y = 0.5" - (C) x Slope	Y = 0.5"
Z = 0.5" - (C) x Slope + (D) x C.S.	Z = 0.5" + (D) x C.S.

END 1	END 2
(ii) Negative Cross Slope (C.S.), Single Bearing & Right Side Double Bearing	
W = 0.5"	W = 0.5" - (C) x Slope
X = 0.5" - (D) x C.S.	X = 0.5" - (C) x Slope - (D) x C.S.
Y = 0.5" - (C) x Slope - (D) x C.S.	Y = 0.5" - (D) x C.S.
Z = 0.5" - (C) x Slope	Z = 0.5"
(iii) Positive Cross Slope (C.S.), Right Side Double Bearing	
W = 0.5" + (2D+E) x C.S.	W = 0.5" - (C) x Slope + (2D+E) x C.S.
X = 0.5" + (D+E) x C.S.	X = 0.5" - (C) x Slope + (D+E) x C.S.
Y = 0.5" - (C) x Slope + (D+E) x C.S.	Y = 0.5" + (D+E) x C.S.
Z = 0.5" - (C) x Slope + (2D+E) x C.S.	Z = 0.5" + (2D+E) x C.S.
(iv) Negative Cross Slope (C.S.), Left Side Double Bearing	
W = 0.5" - (D+E) x C.S.	W = 0.5" - (C) x Slope - (D+E) x C.S.
X = 0.5" - (2D+E) x C.S.	X = 0.5" - (C) x Slope - (2D+E) x C.S.
Y = 0.5" - (C) x Slope - (2D+E) x C.S.	Y = 0.5" - (2D+E) x C.S.
Z = 0.5" - (C) x Slope - (D+E) x C.S.	Z = 0.5" - (D+E) x C.S.
(II) PLAN VIEW CASE 2:	
(a) END ELEVATION CONDITION 1 OR 2 (Positive Slope)	
(i) Positive Cross Slope (C.S.), Single Bearing & Left Side Double Bearing	
W = 0.5" + (C+D/tan Φ) x Slope + (D) x C.S.	W = 0.5" + (D) x C.S.
X = 0.5" + (C+D/tan Φ) x Slope	X = 0.5"
Y = 0.5"	Y = 0.5" + (C) x Slope
Z = 0.5" + (D/tan Φ) x Slope + (D) x C.S.	Z = 0.5" + (C+D/tan Φ) x Slope + (D) x C.S.
(ii) Negative Cross Slope (C.S.), Single Bearing & Right Side Double Bearing	
W = 0.5" + (C) x Slope	W = 0.5"
X = 0.5" + (C) x Slope - (D) x C.S.	X = 0.5" - (D) x C.S.
* Y = 0.5" - (D/tan f) x Slope - (D) x C.S.	Y = 0.5" + (C) x Slope - (D) x C.S.
Z = 0.5"	Z = 0.5" + (C+D/tan Φ) x Slope

END 1	END 2
(iii) Positive Cross Slope (C.S.), Right Side Double Bearing	
W = 0.5"+[(2D+E)/tanΦ+C] xSlope+(2D+E)xC.S.	W = 0.5" + (D+E)/tan Φ x Slope + (2D+E) x C.S.
X = 0.5"+[(2D+E)/tanΦ+C]xSlope+(D+E)xC.S.	X = 0.5" + (D+E)/tan Φ x Slope + (D+E) x C.S.
Y = 0.5" + (D+E)/tan Φ x Slope + (D+E) x C.S.	Y = 0.5"+[(D+E)/tanΦ+C]xSlope+(D+E)xC.S.
Z = 0.5" + (2D+E)/tan Φ x Slope + (2D+E) x C.S.	Z = 0.5"+[(2D+E)/tanΦ+C]xSlope+(2D+E)xC.S.
(iv) Negative Cross Slope (C.S.), Left Side Double Bearing	
W = 0.5" + [C-(D+E)/tan Φ] x Slope - (D+E) x C.S.	* W = 0.5" - (D+E)/tan Φ x Slope - (D+E) x C.S.
X = 0.5" + [C-(D+E)/tan Φ] x Slope-(2D+E) x C.S.	* X = 0.5" - (D+E)/tan Φ x Slope - (2D+E) x C.S.
* Y = 0.5" - (2D+E)/tan Φ x Slope - (2D+E) x C.S.	Y = 0.5" + [C-(D+E)/tan Φ] x Slope-(2D+E) x C.S.
* Z = 0.5" - (D+E)/tan Φ x Slope - (D+E) x C.S.	Z = 0.5" + [C - E/tan Φ] x Slope - (D+E) x C.S.
(b) END ELEVATION CONDITION 3 (Negative Slope)	
(i) Positive Cross Slope (C.S.), Single Bearing & Left Side Double Bearing	
W = 0.5" + (D) x C.S.	W = 0.5" - (C) x Slope + (D) x C.S.
X = 0.5"	X = 0.5" - (C) x Slope
Y = 0.5" - (C+D/tan Φ) x Slope	Y = 0.5"
Z = 0.5" - (C) x Slope + (D) x C.S.	* Z = 0.5" + (D/tan Φ) x Slope + (D) x C.S.
(ii) Negative Cross Slope (C.S.), Single Bearing & Right Side Double Bearing	
W = 0.5"	W = 0.5" - (C+D/tan Φ) x Slope
X = 0.5" - (D) x C.S.	X = 0.5" - (C+D/tan Φ) x Slope - (D) x C.S.
Y = 0.5" - (C+D/tan Φ) x Slope - (D) x C.S.	Y = 0.5" - (D/tan Φ) x Slope - (D) x C.S.
Z = 0.5" - (C) x Slope	Z = 0.5"
(iii) Positive Cross Slope (C.S.), Right Side Double Bearing	
* W = 0.5"+(D+E)/tan Φ x Slope+(2D+E) x C.S.	W = 0.5" - [C-(D+E)/tanΦ] x Slope+(2D+E) x C.S.
* X = 0.5" + (D+E)/tan Φ x Slope + (D+E) x C.S.	X = 0.5" - [C-(D+E)/tanΦ] x Slope + (D+E) x C.S.
Y = 0.5" - [C-E/tan Φ] x Slope + (D+E) x C.S.	* Y = 0.5" + (D+E)/tan Φ x Slope + (D+E) x C.S.
Z = 0.5" - [C-(D+E)/tanΦ] x Slope + (2D+E) x C.S.	* Z = 0.5" + (2D+E)/tan Φ x Slope+(2D+E) x C.S.

END 1	END 2
(iv) Negative Cross Slope (C.S.), Left Side Double Bearing	
W = 0.5" - (D+E)/tan Φ x Slope - (D+E) x C.S.	W = 0.5" - [C+(2D+E)/tanΦ] x Slope-(D+E) x C.S.
X = 0.5" - (D+E)/tan Φ x Slope - (2D+E) x C.S.	X = 0.5" - [C+(2D+E)/tanΦ] x Slope-(2D+E) x C.S.
Y = 0.5" - [C+(2D+E)/tanΦ] x Slope-(2D+E) x C.S.	Y = 0.5" - (2D+E)/tan Φ x Slope - (2D+E) x C.S.
Z = 0.5" - [C + (D+E)/tan Φ] x Slope - (D+E) x C.S.	Z = 0.5" - (D+E)/tan Φ x Slope - (D+E) x C.S.
(III) PLAN VIEW CASE 3:	
(a) END ELEVATION CONDITION 1 OR 2 (Positive Slope)	
(i) Positive Cross Slope (C.S.), Single Bearing & Left Side Double Bearing	
W = 0.5" + (C) x Slope + (D) x C.S.	W = 0.5" + (D) x C.S.
X = 0.5" + (C) x Slope	X = 0.5"
Y = 0.5"	Y = 0.5" + (C+D/tan Φ) x Slope
* Z = 0.5" - (D/tan Φ) x Slope + (D) x C.S.	Z = 0.5" + (C) x Slope + (D) x C.S.
(ii) Negative Cross Slope, Single Bearing & Right Side Double Bearing	
W = 0.5" + (C+D/tan Φ) x Slope	W = 0.5"
X = 0.5" + (C+D/tan Φ) x Slope-(D) x C.S.	X = 0.5" - (D) x C.S.
Y = 0.5" - (D/tan Φ) x Slope - (D) x C.S.	Y = 0.5" + (C+D/tan Φ) - (D) x C.S.
Z = 0.5"	Z = 0.5" + (C) x Slope
(iii) Positive Cross Slope, Right Side Double Bearing	
W = 0.5"+[C-(D+E)/tanΦ] x Slope+(2D+E) x C.S.	* W = 0.5" - (D+E)/tanΦ x Slope + (2D+E) x C.S.
X = 0.5" + [C-(D+E)/tanΦ] x Slope+(D+E) x C.S.	* X = 0.5" - (D+E)/tanΦ x Slope + (D+E) x C.S.
* Y = 0.5" - (D+E)/tanΦ x Slope + (D+E) x C.S.	Y = 0.5" + (C-E/tanΦ] x Slope + (D+E) x C.S.
* Z = 0.5" - (2D+E)/tanΦ x Slope+(2D+E) x C.S.	Z = 0.5" + [C-(D+E)/tanΦ] x Slope+(2D+E) x C.S.
(iv) Negative Cross Slope, Left Side Double Bearing	
W = 0.5"+[C+(2D+E)/tanΦ] x Slope-(D+E) x C.S.	W = 0.5" + (D+E)/tanΦ x Slope - (D+E) x C.S.
X = 0.5"+[C+(2D+E)/tanΦ] x Slope-(2D+E) x C.S.	X = 0.5" + (D+E)/tanΦ x Slope - (2D+E) x C.S.
Y = 0.5" + (2D+E)/tan Φ x Slope - (2D+E) x C.S.	Y = 0.5"+[C+(2D+E)/tanΦ] x Slope-(2D+E) x C.S.
Z = 0.5" + (D+E)/tanΦ x Slope - (D+E) x C.S.	Z = 0.5" + [C + (D+E)/tanΦ] x Slope - (D+E) x C.S.

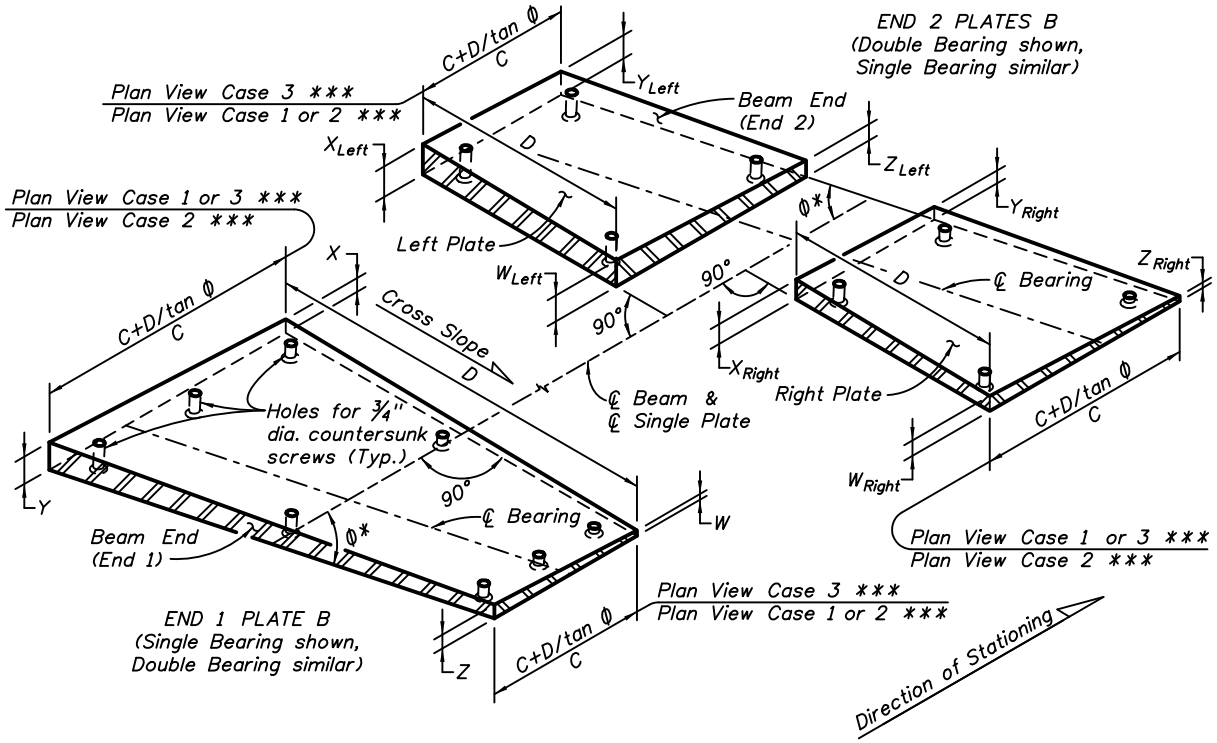
END 1	END 2
(b) END ELEVATION CONDITION 3 (Negative Slope)	
(i) Positive Cross Slope (C.S.), Single Bearing & Left Side Double Bearing	
W = 0.5" + (D) x C.S.	W = 0.5"-(C+D/tan Φ) x Slope+(D) x C.S.
X = 0.5"	X = 0.5" - (C+D/tan Φ) x Slope
Y = 0.5" - (C) x Slope	Y = 0.5"
Z = 0.5"-[C+D/tan Φ] x Slope + (D) x C.S.	Z = 0.5" - (D/tan Φ) x Slope + (D) x C.S.
(ii) Negative Cross Slope (C.S.), Single Bearing & Right Side Double Bearing	
W = 0.5"	W = 0.5" - (C) x Slope
X = 0.5" - (D) x C.S.	X = 0.5" - (C) x Slope - (D) x C.S.
Y = 0.5" - (C) x Slope - (D) x C.S.	Y = 0.5" + (D/tan Φ) x Slope - (D) x C.S.
Z = 0.5" - (C+D/tan Φ) x Slope	Z = 0.5"
(iii) Positive Cross Slope (C.S.), Right Side Double Bearing	
W = 0.5" - (D+E)/tan Φ x Slope + (2D+E) x C.S.	W = 0.5"-[C+(2D+E)/tanΦ] x Slope+(2D+E) x C.S.
X = 0.5" - (D+E)/tan Φ x Slope + (D+E) x C.S.	X = 0.5"-[C+(2D+E)/tanΦ] x Slope+(D+E) x C.S.
Y = 0.5"-[C + (D+E)/tanΦ] x Slope + (D+E) x C.S.	Y = 0.5" - (D+E)/tan Φ x Slope + (D+E) x C.S.
Z = 0.5"-[C+(2D+E)/tanΦ] x Slope+(2D+E) x C.S.	Z = 0.5" - (2D+E)/tan Φ x Slope + (2D+E) x C.S.
(iv) Negative Cross Slope (C.S.), Left Side Double Bearing	
* W = 0.5" + (D+E)/tan Φ x Slope - (D+E) x C.S.	W = 0.5" - [C - (D+E)/tanΦ] x Slope - (D+E) x C.S.
* X = 0.5" + (D+E)/tan Φ x Slope - (2D+E) x C.S.	X = 0.5" - [C - (D+E)/tanΦ] x Slope-(2D+E) x C.S.
Y = 0.5"-[C - (D+E)/tanΦ] x Slope - (2D+E) x C.S.	* Y = 0.5" + (2D+E)/tanΦ x Slope - (2D+E) x C.S.
Z = 0.5" - [C - (E)/tan Φ] x Slope - (D+E) x C.S.	* Z = 0.5" + (D+E)/tan Φ x Slope - (D+E) x C.S.

* Could be less than 0.5" for steep slopes. Adjust plate thickness equally at all corners of both left and right side plates to provide a minimum 0.5" thickness.

BEARING PLATE DATA TABLE — Table Date 1-01-08

GENERAL BEARING PLATE DATA									EMBEDDED PLATE DIMENSIONS (PLATE A) (inches)			BEVELED PLATE REQUIRED (Yes/No)	BEVELED PLATE DIMENSIONS (PLATE B) (inches)						
BRG. PLATE MARK ***	SPAN NO(s).	BEAM NO(s).	BEARING TYPE	BEAM END	PLAN VIEW CASE	CROSS SLOPE (%) ##	SLOPE (%) **	ANGLE ∅ *	C	D	C+D/TAN ∅		C	D	C+D/TAN ∅	W	X	Y	Z

NOTES:
* ∅ = Acute angle (≤ 90°) measured from left or right side of ℄ Beam as required (See Plan View Case No.).
** Slope measured along ℄ of Beam at ℄ of Bearing.
Cross Slope measured perpendicular to ℄ of Beam at bottom of beam.
*** See "TABLE OF BEAM VARIABLES" and Index No. 20210.
See Index No. 20502 for additional notes and details.



ISOMETRIC VIEW OF BEVELED BEARING PLATES FOR FLORIDA U-BEAMS
(SKEWED PLATES SHOWN, NON-SKEWED PLATES SIMILAR)

Payment

The cost of beveled and embedded bearing plates is incidental to the cost of the prestressed beams they are used with. No separate payment is made.

Index 20510 Composite Elastomeric Bearing Pads for Florida-I Beams

Design Criteria

AASHTO LRFD Bridge Design Specifications, 4th Edition; ***Structures Design Guidelines (SDG)***

Design Assumptions and Limitations

This standard depicts details and notes for elastomeric bearing pads for prestressed concrete Florida-I Beams with or without skewed end conditions.

This standard is intended for use with prestressed concrete Florida-I Beams, but may be used for steel girder or other bridge types with the appropriate notes and cross references.

Use this standard with Indexes 20010, 20036, 20045, 20054, 20063, 20072, 20078 and 20511.

Beveled Bearing Plates B are required for beams on grades greater than 2%, see instructions for Index 20511.

LIMITING PARAMETERS FOR COMPOSITE ELASTOMERIC BEARING PADS USED WITH FDOT STANDARD FLORIDA-I BEAMS

Pad Type	Maximum Service Live Load (kips)	Maximum Service Dead Load (LL = Actual Service Live Load)	Skew Angle (degrees)	Maximum Shear Deflection (in)	Shear Modulus, G (Psi)
D	135	DL=147+1.75(135-LL)	0 - 5	0.75	110
	110	DL=120+1.75(110-LL)	0 - 15		
E	150	DL=233+1.75(150-LL)	0 - 5	0.75	110
	110	DL=113+1.75(110-LL)	0 - 20		
F	150	DL=290+1.75(150-LL)	0 - 5	1	110
	120	DL=139+1.75(120-LL)	0 - 30		
G	145	DL=230+1.75(145-LL)	0 - 30	1	150
	95	DL=98+1.75(95-LL)	0 - 45		
H	180	DL=268+1.75(180-LL)	0 - 35	1.25	150
	135	DL=230+1.75(135-LL)	0 - 45		
J	145	DL=227+1.75(145-LL)	0 - 45	1.5	150
K	200	DL=383+1.75(200-LL)	0 - 45	1.5	150

The Service Live Load (including impact) and Service Dead Load Reactions can be determined from the beam design. The Shear Deflection is the product of the coefficient of thermal expansion, 65% of the thermal gradient and the length of bridge contributing to movement, plus the contributing beam creep and shrinkage at the bottom of beam. Assume beam creep and shrinkage from day 120 to day 240 (this value can be determined from data in the beam design output).

Standard Elastomeric bearing pads have been designed in accordance with the ***AASHTO LRFD Bridge Design Specifications***, Method "B" (2009 Interim), for a maximum static rotation (beam grade, camber and dead load rotation) of 0.0125 radians and a cyclic rotation (live load) of 0.004 radians. Live load rotations are assumed to be in the opposite direction to static rotations. Rotation does not need to be checked for standard prestressed beams provided that the top of the beveled bearing plates (when required) or the bearing seats (pedestals) are finished approximately parallel to the slope of the beam. The effects of camber (at day 120) from prestressing and dead load deflection may be neglected when determining the slope at the ends of the beam, unless the sum of these effects exceeds 0.0125 radians (1.25%). Bearing seats may be finished level for beam grades less than 0.5%, or when the combined effects of beam grade, camber and dead load rotation do not exceed 1.25%. Whenever possible, the bearing seats at each end of the beam should be detailed with the same slope. See also instructions for Index 20511.

For design values exceeding the limiting parameters shown on this sheet, the designer must develop custom designs and details. For skew angles greater than 45°, consider round pads with elastomer and plate thicknesses similar to those shown in Index 20510.

Plan Content Requirements

In the Structures Plans:

Complete the following "BEARING PAD DATA TABLE" and "ESTIMATED BEARING PAD QUATITIES" table and include them on the supplemental sheets. See Introduction I.3 for more information regarding use of Data Tables.

The "BEARING PAD DATA TABLE" is intended for use with prestressed beam bridges, but may be modified for steel girder or other bridge types. Supplement this table with additional columns or notes as required to clearly identify the location and type of bearing pads.

For beam grades greater than 2%, provide beveled bearing plates in accordance with Index 20511 and include a "BEARING PLATE DATA TABLE" in the plans.

BEARING PAD DATA TABLE				Table Date 7-01-09
SPAN NO(s).	BEAM NO(s).	PAD TYPE	BEAM TYPE	BEAM END *

NOTE:
Work this table with Index No. 20510 for Pad Types D, E, F, G, H, J & K, and/or any project specific bearing pads.
* END 1 = Begin Bridge end of beam (Back station).
END 2 = End Bridge end of beam (Ahead station).

ESTIMATED BEARING PAD QUANTITIES		Table Date 07-01-09
PAD TYPE	NUMBER REQUIRED	QUANTITY (CF)

Payment

Item number	Item description	Unit Measure
400-147	Composite Neoprene Pads	CF

Examples

The following examples show the information required to determine the correct standard elastomeric bearing pad type to use. These examples do not assume any wind or braking loads are applied to the elastomeric bearing pads.

EXAMPLE 1

Given Information:

Superstructure Type - One Simple Span
45" Florida I Beams 101'-0" long, spaced at 9'-0" centers
(99'-8" center to center bearing)
No longitudinal restraints except friction between the pad and the concrete substructure
Service Live Load Reaction = 106 kips
Service Dead Load Reaction = 109 kips
Coefficient of Thermal Expansion = 0.000006/°F
Thermal Gradient = 70°F
Creep and Shrinkage at the Bottom of Beam (from day 120 to day 240) = 0.28"
Shear Deflection = (0.000006/°F x 0.65 x 70°F x 99.67'/2 x 12"/') + 0.280"/2 = 0.30"
Beam Grade = 2.0%
Skew Angle = 15°

Service Dead Load Rotation = 0.007 radians (0.7%)
Beam Camber Rotation @ 120 days = 0.012 radians (1.2%)
Net Beam Camber Rotation after Dead Load Deflection = 0.012 - 0.007 = 0.005 radians (0.5%)

Elastomeric Bearing Pad Type Determination:

Compare the design values to the Limiting Parameters Table, Pad Type D for Florida-I Beams.

Limiting Parameters versus Design Values:

Maximum Service Live Load Reaction of 110 kips versus Design Value of 106 kips; therefore, OK

Maximum Service Dead Load Reaction of 120+1.75(110-106) = 127 kips versus Design Value of 109 kips; therefore, OK

Maximum Shear Deflection of 0.75" versus Design Value of 0.30"; therefore, OK

Skew Angle is between 0° and 15°; therefore, OK

Conclusion:

Use Elastomeric Bearing Pad Type D.

No beveled plate is required. Detail beam seat with a 2% slope along the centerline of beam.

Complete "BEARING PLATE DATA TABLE" for embedded bearing plate only, see instructions for Index 20511.

EXAMPLE 2

Given Information:

Superstructure Type - Four Simple Spans with Continuous Deck
45" Florida I Beams 101'-0" long, spaced at 9'-0" centers
(99'-8" center to center bearing)
No longitudinal restraints except friction between the pad and the concrete substructure
Service Live Load Reaction = 106 kips
Service Dead Load Reaction = 109 kips
Coefficient of Thermal Expansion = 0.000006/°F
Thermal Gradient = 70°F
Creep and Shrinkage at the Bottom of each Beam (from day 120 to day 240) = 0.28"
Shear Deflection = (0.000006/°F x 65% x 70°F x 202' x 12"/') + 0.280"/2 = 0.80"
Beam Grade = 5%
Skew Angle = 15°
Service Dead Load Rotation = 0.007 radians (0.7%)
Beam Camber Rotation @ 120 days = 0.012 radians (1.2%)
Net Beam Camber Rotation after Dead Load Deflection = 0.012 - 0.007 = 0.005 radians (0.5%)

Elastomeric Bearing Pad Type Determination:

Compare the design values to the Limiting Parameters Table, Pad Type F for Florida-I Beams.

Limiting Parameters versus Design Values:

Maximum Service Live Load Reaction of 120 kips versus Design Value of 106 kips; therefore, OK

Maximum Service Dead Load Reaction of 139+1.75(120-106) = 163.5 kips versus Design Value of 109 kips; therefore, OK

Maximum Shear Deflection of 1.0" versus Design Value of 0.80"; therefore, OK

Skew angle is between 0° and 30°; therefore, OK

Conclusion:

Use Elastomeric Bearing Pad Type F. Additionally, because beam end slope exceeds 2%, include a beveled bearing plate in the "BEARING PLATE DATA TABLE" and detail bearing seats level, see instructions for Index 20511. Neglect the effects of net beam camber in the beveled bearing plate design since rotation is less than 0.0125 radians.

Index 20511 Bearing Plate Details Prestressed Florida-I Beams

Design Criteria

AASHTO LRFD Bridge Design Specifications, 4th Edition; ***Structures Design Guidelines (SDG)***

Design Assumptions and Limitations

This standard contains generic details and notes for beveled and embedded bearing plates for prestressed concrete Florida-I Beams with or without skewed end conditions.

Use this standard with Indexes 20010, 20036, 20045, 20054, 20063, 20072, 20078 and 20510.

Embedded Bearing Plates A are required for all Florida-I Beams. Embedded Bearing Plates A and Beveled Bearing Plates B are required for beams on grades greater than 2%.

Plan Content Requirements

In the Structures Plans:

Bearing seats (pedestals) may be finished level for beam grades less than 0.5%. Use Embedded Bearing Plates A but do not use Beveled Bearing Plates B.

For beam grades between 0.5% and 2%, show the bearing seats (pedestals) to be finished parallel to the beam grade with no allowance for beam camber or deflection. Use Embedded Bearing Plates A but do not use Beveled Bearing Plates B.

For beam grades greater than 2%, show the bearing seats (pedestals) to be finished level and use Bearing Plates A and B.

See also instructions for Index 20510.

Complete the following "BEARING PLATE DATA TABLE" and include it in the plans. Fill in the table to correspond with data on the "FLORIDA-I BEAM TABLE OF BEAM VARIABLES" using inch units for Beveled Plate dimensions 'X', 'Y' & 'Z' rounded to 1/16th of an inch. If Beveled Bearing Plates B are not required, fill in the corresponding columns with "N/A". See Introduction I.3 for more information regarding use of Data Tables.

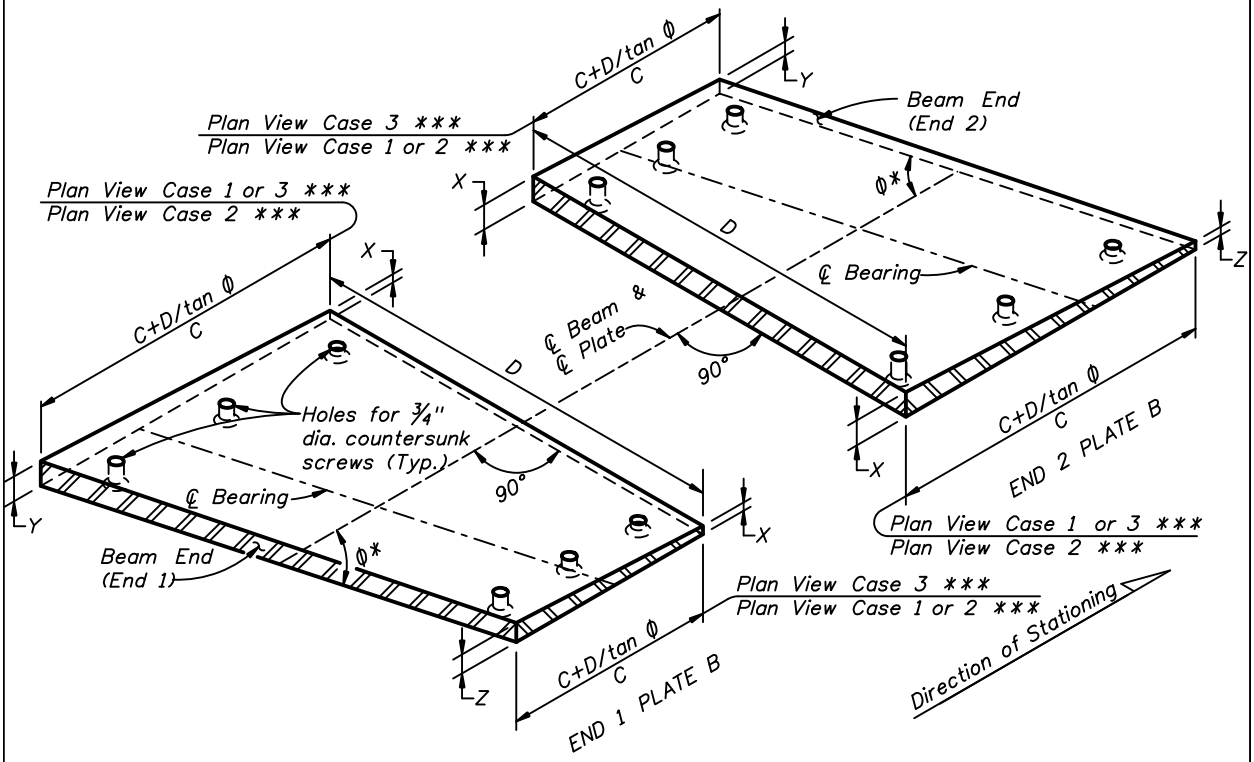
Use the following equations to determine the Beveled Bearing Plate B thicknesses for "PLAN VIEW CASES"' and "END ELEVATION CONDITIONS"' corresponding to those shown on Index 20010. The Slope parameter in these equations requires decimal units and correct sign convention:

END 1	END 2
(I) PLAN VIEW CASE 1:	
(a) END ELEVATION CONDITION 1 or 2 (Positive Slope)	
X = 0.5" + (C) x Slope	X = 0.500"
Y = Z = 0.500"	Y = Z = 0.5" + (C) x Slope
(b) END ELEVATION CONDITION 3 (Negative Slope)	
X = 0.500"	X = 0.5" - (C) x Slope
Y = Z = 0.5" - (C) x Slope	Y = Z = 0.500"
(II) PLAN VIEW CASE 2:	
(a) END ELEVATION CONDITION 1 or 2 (Positive Slope)	
X = 0.5" + (C + D / tan Φ) x Slope	X = 0.500"
Y = 0.500"	Y = 0.5" + (C) x Slope
Z = 0.5" + (D / tan Φ) x Slope	Z = 0.5" + (C + D / tan Φ) x Slope
(b) END ELEVATION CONDITION 3 (Negative Slope)	
X = 0.500"	X = 0.5" - (C + D / tan Φ) x Slope
Y = 0.5" - (C + D / tan Φ) x Slope	Y = 0.5" - (D / tan Φ) x Slope
Z = 0.5" - (C) x Slope	Z = 0.500"
(III) PLAN VIEW CASE 3:	
(a) END ELEVATION CONDITION 1 or 2 (Positive Slope)	
X = 0.5" + (C + D / tan Φ) x Slope	X = 0.500"
Y = 0.5" + (D / tan Φ) x Slope	Y = 0.5" + (C + D / tan Φ) x Slope
Z = 0.500"	Z = 0.5" + (C) x Slope
(b) END ELEVATION CONDITION 3 (Negative Slope)	
X = 0.500"	X = 0.5" - (C + D / tan Φ) x Slope
Y = 0.5" - (C) x Slope	Y = 0.500"
Z = 0.5" - (C + D / tan Φ) x Slope	Z = 0.5" - (D / tan Φ) x Slope

BEARING PLATE DATA TABLE — Table Date 7-01-09

GENERAL BEARING PLATE DATA								EMBEDDED PLATE DIMENSIONS (PLATE A) (inches)			BEVELED PLATE REQUIRED (Yes/No)	BEVELED PLATE DIMENSIONS (PLATE B) (inches)					
BRG. PLATE MARK ***	SPAN NO(s).	BEAM NO(s).	PAD TYPE	BEAM END	PLAN VIEW CASE	SLOPE (%) **	ANGLE ∅ *	C	D	C+D/TAN ∅		C	D	C+D/TAN ∅	X	Y	Z

NOTES:
* ∅ = Acute angle (≤ 90°) measured from left or right side of ℄ Beam as required.
** Slope measured along ℄ of Beam at ℄ of Bearing.
*** See "TABLE OF BEAM VARIABLES" and Index No. 20010.
See Index No. 20511 for additional notes and details.



ISOMETRIC VIEW OF BEVELED BEARING PLATES
(SKEWED PLATES SHOWN, NON-SKEWED PLATES SIMILAR)

Payment

The cost of beveled and embedded bearing plates is incidental to the cost of the prestressed beams they are used with. No separate payment is made.

Index 20600 Series Concrete Piles

Design Criteria

AASHTO LRFD Bridge Design Specifications, 4th Edition; ***Structures Design Guidelines (SDG)***; ***Structures Detailing Manual (SDM)***

Design Assumptions and Limitations

Index 20600 is the lead standard for the Square Prestressed Concrete Pile standard series which includes Indexes 20600 through 20631. Use this standard with Indexes 20601, 20602, 20612, 20614, 20618, 20620, 20624, 20630 and 20631.

Standard piles are designed to have 1000 psi uniform compression after prestress losses without any applied loads.

The piles are designed to have 0.0 psi tension using a load factor of 1.5 times the pile self weight during pick-up, storage and transportation as shown in the "Table of Maximum Pile Pick-Up and Support Lengths" on the standard.

Plan Content Requirements

In the Structures Plans:

Show and label the piles on the Foundation Layout, End Bent, Intermediate Bent, Pier, Footing, Typical Section and other sheets as required.

Complete the following "Data Table" in accordance with ***SDG*** 3.5 and ***SDM*** 11.4 and include it in the contract plans with the "Foundation Layout" sheets. Modify table and notes as required to accommodate the required number of piles, piers and/or bents, use of Test Piles and EDC instrumentation. When not enough space is available on one plan sheet, continuations of the Data Table and/or separate pile cut-off elevation tables are acceptable. See Introduction I.3 for more information regarding use of Data Tables.

For projects without Test Piles change data table column heading "TEST PILE LENGTH (ft.)" to "PILE ORDER LENGTH (ft.)".

PILE DATA TABLE															Table Date 7-01-09									
INSTALLATION CRITERIA								DESIGN CRITERIA							PILE CUT-OFF ELEVATIONS									
PIER or BENT NUMBER	PILE SIZE (in.)	NOMINAL BEARING RESISTANCE (tons)	TENSION RESISTANCE (tons)	MINIMUM TIP ELEVATION (ft.)	TEST PILE LENGTH (ft.)	REQUIRED JET ELEVATION (ft.)	REQUIRED PREFORM ELEVATION (ft.)	FACTORED DESIGN LOAD (tons)	DOWN DRAG (tons)	TOTAL SCOUR RESISTANCE (tons)	NET SCOUR RESISTANCE (tons)	100-YEAR SCOUR ELEVATION (ft.)	LONG TERM SCOUR ELEVATION (ft.)	RESISTANCE FACTOR-Ø	PILE 1	PILE 2	PILE 3	PILE 4	PILE 5	PILE 6	PILE 7	PILE 8	PILE 9

$$\frac{\text{Factored Design Load} + \text{Net Scour Resistance} + \text{Down Drag}}{Ø} \leq \text{Nominal Bearing Resistance}$$

TENSION RESISTANCE – The ultimate side friction capacity that must be obtained below the 100 year scour elevation to resist pullout of the pile (Specify only when design requires tension capacity).

TOTAL SCOUR RESISTANCE – An estimate of the ultimate static side friction resistance provided by the scourable soil.

NET SCOUR RESISTANCE – An estimate of the ultimate static side friction resistance provided by the soil from the required preformed or jetting elevation to the scour elevation.

100-YEAR SCOUR ELEVATION – Estimated elevation of scour due to the 100 year storm event.

LONG TERM SCOUR ELEVATION – Estimated elevation of scour used in design for extreme event loading.

PILE INSTALLATION NOTES:

Contractor to verify location of all utilities prior to any pile driving.

Minimum Tip Elevation is required for lateral stability.

When a required jetting elevation is shown, the jet shall be lowered to the elevation and continue to operate at this elevation until the pile driving is completed. If jetting or preforming elevations differ from those shown on the table, the Engineer shall be responsible for determination of the required driving resistance.

No jetting will be allowed without the approval of the Engineer.

The Contractor should not anticipate being allowed to jet piles below the minimum tip elevation.

At each Bent, pile driving is to commence at the center of the Bent and proceed outward.

EMBEDDED DATA COLLECTOR NOTE:

Provide Embedded Data Collector (EDC) Instrumentation in all piles in accordance with Design Standard Index No. 20602.

Payment

Item number	Item description	Unit Measure
455-34-AA	Prestressed Concrete Piling	LF

Index 20654 54" Precast / Post-Tensioned Concrete Cylinder Pile

Design Criteria

AASHTO LRFD Bridge Design Specifications, 4th Edition; ***Structures Design Guidelines (SDG)***; ***Structures Detailing Manual (SDM)***

Design Assumptions and Limitations

Standard piles are designed to have 1000 psi uniform compression after prestress losses without any applied loads.

The piles are designed to have 0.0 psi tension using a load factor of 1.5 times the pile self weight during pick-up, storage and transportation as shown in the "Table of Maximum Pile Pick-Up and Support Lengths" on the standard.

Plan Content Requirements

In the Structures Plans:

Show and label the piles on the Foundation Layout, End Bent, Intermediate Bent, Pier, Footing, Typical Section and other sheets as required.

Complete the following "Data Table" in accordance with ***SDG*** 3.5 and ***SDM*** 11.4 and include it in the contract plans with the "Foundation Layout" sheets. Modify table and notes as required to accommodate the required number of piles, piers and/or bents and use of Test Piles. When not enough space is available on one plan sheet, continuations of the Data Table and/or separate pile cut-off elevation tables are acceptable. See Introduction I.3 for more information regarding use of Data Tables.

For projects without Test Piles change column heading "TEST PILE LENGTH (ft.)" to "PILE ORDER LENGTH (ft.)".

PILE DATA TABLE

Table Date 7-01-09

INSTALLATION CRITERIA								DESIGN CRITERIA							PILE CUT-OFF ELEVATIONS								
PIER or BENT NUMBER	PILE SIZE (in.)	NOMINAL BEARING RESISTANCE (tons)	TENSION RESISTANCE (tons)	MINIMUM TIP ELEVATION (ft.)	TEST PILE LENGTH (ft.)	REQUIRED JET ELEVATION (ft.)	REQUIRED PREFORM ELEVATION (ft.)	FACTORED DESIGN LOAD (tons)	DOWN DRAG (tons)	TOTAL SCOUR RESISTANCE (tons)	NET SCOUR RESISTANCE (tons)	100-YEAR SCOUR ELEVATION (ft.)	LONG TERM SCOUR ELEVATION (ft.)	RESISTANCE FACTOR-Ø	PILE 1	PILE 2	PILE 3	PILE 4	PILE 5	PILE 6	PILE 7	PILE 8	PILE 9

$$\frac{\text{Factored Design Load} + \text{Net Scour Resistance} + \text{Down Drag}}{Ø} \leq \text{Nominal Bearing Resistance}$$

TENSION RESISTANCE – The ultimate side friction capacity that must be obtained below the 100 year scour elevation to resist pullout of the pile (Specify only when design requires tension capacity).

TOTAL SCOUR RESISTANCE – An estimate of the ultimate static side friction resistance provided by the scourable soil.

NET SCOUR RESISTANCE – An estimate of the ultimate static side friction resistance provided by the soil from the required preformed or jetting elevation to the scour elevation.

100-YEAR SCOUR ELEVATION – Estimated elevation of scour due to the 100 year storm event.

LONG TERM SCOUR ELEVATION – Estimated elevation of scour used in design for extreme event loading.

PILE INSTALLATION NOTES:

Contractor to verify location of all utilities prior to any pile driving.

Minimum Tip Elevation is required for lateral stability.

When a required jetting elevation is shown, the jet shall be lowered to the elevation and continue to operate at this elevation until the pile driving is completed. If jetting or preforming elevations differ from those shown on the table, the Engineer shall be responsible for determination of the required driving resistance.

No jetting will be allowed without the approval of the Engineer.

The Contractor should not anticipate being allowed to jet piles below the minimum tip elevation.

At each Bent, pile driving is to commence at the center of the Bent and proceed outward.

EMBEDDED DATA COLLECTOR NOTE:

Provide Embedded Data Collector (EDC) Instrumentation in all piles in accordance with Design Standard Index No. 20602.

Payment

Item number	Item description	Unit Measure
455-36-1	Concrete Cylinder Piles Furnished & Driven (54" Diameter)	LF

Index 20660 60" Prestressed Concrete Cylinder Pile

Design Criteria

AASHTO LRFD Bridge Design Specifications, 4th Edition; ***Structures Design Guidelines (SDG)***; ***Structures Detailing Manual (SDM)***

Design Assumptions and Limitations

Standard piles are designed to have 1000 psi uniform compression after prestress losses without any applied loads.

The piles are designed to have 0.0 psi tension using a load factor of 1.5 times the pile self weight during pick-up, storage and transportation as shown in the "Table of Maximum Pile Pick-Up and Support Lengths" on the standard.

Plan Content Requirements

In the Structures Plans:

Show and label the piles on the Foundation Layout, End Bent, Intermediate Bent, Pier, Footing, Typical Section and other sheets as required.

Complete the following "Data Table" in accordance with ***SDG*** 3.5 and ***SDM*** 11.4 and include it in the contract plans with the "Foundation Layout" sheets. Modify table and notes as required to accommodate the required number of piles, piers and/or bents and use of Test Piles. When not enough space is available on one plan sheet, continuations of the Data Table and/or separate pile cut-off elevation tables are acceptable. See Introduction I.3 for more information regarding use of Data Tables.

For projects without Test Piles change column heading "TEST PILE LENGTH (ft.)" to "PILE ORDER LENGTH (ft.)".

PILE DATA TABLE																					Table Date 7-01-09
INSTALLATION CRITERIA								DESIGN CRITERIA							PILE CUT-OFF ELEVATIONS									
PIER or BENT NUMBER	PILE SIZE (in.)	NOMINAL BEARING RESISTANCE (tons)	TENSION RESISTANCE (tons)	MINIMUM TIP ELEVATION (ft.)	TEST PILE LENGTH (ft.)	REQUIRED JET ELEVATION (ft.)	REQUIRED PREFORM ELEVATION (ft.)	FACTORED DESIGN LOAD (tons)	DOWN DRAG (tons)	TOTAL SCOUR RESISTANCE (tons)	NET SCOUR RESISTANCE (tons)	100-YEAR SCOUR ELEVATION (ft.)	LONG TERM SCOUR ELEVATION (ft.)	RESISTANCE FACTOR-Ø	PILE 1	PILE 2	PILE 3	PILE 4	PILE 5	PILE 6	PILE 7	PILE 8	PILE 9

$$\frac{\text{Factored Design Load} + \text{Net Scour Resistance} + \text{Down Drag}}{Ø} \leq \text{Nominal Bearing Resistance}$$

TENSION RESISTANCE – The ultimate side friction capacity that must be obtained below the 100 year scour elevation to resist pullout of the pile (Specify only when design requires tension capacity).

TOTAL SCOUR RESISTANCE – An estimate of the ultimate static side friction resistance provided by the scourable soil.

NET SCOUR RESISTANCE – An estimate of the ultimate static side friction resistance provided by the soil from the required preformed or jetting elevation to the scour elevation.

100-YEAR SCOUR ELEVATION – Estimated elevation of scour due to the 100 year storm event.

LONG TERM SCOUR ELEVATION – Estimated elevation of scour used in design for extreme event loading.

PILE INSTALLATION NOTES:

Contractor to verify location of all utilities prior to any pile driving.

Minimum Tip Elevation is required for lateral stability.

When a required jetting elevation is shown, the jet shall be lowered to the elevation and continue to operate at this elevation until the pile driving is completed. If jetting or preforming elevations differ from those shown on the table, the Engineer shall be responsible for determination of the required driving resistance.

No jetting will be allowed without the approval of the Engineer.

The Contractor should not anticipate being allowed to jet piles below the minimum tip elevation.

At each Bent, pile driving is to commence at the center of the Bent and proceed outward.

EMBEDDED DATA COLLECTOR NOTE:

Provide Embedded Data Collector (EDC) Instrumentation in all piles in accordance with Design Standard Index No. 20602.

Payment

Item number	Item description	Unit Measure
455-36-2	Concrete Cylinder Piles Furnished & Driven (60" Diameter)	LF

Index 20900 Approach Slabs (Flexible Pavement Approaches)

Design Criteria

AASHTO LRFD Bridge Design Specifications, 4th Edition; ***Structures Detailing Manual (SDM)***

Design Assumptions and Limitations

Index 20900 is intended to be used with asphalt (flexible) roadway approach pavement.

Approach Slabs are intended to provide a smooth vertical transition between the roadway approach pavement and the bridge. They are supported at the bridge end by the end bent and by the embankment at the roadway approach end. This support configuration allows the Approach Slabs to rotate and settle as the roadway approach embankment settles. No additional supports (piles, footings, etc.) are required or allowed.

Index 20900 requires supplemental sheets, a completed data table and reinforcing bar lists to be included in the Structures Plans. Some roadway elements may need to be carried onto the approach slab, and in these cases special attention must be given to clarifying in the plans which elements are to be included as part of the roadway.

Plan Content Requirements

In the Structures Plans:

Include supplemental sheets showing as a minimum a Plan View with geometry and pertinent information not covered by this standard e.g., Survey Lines, PGL, Direction of Stationing, Phase Construction Joints, Raised Sidewalks and any other information necessary to accurately complete detailing of the Approach Slabs. Match the skew angle of the bridge at both ends of the Approach Slab. Include cross references to ***Design Standards*** Index 20900.

Urban roadway approaches usually have a 6-inch raised sidewalk. If the raised sidewalk is not continued across the bridge, when possible, transition the raised sidewalk to the bridge sidewalk over the length of the approach slab. Design and detail the transition to prohibit low spots or ponding and to redirect or collect runoff from the bridge and approach slab into suitable roadway or drainage structures.

Include Approach Slab Finish Grade Elevations with the Bridge Finish Grade Elevations. Show Finish Grade Elevations at the top of the asphalt overlay.

Include reinforcing bars in the Reinforcing Steel List. All reinforcing bars are straight bars (Types 1 and 2). Bars 5C are 5'-0" long.

Complete the following "Approach Slab Index No. 20900 Table of Dimensions and Estimated Quantities" and include it on the supplemental sheets. See Introduction I.3 for more information regarding use of Data Tables.

APPROACH SLAB INDEX NO. 20900 TABLE OF DIMENSIONS AND ESTIMATED QUANTITIES — Table Date 7-01-05

LOCATION	DIMENSIONS					ANGLE Ø	REINFORCING STEEL (Lbs.)	CLASS II CONCRETE (C.Y.)
	L 1	L 2	M1	M2	N			

Dimension and Quantity Notes:
Dimensions 'L 1' & 'L 2' are measured along gutter line, inside face of parapet or inside face of railing on raised sidewalks.
Dimensions 'L 1' & 'L 2' are arc dimensions within curved alignments.

Quantities shown are for one Approach Slab and where applicable, raised sidewalks. Quantities do not include items placed on the slab such as Traffic Railing, Pedestrian/Bicycle Railings or Traffic Separators.

For Traffic Railing, Pedestrian/Bicycle Railing and Traffic Separator Quantities see Bid Item List.

Payment.

Item number	Item description	Unit Measure
400-2-10	Concrete Class II, Approach Slabs	CY
415-1-9	Reinforcing Steel - Approach Slabs	LB

The stabilization required under the approach slabs shall be paid for using the standard roadway pay item and the quantity included in the roadway plans. In addition, roadway elements such as guardrail, earthwork, sidewalks, approach slab surfacing, etc., which are part of the roadway approaches to the bridge and which interface with the approach slabs, will also be included and paid for in the roadway quantities.

Index 20910 Approach Slabs (Rigid Pavement Approaches)

Design Criteria

AASHTO LRFD Bridge Design Specifications, 4th Edition; ***Structures Detailing Manual (SDM)***

Design Assumptions and Limitations

Index 20910 is intended to be used with concrete (rigid) roadway approach pavement.

Approach Slabs are intended to provide a smooth vertical transition between the roadway approach pavement and the bridge. They are supported at the bridge end by the end bent and by the embankment at the roadway approach end. This support configuration allows the Approach Slabs to rotate and settle as the roadway approach embankment settles. No additional supports (piles, footings, etc.) are required or allowed.

Index 20910 works with Index 306 Bridge Approach Expansion Joint Concrete Pavement. The roadway approach end of the Approach Slab must be non-skewed to match up with Index 306.

Index 20910 requires supplemental sheets, a completed data table and reinforcing bar lists to be included in the Structures Plans. Some roadway elements may need to be carried onto the approach slab, and in these cases special attention must be given to clarifying in the plans which elements are to be included as part of the roadway.

Plan Content Requirements

In the Structures Plans:

Include supplemental sheets showing as a minimum a Plan View with geometry and pertinent information not covered by this standard e.g., Survey Lines, PGL, Direction of Stationing, Phase Construction Joints, Raised Sidewalks and any other information necessary to accurately complete detailing of the Approach Slabs. Match the skew angle of the bridge at the bridge end of the Approach Slab. The roadway approach end of the Approach Slab shall be non-skewed (perpendicular to the stationing line) to match up with the details shown on Index 306 Bridge Approach Expansion Joint Concrete Pavement. Include cross references to ***Design Standards*** Index 20910.

Urban roadway approaches usually have a 6-inch raised sidewalk. If the raised sidewalk is not continued across the bridge, when possible, transition the raised sidewalk to the bridge sidewalk over the length of the approach slab. Design and detail the transition to prohibit low spots or ponding and to redirect or collect runoff from the bridge and approach slab into suitable roadway or drainage structures.

Include Approach Slab Finish Grade Elevations with the Bridge Finish Grade Elevations.

Include reinforcing bars in the Reinforcing Steel List. All reinforcing bars are straight bars (Types 1 and 2). Bars 5C1 are 5'-0" long.

Complete the following "Approach Slab Index No. 20910 Table of Dimensions and Estimated Quantities" and include it on the supplemental sheets. See Introduction I.3 for more information regarding use of Data Tables.

APPROACH SLAB INDEX NO. 20910 TABLE OF DIMENSIONS AND ESTIMATED QUANTITIES — Table Date 7-01-05

LOCATION	DIMENSIONS					ANGLE Ø	REINFORCING STEEL (Lbs.)	CLASS II CONCRETE (C.Y.)
	L 1	L 2	M1	M2	N			

Dimension and Quantity Notes:
Dimensions 'L 1' & 'L 2' are measured along gutter line, inside face of parapet or inside face of railing on raised sidewalks.
Dimensions 'L 1' & 'L 2' are arc dimensions within curved alignments.

Quantities shown are for one Approach Slab and where applicable, raised sidewalks. Quantities do not include items placed on the slab such as Traffic Railing, Pedestrian/Bicycle Railings or Traffic Separators.

For Traffic Railing, Pedestrian/Bicycle Railing and Traffic Separator Quantities see Bid Item List.

Payment.

Item number	Item description	Unit Measure
400-2-10	Concrete Class II, Approach Slabs	CY
400-9	Bridge Deck Grooving and Planing - Deck Thickness 8.5" or Greater	SY
415-1-9	Reinforcing Steel - Approach Slabs	LB

The stabilization required under the approach slabs shall be paid for using the standard roadway pay item and the quantity included in the roadway plans. In addition, roadway elements such as guardrail, earthwork, sidewalks, etc., which are part of the roadway approaches to the bridge and which interface with the approach slabs, will also be included and paid for in the roadway quantities.

Index 21100 Strip Seal Expansion Joint

Design Criteria

AASHTO LRFD Bridge Design Specifications, 4th Edition; ***Structures Design Guidelines (SDG)***

Design Assumptions and Limitations

Use Index 21100 in accordance with the requirements of ***SDG*** 6.4.

Plan Content Requirements

Show Strip Seal Expansion Joints on Superstructure and Approach Slab detail sheets and other sheets as required. Show Sidewalk Cover Plates at all expansion joint locations along sidewalks. Include cross references to ***Design Standards*** Index 21100.

Complete the following "Strip Seal Expansion Joint Data Table Index No. 21100" using the instructions provided and include the table in the plans. See Introduction I.3 for more information regarding use of Data Tables.

Instructions:

1. Total Design Movement shall be the factored movement.
2. Dimension "A" (measured perpendicular to the joint) @ 70°F is normally set at 2 inches to accommodate installation of the neoprene seal and a total design movement up to 3 inches. The designer should adjust Dimension "A" when necessary to account for skews or greater design movement with the following considerations:
   a. the minimum joint opening in the Direction of Movement is ½ inch for the factored movement;
   b. the maximum joint opening in the Direction of Travel ("W" per ***SDG*** 6.4) is 4 inches for the factored movement;
3. Dimension "A" adjustments for 10°F shall be based on the unfactored movements.
4. See Figures 1 through 4 for determining the Direction of Movement.

STRIP SEAL EXPANSION JOINT DATA TABLE
INDEX NO. 21100

Table Date 7-01-09

LOCATION	TOTAL DESIGN MOVEMENT			MOVEMENT ANGLE α	SKEW ANGLE		DIM. "A" @ 70°F	DIM. "A" ADJUSTMENT PER 10°F
	IN DIRECTION OF MOVEMENT	PERPENDICULAR TO ℄ JOINT	PARALLEL TO ℄ JOINT		LEFT SIDE	RIGHT SIDE		

NOTE:
Dim. "A" adjustment per 10°F shown is measured perpendicular to ℄ Expansion Joint. For theoretical direction of movement, see Index No. 21100, Sheet 2 of 3.

Figure 1 Curved Bridge (Single Continuous Unit) with Skewed Joints

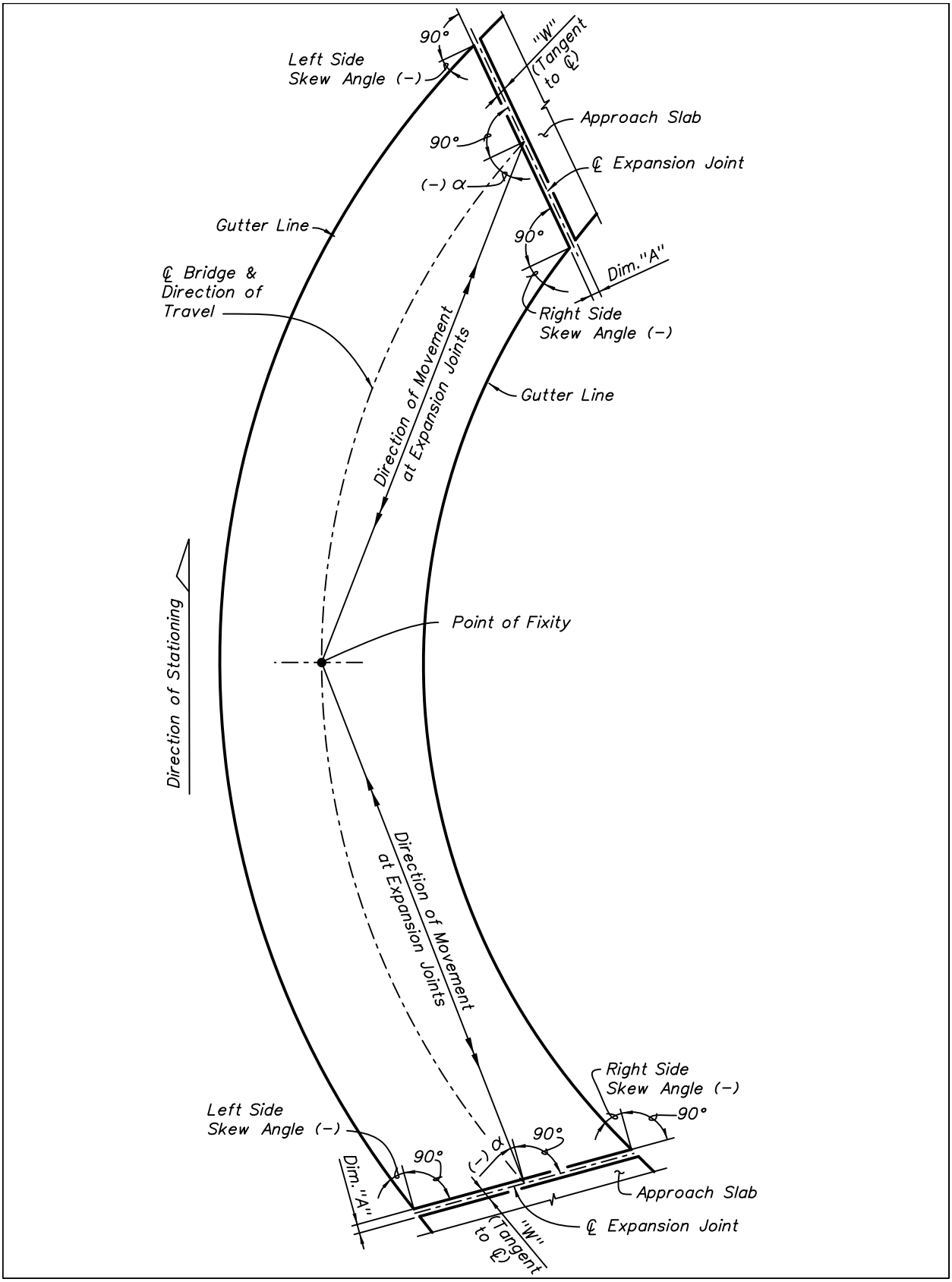


Figure 2 Curved Bridge (Single Continuous Unit) with Radial Joints

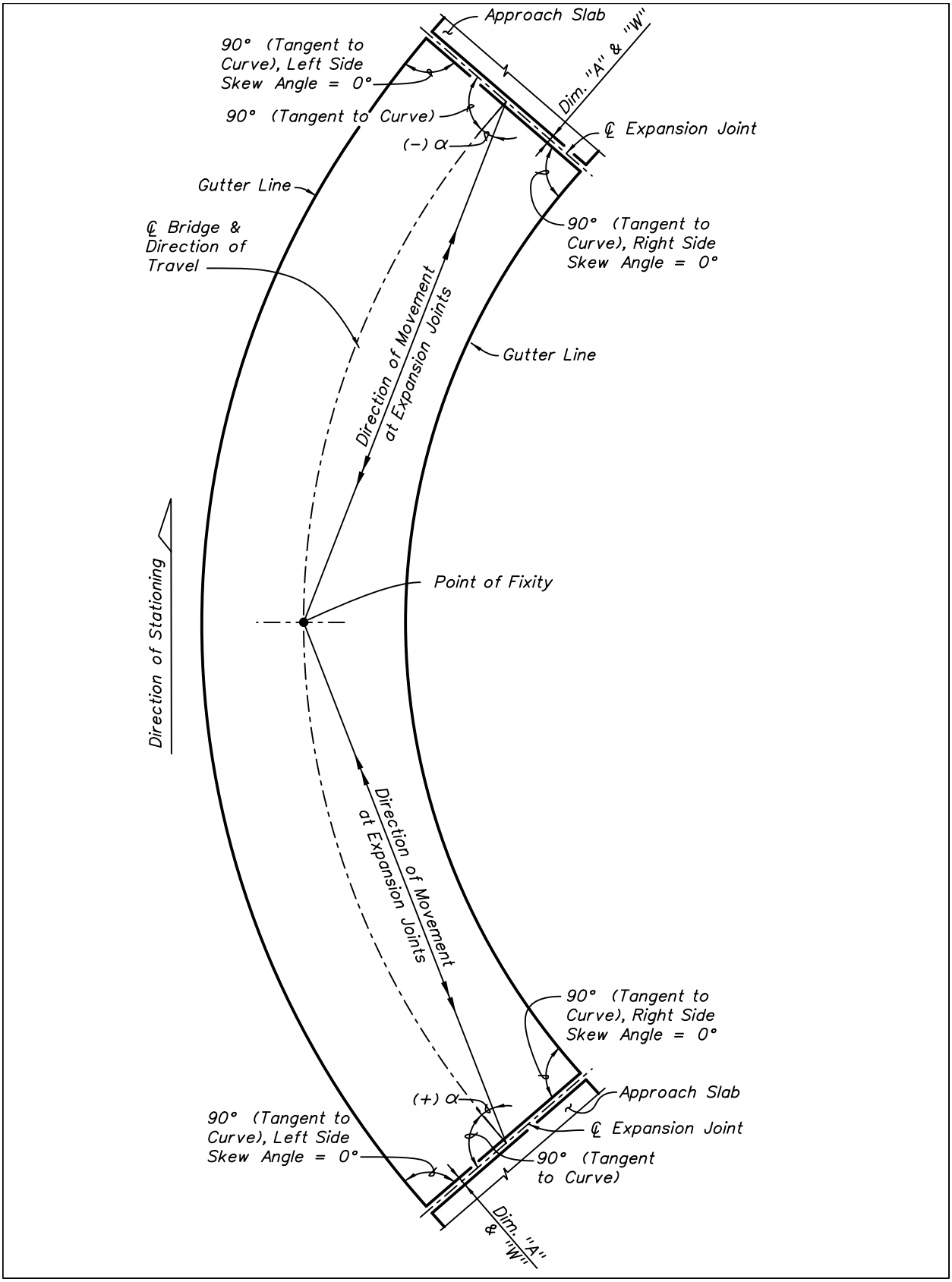


Figure 3 Curved Bridge (Multiple Continuous Units) with Radial Joints

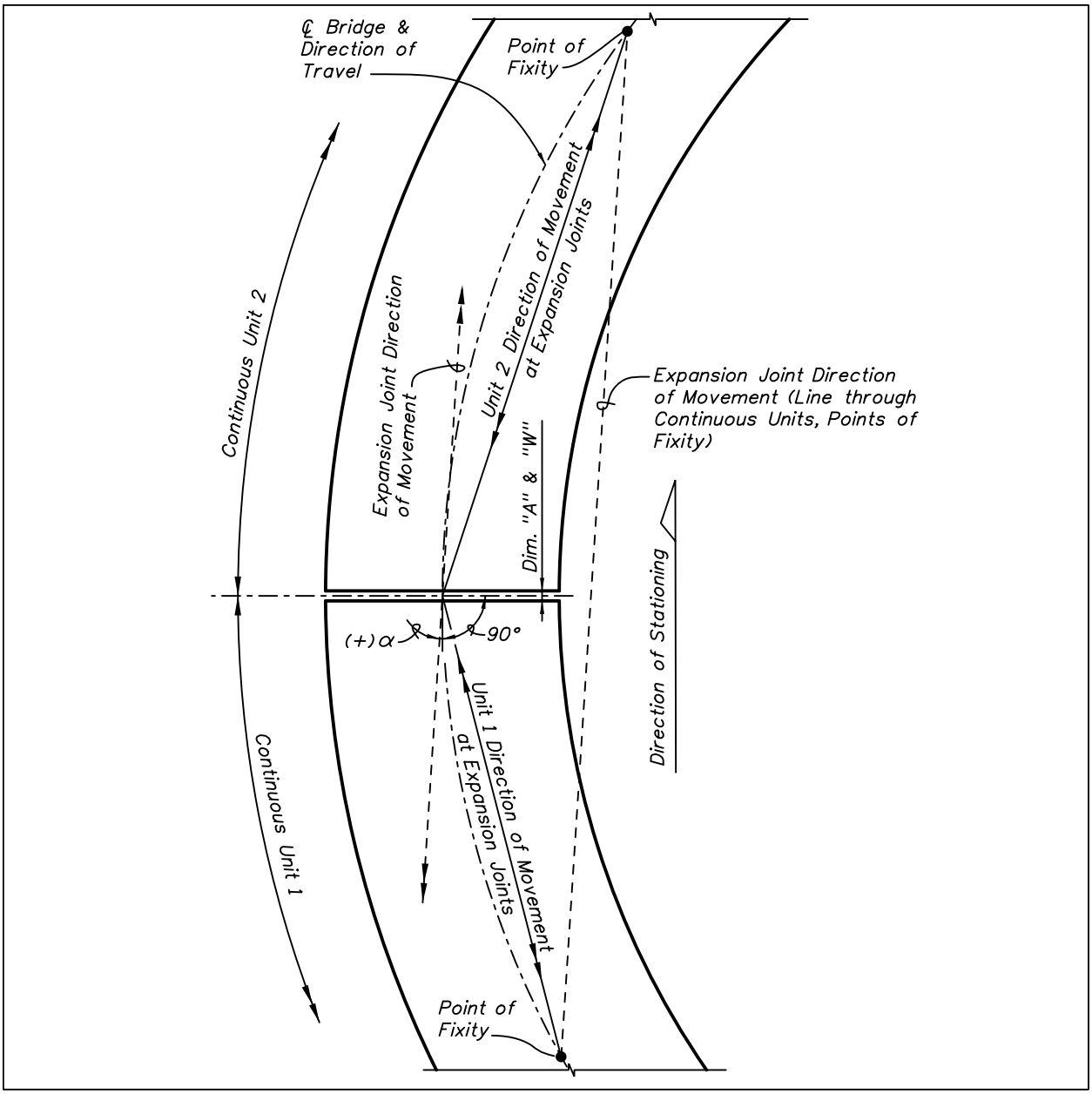
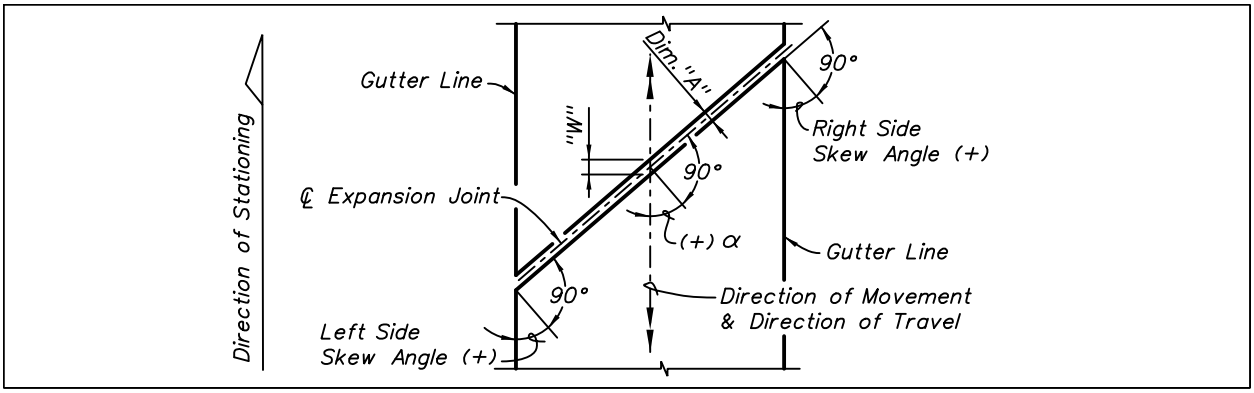


Figure 4 Straight Bridge with Skewed Joints



Payment.

Item number	Item description	Unit Measure
458-1-12	Bridge Deck Expansion Joint; New Construction - F&I; Strip Seal Joint System	LF

Index 21110 Poured Joint with Backer Rod Expansion Joint System

Design Criteria

AASHTO LRFD Bridge Design Specifications, 4th Edition; ***Structures Design Guidelines (SDG)***

Design Assumptions and Limitations

Use Index 21110 in accordance with the requirements of ***SDG*** 6.4.

Allow for a minimum (fully closed) opening of 50% of Dimension "A" and a maximum opening of 3" (measured in the direction of travel).

Plan Content Requirements

Show Poured Joint with Backer Rod Expansion Joints on Superstructure and Approach Slab detail sheets and other sheets as required. Show Sidewalk Cover Plates at all expansion joint locations along sidewalks. Include cross references to ***Design Standards*** Index 21110.

Complete the following "Poured Expansion Joint Data Table Index No. 21110" using the instructions provided and include the table in the plans. See Introduction I.3 for more information regarding use of Data Tables.

Instructions:

1. Total Design Movement shall be the factored movement.
2. Dimension "A" (measured perpendicular to the joint) @ 70°F is normally set at 2 inches for a total design movement up to 2 inches for non-skewed joints. The designer may reduce Dimension "A" when necessary to account for skews or smaller design movement with the following considerations:
    a. The design joint opening (Dimension "A") should not be less than twice the joint contraction;
    b. The minimum joint opening in the Direction of Movement is ½ inch for the factored movement;
    c. The maximum joint opening in the Direction of Travel is 3 inches for the factored movement;
    d. The minimum joint opening recommended by manufacturers at the time of installation is 1 inch.
3. Dimension "A" adjustments for 10°F shall be based on the unfactored movements.
4. See Instructions for Index 21100 (Figures 1 through 4) for determining the Direction of Movement.

POURED EXPANSION JOINT DATA TABLE INDEX NO. 21110			Table Date 1-01-09
LOCATION	DIM. "A" @ 70°F	TOTAL DESIGN MOVEMENT	DIM. "A" ADJUSTMENT PER 10°F

NOTE:
Dim. "A" adjustment per 10°F shown is measured perpendicular to ℄ Expansion Joint. Work this table with Design Standards Index No. 21110.

Payment

Item number	Item description	Unit Measure
458-1-AB	Bridge Deck Expansion Joint	LF

Index 21200 Light Pole Pilaster

Design Criteria

AASHTO LRFD Bridge Design Specifications, 4th Edition; ***Structures Design Guidelines (SDG)***

Design Assumptions and Limitations

The pilaster and supporting deck are designed to resist the following Working Loads from the light pole applied at the top of the pilaster:

Axial Dead Load = 1.560 kip

Wind Load Moment about Transverse Axis = 40.60 kip-ft

Wind Load Moment about Longitudinal Axis = 28.30 kip-ft

Dead Load Moment about Longitudinal Axis = 1.690 kip-ft

Maximum Shear = 1.380 kip

Torsion about Pole Axis = 3.560 kip-ft

In order to minimize vibration of light poles due to traffic, locate pilasters near substructure supports.

Locate the centerlines of pilasters a minimum 3'-10" away from centerlines of open joints in railings and ends of railings.

Design of the additional bridge deck reinforcement is based on the minimum transverse top deck reinforcing required by the ***SDG***.

Use this standard with Indexes 420, 422, 423, 424, 425, 820, 821, 5210 and 5212 as appropriate.

Plan Content Requirements

In the Structures Plans:

Show Light Pole Pilasters on Plan and Elevation, Superstructure and Approach Slab Supplemental Detail sheets. Use stations or longitudinal dimensions along bridge to define pilaster locations.

Payment

No separate payment is made for Light Pole Pilasters. See Payment Note on the ***Design Standard***.

Index 21210 Utility Conduit Details

Design Criteria

NFPA National Electric Code; ***Structures Detailing Manual (SDM)***; ***AASHTO LRFD Bridge Design Specifications***, 4th Edition and ***NCHRP Report 350*** Test Level 4 Criteria (for traffic railing installations)

Design Assumptions and Limitations

This standard can be used for electrical service for highway or navigation lighting, ITS applications or for accommodating permitted and compatible utility facilities.

The details as shown for installing two 2" diameter conduits and associated pull boxes in traffic railings have been determined to be crashworthy in accordance with the requirements of ***NCHRP Report 350*** and the ***AASHTO LRFD Bridge Design Specifications***.

Plan Content Requirements

Provide supplemental designs, notes, details, wiring diagrams and wiring specifications in the plans as required to complement this Standard.

Coordinate with the highway lighting designer, navigation lighting designer and/or District Utility Coordinator as appropriate to determine the present and future electrical service and utility accommodation requirements at the project location.

In the Structures and/or Retaining Wall Plans:

Specify in the plans the type of Pull Boxes required: Pull Box "A" - multiple raceways; Pull Box "B" - single raceways. Generally, multiple raceway Pull Boxes can be used where utilities contained within individual raceways (conduits) can share a common Pull Box. Single raceway Pull Boxes should be used where it is desirable or required that utilities contained within individual raceways (conduits) be isolated from each other.

Specify the type of fittings required at Expansion Joint locations on bridges: Expansion Fittings or Expansion / Deflection Fittings. Generally, Expansion Fittings can be typically used for bridges on tangent or large radius curved alignments where little or no transverse movement is expected at Expansion Joints. Expansion / Deflection Fittings are typically required for bridges on curved alignments or combined curved and tangent alignments where transverse movement is expected at Expansion Joints.

For electrical service, specify the use of THWN or XHHW conductors only.

Payment

Generally the cost of furnishing and installing Conduit, Pull Boxes, Expansion and Expansion / Deflection Fittings and all associated hardware required to complete the installation is included in the cost for the Traffic Railing or Pedestrian Railing (Parapet) that the conduit is installed in.

However, there may be special cases where a utility owner provides conduit materials and the Department pays for the installation. In these cases, coordinate payment issues with the District Utility Coordinator.

Index 21220 Navigation Light System Details (Fixed Bridges)

Design Criteria

Structures Design Guidelines (SDG); Code of Federal Regulations Title 33, Chapter 1, Part 118; United States Coast Guard ***Bridge Lighting and Other Signals*** manual.

Design Assumptions and Limitations

Project specific designs are required for structures supporting Green Center Channel and Red Channel Margin Lights.

Provide design of RFL locations and configurations in Fender System drawings if applicable.

If actual conditions differ from the typical configurations shown on the standard, design a project specific Navigation Light System to comply with ***Code of Federal Regulations Title 33, Chapter 1, Part 118*** and United States Coast Guard ***Bridge Lighting and Other Signals*** manual.

Include the height of Green Center Channel and Red Channel Margin Lights when establishing superstructure heights to comply with vertical clearance requirements.

Use this standard with Indexes 21210, 21900, 21910, 21920 and 21930, and/or project specific details as required.

Plan Content Requirements

In the Structures Plans:

Show fully detailed project specific designs of structures supporting Green Center Channel and Red Channel Margin Lights. Specify requirement for automatic lock positions for service and operating. Specify light and Service Chain mounting locations.

Show fully detailed project specific designs for Red Pier / Fender and Red Channel Margin Lights.

Prepare supplemental designs as required showing locations and details of conduit runs, power sources and other electrical components and incidental items.

Payment

Item number	Item description	Unit Measure
510-1	Navigation Lights - Fixed Bridge	LS

Index 21240 Maintenance Lighting For Box Girders

Design Criteria

NFPA National Electric Code; ***Structures Design Guidelines (SDG)***

Design Assumptions and Limitations

This standard shows basic details and requirements for maintenance lighting systems located inside concrete and steel box girder superstructures. It does not show all structural elements and is not intended to show the exact location of conduit runs.

Lighting fixtures and equipment locations must be coordinated with the box girder superstructure details, e.g., structural steel components, metal stay-in-place deck formwork and post tensioning systems in concrete box girders.

This standard may be used in conjunction with Index 21210.

Plan Content Requirements

In the Structures Plans:

Show interior lighting and electrical outlets spaced at not more than 50 feet. Where inside box girder heights permit, show lighting mounted along center of box.

Prepare supplemental designs as required showing locations and details of conduit runs, power sources and other electrical components and incidental items.

Payment

Item number	Item description	Unit Measure
715-50	Lighting - Inside Box Girder	LS

Index 21300 Standard Bar Bending Details

Design Criteria

AASHTO LRFD Bridge Design Specifications, 4th Edition; ***Structures Detailing Manual (SDM)***; ***ACI 318 Building Code Requirements for Structural Concrete and Commentary***

Design Assumptions and Limitations

Index 21300 includes commonly used types, shapes and configurations of straight and bent reinforcing steel bars. This standard works with the REINFORCING BAR LIST that must be completed and included in the plans.

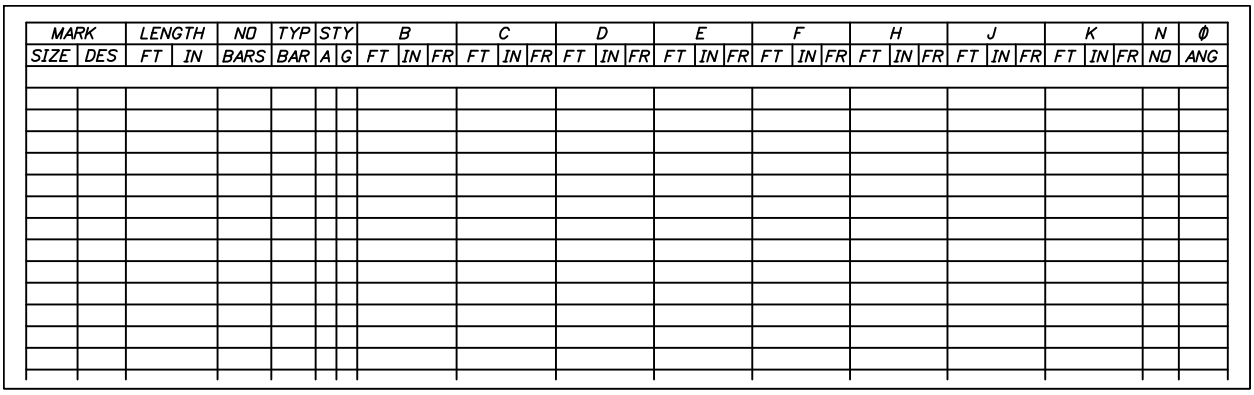
Plan Content Requirements

Complete and include in the plans the REINFORCING BAR LIST for cast-in-place concrete components if the reinforcing steel within the component is not considered incidental to the cost of the component. Do not include reinforcing steel for drilled shafts, auger cast piles and standard traffic and pedestrian railings, and all precast components, e.g. prestressed concrete piles and beams, MSE wall copings and precast sound barrier posts and panels. For additional information and guidance see the ***Specifications***, ***Design Standards*** and/or ***Instructions for Design Standards*** for a given component.

The REINFORCING BAR LIST may be completed using the Rebar Application provided with the FDOT CADD Bar Menu (preferred method) or it may be prepared by other manual, automated or combination methods.

Include a reference to Design Standard 21300 on the REINFORCING BAR LIST sheets

.



Payment

Item number	Item description	Unit Measure
415-1-A	Reinforcing Steel	LB

Index 21600 Series Temporary Detour Bridge

Design Criteria

AASHTO LRFD Bridge Design Specifications, 4th Edition; ***Structures Design Guidelines (SDG)***; ***Acrow Panel Bridging Series 300 Technical Handbook***

Design Assumptions and Limitations

These Standards are based on the FDOT current inventory of temporary bridge components which are manufactured in accordance with Acrow Series 300 Double Wide design. Details presented in these Standards are for a Double Single configuration and incorporating the Double Wide Light Transom. Refer to "***Acrow Panel Bridging Series 300 Technical Handbook***" for temporary bridge dimensions, capacities and component designations. Contact the Structures Design Office to obtain a copy of this handbook.

The Acrow Panel Bridging with the Double Single configuration is designed to meet a HS20-44 loading for simple spans up to 50 feet and continuous spans up to 60 feet, based on two lanes of traffic.

The FDOT Office of Maintenance maintains the inventory of FDOT owned temporary bridge components. Contact the Office of Maintenance to coordinate the availability of temporary bridge components that are required for a given project.

Establish temporary bridge length to accommodate project geometric needs, environmental permits, drainage requirements, etc., using the following span length and arrangement criteria.

Details presented in the standards assume one single span or the use of continuous spans for multiple span bridges. Limit continuous length of bridge to 360' in accordance with these standard details. If a total bridge length in excess of 360' is required, supplemental details are required for the mid-bridge expansion joint(s) and associated intermediate bent support(s).

Vary span lengths in increments of 10' with 30' minimum and 60' maximum span lengths. For continuous spans the ratio of adjacent span lengths shall not exceed 6:10 to prevent the shorter span from lifting off its bearings under live load. Specify Distributing Beams at all intermediate supports for all span lengths.

The Approach Span and Ramp Span are to be simple spans, each 5' -0" in length, to eliminate Live Load uplift at the backwall bent and grade beam support.

Do not place the temporary bridge on a vertical curve. A constant grade is acceptable. Refer to "***Acrow Panel Bridging Series 300 Technical Handbook***" for maximum grade and elevation tolerance from constant grade (Bent to Bent and Cross-Slope) for final cap elevations.

The temporary bridge is to have a zero cross-slope. Provide asphalt buildup transitions to a zero cross slope outside the limits of the temporary bridge.

Design the pile cap connection to pile assuming the truss reaction with a minimum of 3" eccentricity. Design of this connection detail is the responsibility of the Engineer of Record.

Select the pile type considering the driving capacity requirements of the production piles on the permanent bridge, free standing height, water levels if present and soil conditions.

Design the foundations according to current ***AASHTO LRFD Bridge Design Specifications***.

For Substructure Design use the following:

Dead Load Factor = 1.25
Live Load Factor = 1.35
SERVICE LEVEL LOADS:

Calculate reactions using superstructure dead load unit weight = 1.26 Kip/Ft. Include a concentrated dead load = 250 Lbs. per truss plane at abutments. This load accounts for 1 end post and 1 bearing per truss plane.

Calculate wind force on superstructure using basic wind force of 0.45 Kip/Ft. Ratio the above loading using wind pressures in Table 3.8.1.2.2-1 of ***AASHTO LRFD Bridge Design Specifications***.

Example-
For wind skew of 30°
W Lateral = 0.45 (0.065/0.075) = 0.39 Kip/Ft.
W Longitudinal = 0.45 (0.028/0.075) = 0.17 Kip/Ft.

Plan Content Requirements

Plans for temporary bridge shall, as a minimum, cover the following:

1. General Note Sheet.
2. Simple span bearing details if non-continuous spans are selected.
3. Grade change details at the extremities of the bridge.
4. Plan and elevation sheets with span lengths, stationing, alignment, grade and boring locations.
5. Foundation layout sheet including pile spacing & bent stationing.
6. Pile data table showing pile type, size, cut off elevations, capacity & estimated lengths.
7. Bent detail sheet.
8. A parts list as required for shipping purposes.

Payment

Item number	Item description	Unit Measure
102-2-AA	Special Detour	LS

Index 21800 Series Post-Tensioning

Design Criteria

AASHTO LRFD Bridge Design Specifications, 4th Edition; ***Structures Design Guidelines (SDG)***; ***Specification*** Sections 452, 453 and 462

Design Assumptions and Limitations

Indexes 21801, 21802 and 21803 depict various details and requirements for post-tensioning systems used on department projects. Use these standards with Specification Sections 452, 453 and 462 and the Approved Post Tensioning Systems List on the SDO website.

SHOP DRAWING REVIEW AND REVIEW OF CONTRACTOR'S GROUTING PLAN:

1. Shop Drawings
   a. Shop Drawings shall conform to the requirements of Section 462 of the ***Specifications***.

   A partial list of essential elements is as follows:

      i. Post-tensioning systems to be used.
      ii. Layout showing locations and geometry.
      iii. Duct spacing and supports.
      iv. Inlet and outlet locations.
      v. Stressing sequence.
      vi. Friction.

   b. Verify that PT systems are consistent with Contractor's Grouting Plan.
   c. Layout for post-tensioning systems shall at a minimum include the following:
      i. Anchor access after grouting for inspection.
      ii. Anchor access for vacuum grouting of voids.
      iii. Injection ports at all low point and at all anchor locations consistent with Indices.
      iv. Grout outlets and inspection access at all high points and at all locations consistent with Indices.
      v. All individual concrete element shop drawings shall clearly cross-reference the necessary PT systems components by type and name.
2. Contractor's Grouting Plan: The Engineer of Record should work with the Project Engineer and review the Contractor's Grouting Plan submittal along with

construction personnel. The Contractor's Grouting Plan shall include, but is not limited to the following items for each tendon on the project.

a. Type, quantity, and brand of materials used in grouting including all certifications required.
b. Type of equipment furnished, including capacity in relation to demand and working condition, as well as back-up equipment and spare parts.
c. General grouting procedure.
d. Duct pressure test and repair procedures.
e. Method to be used to control the rate of flow within ducts.
f. Theoretical grout volume calculations.
g. Types and locations of inlet and outlet pipes consistent with plan requirements.
h. Duct cleaning methods prior to grouting.
i. Mixing and pumping procedures.
j. Direction of grouting.
k. Grouting process for each tendon on project including injection locations (low points), vent closure sequence, and time delayed grout phasing.
l. Sequence of use of the inlet and outlet pipes.
m. Procedures for handling blockages.
n. Procedures for possible post grouting repair.

Plan Content Requirements

In the Structures Plans:

Grouting and Anchor Protection: In addition to providing post tensioning quantity and stressing information on the plans, the designer shall provide general grouting information for each tendon type and anchor protection information for all tendons on the project. See the example post-tensioning schedules shown below for both PT Bar and strand type tendons, respectively. Also refer to Post-Tensioning Anchorage Protection, Index 21802.

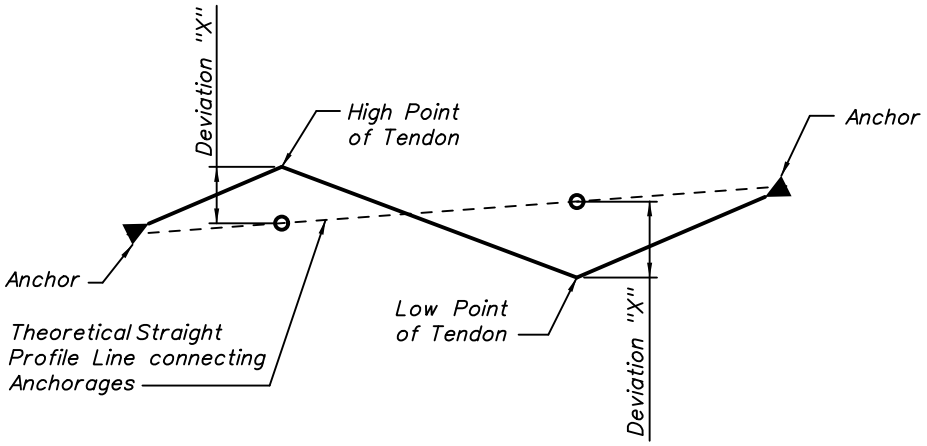
The plan details should be consistent with the Post-Tensioning Standards and Specification Section 462.

Details shown in the Post-Tensioning Anchorage and Grouting Details, Index 21803 shall be incorporated into the Contract Documents.

In cases where the tendon types and anchor protection details are not sufficient for specific project requirements, the designer shall supplement the drawings as necessary. Deviations from Standard Drawings however, require the Department's approval.

Detail to the following FDOT Standard tendon anchorage capacities: 4k6, 7k6, 12k6, 15k6, 19k6, 27k6.

Top slab transverse tendons, top slab cantilever tendons and bottom slab continuity tendons with Deviation "X" less than or equal to 20" shall be treated as a Profile 12 tendon for grouting procedures (see sketch below).



TENDON PROFILE DEVIATION

For projects that utilize post tensioning bars, complete the following "Post-Tensioning Bar Data Table" and include it in the plans:

POST-TENSIONING BAR DATA TABLE

BAR DESIGNATION	NO. REQUIRED	BAR SIZE	BAR LENGTH (ft-in)	BAR WEIGHT (lbs)	TOTAL WEIGHT (lbs)	STRESSING FORCE/BAR (kips)	LIVE END FORCE AFTER ANCHOR SET (kips)	DEAD END FORCE AFTER ANCHOR SET (kips)	STRESSING END	ELONGATION (in)	*TENDON PROFILE	**ANCHOR PROTECTION TYPE	
												UP STA.	DOWN STA.

* See Post-Tensioning Vertical Profiles, Design Standards Index No. 21801.
** See Post-Tensioning Anchorage Protection, Design Standards Index No. 21802. For transverse tendons, up station denotes left anchor, down station denotes right anchor (looking up station). For vertical bars, up station denotes top anchor, down station denotes bottom anchor.

For projects that utilize post tensioning tendons, complete the following "Post-Tensioning Tendon Data Table" and include it in the plans:

POST-TENSIONING TENDON DATA TABLE

TENDON DESIGNATION	NO. REQUIRED	TENDON SIZE	TENDON LENGTH (ft-in)	TENDON WEIGHT (lbs)	TOTAL WEIGHT (lbs)	STRESSING FORCE / TENDON (kips)	LIVE END FORCE AFTER ANCHOR SET (kips)	DEAD END FORCE AFTER ANCHOR SET (kips)	STRESSING END	ELONGATION (in)		*TENDON PROFILE	**ANCHOR PROTECTION TYPE	
										BEFORE ANCHOR SET	AFTER ANCHOR SET		UP STA.	DOWN STA.

* See Post-Tensioning Vertical Profiles, Design Standards Index No. 21801.
** See Post-Tensioning Anchorage Protection, Design Standards Index No. 21802. For transverse tendons, up station denotes left anchor, down station denotes right anchor (looking up station). For vertical tendons, up station denotes top anchor, down station denotes bottom anchor.

Note, the above tables are not currently available as CADD cells, and must be developed by the designer for each project. Any deviations from these standards shall be approved by the Department.

Payment

Item number	Item description	Unit Measure
462-2-AA	Post Tensioning Tendons	LB
462-3	Additional Post Tensioning in Segmental Box Span *Note: Use for rehabilitation projects only*	EA

Sample Tables:

POST-TENSIONING BAR DATA TABLE

BAR DESIGNATION	NO. REQUIRED	BAR SIZE	BAR LENGTH (ft-in)	BAR WEIGHT (lbs)	TOTAL WEIGHT (lbs)	STRESSING FORCE/BAR (kips)	LIVE END FORCE AFTER ANCHOR SET (kips)	DEAD END FORCE AFTER ANCHOR SET (kips)	STRESSING END	ELONGATION (in)	*TENDON PROFILE	**ANCHOR PROTECTION TYPE	
												UP STA.	DOWN STA.
T1	8	1⅜" Ø	17-0	56.2	449.6	170.6	165	165	UPSTATION	⅝	12	5	7

* See Post-Tensioning Vertical Profiles, Design Standards Index No. 21801.
** See Post-Tensioning Anchorage Protection, Design Standards Index No. 21802. For transverse tendons, up station denotes left anchor, down station denotes right anchor (looking up station). For vertical bars, up station denotes top anchor, down station denotes bottom anchor.

POST-TENSIONING TENDON DATA TABLE

TENDON DESIGNATION	NO. REQUIRED	TENDON SIZE	TENDON LENGTH (ft-in)	TENDON WEIGHT (lbs)	TOTAL WEIGHT (lbs)	STRESSING FORCE / TENDON (kips)	LIVE END FORCE AFTER ANCHOR SET (kips)	DEAD END FORCE AFTER ANCHOR SET (kips)	STRESSING END	ELONGATION (in)		*TENDON PROFILE	**ANCHOR PROTECTION TYPE	
										BEFORE ANCHOR SET	AFTER ANCHOR SET		UP STA.	DOWN STA.
2C1	4	12X0.6" Ø	30-0	466.2	1864.8	562	492	457	UPSTATION	2.71	2.47	9	1A	3

* See Post-Tensioning Vertical Profiles, Design Standards Index No. 21801.
** See Post-Tensioning Anchorage Protection, Design Standards Index No. 21802. For transverse tendons, up station denotes left anchor, down station denotes right anchor (looking up station). For vertical tendons, up station denotes top anchor, down station denotes bottom anchor.

Index 21900 Series Fender Systems

Design Criteria

AASHTO LRFD Bridge Design Specifications, 4th Edition; ***Structures Design Guidelines (SDG)*** 3.14

Design Assumptions and Limitations

Design Standards Index 21900 Series includes designs and details for Heavy, Medium and Light Duty Fender Systems. Refer to ***SDG*** 3.14 for Fender System design criteria and the selection of the appropriate standard Fender System for use at a given site. Design project specific Fender Systems for sites that do not, as a minimum, satisfy the design criteria which was used to develop these standards. Utilize standardized details and components as appropriate for project specific designs. Use this standard with Indexes 21220, 21910, 21920 and 21930.

Plan Content Requirements

In the Structures Plans:

Prepare and include in the plans supplemental project specific designs and details for the following items:

- Electrical service for navigation lights including conduit path from bridge to fender system and identification of service point. Coordinate design with Index 21220 and ***Specification*** Section 510.
- Access ladders and catwalks from bridge to fender system are optional and may be included at the discretion of the District.

Designate in the plans the type of decking material to be used for catwalks: 2" x 12" Plastic Lumber or Fiberglass Open Grating. Catwalk decking material shall be determined by the District.

Complete the following "Data Tables" and include them in the plans. One "Estimated Bill of Materials Table", one "Fender System Table of Variables" and one "Estimated Quantities Block" are required for each Fender System location within a project. For projects with multiple fender systems or configurations, clearly note which Fender System the Tables and Blocks are applicable to. See Introduction I.3 for more information regarding use of Data Tables.

See ***SDG*** 3.14 for instructions for determining Minimum Pile Tip Elevations and Pile Lengths.

Table for use with Index 21910 Fender System-Heavy Duty:

ESTIMATED BILL OF MATERIALS FENDER SYSTEM - HEAVY DUTY DESIGN STANDARDS INDEX NO. 21910			Table Date 01-01-06
MARK	NO. REQ'D.	UNIT	QUANTITY
A1		MB	
A2		MB	
A3		MB	
A4		MB	
A5		MB	
A6		MB	
B		MB	
C		MB	
D		MB	
* E		MB	
F1		MB	
F2		MB	
F3		MB	
F4		MB	
F5		MB	
F6		MB	
G1		MB	
G2		MB	
H1		MB	
H2		MB	

NOTE: For Member Marks, Sizes and Dimensions see Design Standards Index No. 21910, Sheet 5.

Bill of Materials Table above is for an entire fender system (left and right fenders).

* Provide 2'-6" wide Fiberglass Open Grating for full length of fender in lieu of 2" X 12" Plastic Lumber when called for in Plans. Provide Stainless Steel Mounting Hardware and install per Manufacturer's recommendations. See Index Nos. 21900 & 21910 for notes. Include the cost of Fiberglass Open Grating and miscellaneous items required to install the grating in the price for Plastic Marine Lumber (Non-Reinforced).

FENDER SYSTEM TABLE OF VARIABLES INDEX NO. 21910		Table Date 01-01-06
CONTROL POINTS	STATION	OFFSET Lt. or Rt.
A		
B		
C		
D		
DIMENSION "L"		
CLEAR CHANNEL WIDTH		
CHANNEL SKEW ANGLE		
MHW or NHW ELEVATION		
MLW or NLW ELEVATION		
PILE CUTOFF ELEVATION		
MINIMUM PILE TIP ELEVATION LEFT FENDER		
PILE LENGTH LEFT FENDER		
MINIMUM PILE TIP ELEVATION RIGHT FENDER		
PILE LENGTH RIGHT FENDER		
NUMBER OF WALE ROWS		

NOTE: Work this Table with Design Standards Index Nos. 21900 and 21910.

ESTIMATED QUANTITIES, INDEX NO. 21910		Table Date 01-01-06
MARK	UNIT	QUANTITY
Plastic Marine Lumber (Reinforced)	MB	
Plastic Marine Lumber (Non-Reinforced)	MB	
Plastic Marine Composite Piles 16" ϕ	LF	

NOTE: Estimated Quantities are for one entire fender system (left and right fenders).

Table for use with Index 21920 Fender System-Medium Duty:

ESTIMATED BILL OF MATERIALS FENDER SYSTEM - MEDIUM DUTY DESIGN STANDARDS INDEX NO. 21920			Table Date 01-01-06
MARK	NO. REQ'D.	UNIT	QUANTITY
A1		MB	
A2		MB	
A3		MB	
A4		MB	
A5		MB	
A6		MB	
B		MB	
C		MB	
D		MB	
* E		MB	
F1		MB	
F2		MB	
F3		MB	
F4		MB	
F5		MB	
F6		MB	
G1		MB	
G2		MB	
H1		MB	
H2		MB	

NOTE: For Member Marks, Sizes and Dimensions see Design Standards Index No. 21920, Sheet 5.

Bill of Materials Table above is for an entire fender system (left and right fenders).

* Provide 2'-6" wide Fiberglass Open Grating for full length of fender in lieu of 2" X 12" Plastic Lumber when called for in Plans. Provide Stainless Steel Mounting Hardware and install per Manufacturer's recommendations. See Index Nos. 21900 & 21920 for notes. Include the cost of Fiberglass Open Grating and miscellaneous items required to install the grating in the price for Plastic Marine Lumber (Non-Reinforced).

FENDER SYSTEM TABLE OF VARIABLES INDEX NO. 21920		Table Date 01-01-06
CONTROL POINTS	STATION	OFFSET Lt. or Rt.
A		
B		
C		
D		
DIMENSION "L"		
CLEAR CHANNEL WIDTH		
CHANNEL SKEW ANGLE		
MHW or NHW ELEVATION		
MLW or NLW ELEVATION		
PILE CUTOFF ELEVATION		
MINIMUM PILE TIP ELEVATION LEFT FENDER		
PILE LENGTH LEFT FENDER		
MINIMUM PILE TIP ELEVATION RIGHT FENDER		
PILE LENGTH RIGHT FENDER		
NUMBER OF WALE ROWS		

NOTE: Work this Table with Design Standards Index Nos. 21900 and 21920.

ESTIMATED QUANTITIES, INDEX NO. 21920		Table Date 01-01-06
MARK	UNIT	QUANTITY
Plastic Marine Lumber (Reinforced)	MB	
Plastic Marine Lumber (Non-Reinforced)	MB	
Plastic Marine Composite Piles 16" ϕ	LF	

NOTE: Estimated Quantities are for one entire fender system (left and right fenders).

Table for use with Index 21930 Fender System-Light Duty:

ESTIMATED BILL OF MATERIALS FENDER SYSTEM - LIGHT DUTY DESIGN STANDARDS INDEX NO. 21930			Table Date 01-01-06
MARK	NO. REQ'D.	UNIT	QUANTITY
A1		MB	
A2		MB	
A3		MB	
A4		MB	
A5		MB	
A6		MB	
B		MB	
C		MB	
D		MB	
* E		MB	
F1		MB	
F2		MB	
F3		MB	
F4		MB	
F5		MB	
F6		MB	
G1		MB	
G2		MB	
H1		MB	
H2		MB	

NOTE: For Member Marks, Sizes and Dimensions see Design Standards Index No. 21930, Sheet 5.

Bill of Materials Table above is for an entire fender system (left and right fenders).

* Provide 2'-6" wide Fiberglass Open Grating for full length of fender in lieu of 2" X 12" Plastic Lumber when called for in Plans. Provide Stainless Steel Mounting Hardware and install per Manufacturer's recommendations. See Index Nos. 21900 & 21930 for notes. Include the cost of Fiberglass Open Grating and miscellaneous items required to install the grating in the price for Plastic Marine Lumber (Non-Reinforced).

FENDER SYSTEM TABLE OF VARIABLES INDEX NO. 21930		Table Date 01-01-06
CONTROL POINTS	STATION	OFFSET Lt. or Rt.
A		
B		
C		
D		
DIMENSION "L"		
CLEAR CHANNEL WIDTH		
CHANNEL SKEW ANGLE		
MHW or NHW ELEVATION		
MLW or NLW ELEVATION		
PILE CUTOFF ELEVATION		
MINIMUM PILE TIP ELEVATION LEFT FENDER		
PILE LENGTH LEFT FENDER		
MINIMUM PILE TIP ELEVATION RIGHT FENDER		
PILE LENGTH RIGHT FENDER		
NUMBER OF WALE ROWS		

NOTE: Work this Table with Design Standards Index Nos. 21900 and 21930.

ESTIMATED QUANTITIES, INDEX NO. 21930		Table Date 01-01-06
MARK	UNIT	QUANTITY
Plastic Marine Lumber (Reinforced)	MB	
Plastic Marine Lumber (Non-Reinforced)	MB	
14" Sq. Prestressed Concrete piles	LF	

NOTE: Estimated Quantities are for one entire fender system (left and right fenders).

Payment

Include quantity for Composite Marine Lumber 10" X 10" Wales Mark A under Pay Item for Plastic Marine Lumber (Reinforced). Include quantity for all other Plastic Lumber under Pay Item for Plastic Marine Lumber (Non-Reinforced).

Item number	Item description	Unit Measure
471-1-1	Fender System, Plastic Marine Lumber, Reinforced	MB
471-1-2	Fender System, Plastic Marine Lumber, Non- Reinforced	MB
455-34-2	Prestressed Concrete Piling, 14" Sq.	LF
455-37-2	Fiberglass Structurally Reinforced Composite Pile, 16" D	LF