Index 450-511 Bearing Plates (Type 1) - Prestressed Florida-I & AASHTO Type II Beams

Design Criteria

AASHTO LRFD Bridge Design Specifications; ***Structures Design Guidelines (SDG)***

Design Assumptions and Limitations

This standard is intended for use on bridge widenings (with or without end diaphragms) where squared end beams are not feasible as determined by the EOR. For all other cases, use Index 450-512 and its Instructions. Index 450-512 may be used for all projects with squared end beams, with or without end diaphragms.

This standard contains generic details and notes for beveled and embedded bearing plates for prestressed concrete Florida-I and AASHTO Type II Beams with or without skewed end conditions.

Use this standard with Indexes 450-010, 450-036, 450-045, 450-054, 450-063, 450-072, 450-078, 450-084, 450-096, 450-120 and 400-510.

Embedded Bearing Plates A are required for all Florida-I Beams (FIBs). Embedded Bearing Plates A and Beveled Bearing Plates B are required for beams on grades greater than 2%.

Embedded Plates A are cast into the beams 1½" from the beam ends. The position of the centerline of Beveled Plates B is dependent on the presence or absence of end diaphragms, ensuring the minimum bearing length for ***LRFD*** seismic requirements is satisfied.

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 when less than the limits specified in ***SDG*** 6.5.1. Use Embedded Bearing Plates A for FIBs 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. Refer to ***SDG*** 6.5.1 for consideration of beam camber and deflection effects.

Also see instructions for Index 400-510.

Complete the following "BEARING PLATE DATA TABLE" and include it in the plans. Fill in the table to correspond with data on the appropriate "TABLE OF BEAM VARIABLES" using inch units for Beveled Plate dimensions 'W', '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 ***FDM*** **115** 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 450-010 or 450-120. 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)	
W = X = 0.5" + (C) x Slope	W = X = 0.5"
Y = Z = 0.5"	Y = Z = 0.5" + (C) x Slope
(b) END ELEVATION CONDITION 1 or 3 (Negative Slope)	
W = X = 0.5"	W = X = 0.5" - (C) x Slope
Y = Z = 0.5" - (C) x Slope	Y = Z = 0.5"
(II) PLAN VIEW CASE 2:	
(a) END ELEVATION CONDITION 1 or 2 (Positive Slope)	
W = 0.5" + (C / sin Φ + D / tan Φ) x Slope	W = 0.5" + (D / tan Φ) x Slope
X = 0.5" + (C / sin Φ) x Slope	X = 0.5"
Y = 0.5"	Y = 0.5" + (C / sin Φ) x Slope
Z = 0.5" + (D / tan Φ) x Slope	Z = 0.5" + (C / sin Φ + D / tan Φ) x Slope
(b) END ELEVATION CONDITION 1 or 3 (Negative Slope)	
W = 0.5"	W = 0.5" - (C / sin Φ) x Slope
X = 0.5" - (D / tan Φ) x Slope	X = 0.5" - (C / sin Φ + D / tan Φ) x Slope
Y = 0.5" - (C / sin Φ + D / tan Φ) x Slope	Y = 0.5" - (D / tan Φ) x Slope
Z = 0.5" - (C / sin Φ) x Slope	Z = 0.5"
(III) PLAN VIEW CASE 3:	
(a) END ELEVATION CONDITION 1 or 2 (Positive Slope)	
W = 0.5"+ (C / sin Φ) x Slope	W = 0.5"
X = 0.5" + (C / sin Φ + D / tan Φ) x Slope	X = 0.5" + (D / tan Φ) x Slope
Y = 0.5" + (D / tan Φ) x Slope	Y = 0.5" + (C / sin Φ + D / tan Φ) x Slope
Z = 0.5"	Z = 0.5" + (C / sin Φ) x Slope
(b) END ELEVATION CONDITION 1 or 3 (Negative Slope)	
W = 0.5" - (D / tan Φ) x Slope	W = 0.5" - (C / sin Φ + D / tan Φ) x Slope
X = 0.5"	X = 0.5" - (C / sin Φ) x Slope
Y = 0.5" - (C / sin Φ) x Slope	Y = 0.5"
Z = 0.5" - (C / sin Φ + D / tan Φ) x Slope	Z = 0.5" - (D / tan Φ) x Slope

For all cases:

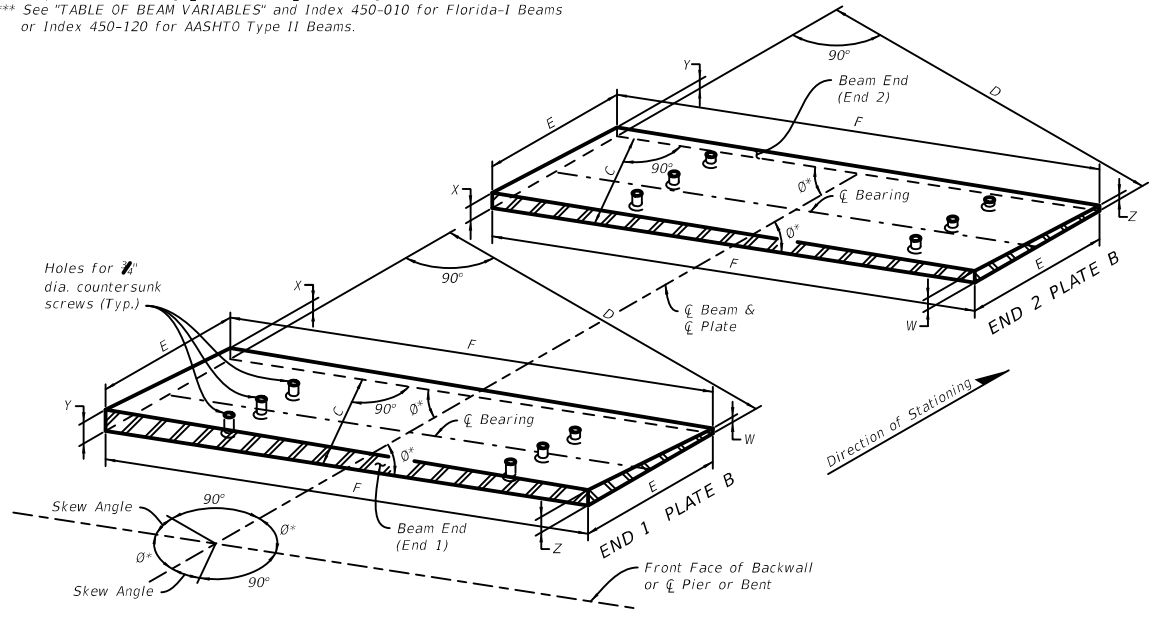
E = C / sin Φ

G = 13.5” / sin Φ

BEARING PLATE DATA TABLE - TYPE 1 — Table Date 7-01-13

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 Ø *	G	F		C	D	E	F	W	X	Y	Z

NOTES:
See Index 450-511 for additional notes and details.
* Ø = 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 450-010 for Florida-I Beams or Index 450-120 for AASHTO Type II Beams.



ISOMETRIC VIEW OF BEVELED BEARING PLATES (TYPE 1) FOR FLORIDA I-BEAMS
(SKEWED PLATES SHOWN, NON-SKEWED PLATES AND AASHTO TYPE II BEAMS 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.

Example

A design calls for FIBs with Type F Bearing Pads. The Grade along the PGL and centerline of the beam is negative 2.5% and slope due to camber and deflection is less than 0.0125 radians. The span has a skew of 10°.

Because the slope is greater than the absolute value of 2%, beveled bearing plates are required. From Index 400-510 a Type F Bearing Pad is 10" x 2'-8", and the Beveled Bearing Plate (Plate B) has dimensions C = 1'-0" and D = 3'-0". The bridge has a 10° skew (Φ=80°). From Index 450-010 using Case 2, End Condition 3 formulas:

END 1	END 2
W=0.5"	W=0.5"-((12"/sin(80°)*(-0.025)) = 0.805"
X=0.5"-((36"/tan(80°)*(-0.025)) = 0.659"	X=0.5"-((12"/sin(80°)+36"/ tan(80°))*(-0.025))=0.963"
Y=0.5"-((12"/sin(80°)+36"/ tan(80°))*(-0.025))=0.963"	Y= 0.5"-((36"/tan(80°)*(-0.025)) = 0.659"
Z=0.5"-((12"/sin(80°)*(-0.025)) = 0.805"	Z= 0.5"

Complete the Table with location information and the following from the example:

BEARING PLATE DATA TABLE - TYPE 1 — Table Date 7-01-13

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 Ø *	G	F		C	D	E	F	W	X	Y	Z
			F	1	2	-2.5	80°	13 11/16	36 9/16	Yes	12	36	12 3/16	36 9/16	1/2	5/8	1	13/16
			F	2	2	-2.5	80°	13 11/16	36 9/16	Yes	12	36	12 3/16	36 9/16	13/16	1	5/8	1/2

NOTES:
See Index 450-511 for additional notes and details.
* Ø = 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 450-010 for Florida-I Beams or Index 450-120 for AASHTO Type II Beams.