SECTION 8 - BEARING DEVICES

8.1 - GENERAL

8.1.1 - BEARING USE CRITERIA

Bearings should be used under all steel and concrete beams and girders except at integral abutments and rigid frame structures. At integral abutments, a plain elastomeric pad or mortar pad should be placed under the beam. At framed structures, no bearings are used at the framed connections. Refer to the Thruway Standard Detail Sheets at the end of this section and in ProjectWise for details of all the bearings described in this section. The choice of bearing type to be used should be based on the following:

A. Movement requirements (rotational and translational)
B. Design Loading (vertical and horizontal)
C. Geometrics (foot print size and orientation); The edge of the masonry plate must be no closer than 3 inches to the exposed edge of supporting concrete.
D. Cost
E. Age of structure and planned remaining service life.

In general, new bearings shall not be installed on projects receiving less work than a complete deck replacement. The original bearings on Thruway structures are usually some type of steel sliding or rocker bearings. These types of bearings can have an extremely long service life if kept cleaned, painted and well lubricated through regular maintenance. If needed, these types of bearings can be rehabilitated as part of a construction contract such as a **Strip, Repair, Seal, & Overlay (SRSO)**, bridge painting, or substructure rehabilitation project. On these types of projects, the intent is to get all of the elements of an older structure on the same replacement schedule. Performing the minimum amount of work until the entire bridge is ready for replacement is the most economical approach to managing our bridges. Bearing replacement is very expensive considering jacking the superstructure, pedestal reconstruction, and the new bearings themselves. In addition, the lead time for new bearings can be up to six months which is unacceptable on most minor rehabilitation projects. Existing bearings on minor rehabilitation projects shall only be replaced under one of the following conditions:

A. Individual severely damaged bearings that are no longer functioning as designed and cannot be repaired.

B. High rocker bearings on seismically sensitive structures that have a history of repeated overextension to the point of instability.

8.1.2 - BEARING PADS

A 1/8th inch thick Bearing Pad meeting the requirements of material specifications 728-01 or 728-02 shall be used under the masonry plate of all bearings. A bearing pad shall not be used under the girder at integral abutments and rigid frames, nor under the preformed fabric pad of preformed fabric bearings.

8.1.3 - BEVELING OF PLATES

Beveling of plates, required to match the finished flange grade to the bearing assembly, shall be specified/detailed at increments no smaller than 1/16th inch. The flattest bevel detailed shall not be less than 1/8th inch measured between the front edge and rear edge of the plate for all bearing types.

BRIDGE BEARING INFORMATION TABLE

BEARING TYPE	VERTICAL LOAD RANGE	EXPANSION LENGTH RANGE (EXPANSION BEARINGS)	ROTATIONAL MOVEMENT RANGE[1]	COST UPSTATE (EACH)	COST DOWNSTATE (EACH)	MAXIMUM ALLOWABLE SKEW[2]	MAX. LEAD TIME
PREFORMED FABRIC	UP TO 200 kips	UP TO 150 ft	UP TO 0.015 RADIANS	$1,200	$2,000	35°	2 Months
MULTI-ROTATIONAL (POT-TYPE)	200 TO 1000 kips	UNLIMITED	UP TO 0.02 RADIANS	$2,500	$5,000	NO MAX.	4 Months
MULTI-ROTATIONAL (DISC-TYPE)	100 TO 2000 kips	UNLIMITED	UP TO 0.02 RADIANS	$2,500	$5,000	NO MAX.	3 Months
SPHERICAL	500 TO 2000 kips	UNLIMITED	GREATER THAN 0.015 RADIANS	$3,000	$6,000	NO MAX.	4 Months
ELASTOMERIC[3] (RECTANGULAR)	UP TO 200 kips	UP TO 130 ft	UP TO 0.015 RADIANS	$1,800	$3,000	35°	3 Months
ELASTOMERIC[3] (CIRCULAR)	190 TO 450 kips	UP TO 130 ft	UP TO 0.015 RADIANS	$2,000	$3,500	35°	3 Months
BASE ISOLATION	VARIES BY TYPE	VARIES BY TYPE	VARIES BY TYPE	VARIES BY TYPE	VARIES BY TYPE	35°	4 Months

TABLE 8.1.1

Notes: 1. Values for rotational movements include a 0.01 radian construction tolerance.
2. Due to the limited transverse resistance capability of some bearing devices, the maximum allowable substructure skew is limited.
3. The upper limit of load range shall be adhered to in order to keep bearing devices of this type to a practical size.

8.1.4 - ANCHOR BOLT DESIGN

All anchor bolts shall be specified as **ASTM** F1554 material. A449 and A325 material shall not be specified but may be substituted by the contractor if F1554 material is not readily available. All anchor bolts shall have a protective zinc coating. Hot dip galvanizing as described in NYSStd. Spec. Sect. 719-01 may be used on A325, A449, F1554-GR36 and F1554-GR55 bolts. A mechanically deposited zinc coating in accordance with the requirements of Class 50 of **ASTM** Specification B695 shall be used on F1554-GR105 anchor bolts. All nuts shall be **ASTM** A563 Heavy Hex Grade DH. The nuts may be either hot dip galvanized or have a mechanically deposited zinc coating as described above.

In accordance with **AASHTO 17th Edition** Subsections 10.29.6.2 and **AASHTO LRFD 4th Edition** Subsection 14.8.3.1 the superstructure shall be positively connected to the substructure, and the **AASHTO 17th Edition** Subsection 14.7.3 and **AASHTO LRFD 4th Edition** Subsection 14.8.3.2, all components of bearing devices shall be positively secured to provide a distinct load path from the superstructure to the bearing components and to the supporting substructure capable of transmitting all anticipated loads and to prevent the bearing components from separation under strength design loading and extreme event loading. On sliding and pot-type bearings this requires that the anchor bolts extend up through the masonry plate and up through the sole plate (or beveled plate, if applicable). The masonry plate shall be held down with single heavy hex nuts and hardened washers (snug tight). The sole plate/beveled plate shall be held in place vertically, against uplift (if applicable), with heavy hex nuts double nutted on the anchor bolt above the top of the plate washers. The gap (a minimum of 1/8th inch) between the bottom of the bottom nut and the top of the plate washer shall be enough to allow for translation and rotation at the bearing without binding. The plate washers shall be a minimum of 1/8th inch thick; square over round holes and rectangular over slotted holes; and beveled to match the slope of the sole/beveled plate. On elastomeric bearings, the masonry plate shall be held down with single heavy hex nuts and hardened washers (snug tight). The shear capacity of the elastomeric material and the vulcanized connection between the elastomer and the external load plates may be adequate to provide the connection required to secure the bearing components together and the superstructure to the substructure under strength design loading and extreme event loading. If this connection is not capable of resisting these loads and/or uplift or buoyancy forces are present, the anchor bolts must run up through the sole plate as described above.

The diameter of the anchor bolt holes in the masonry plate of all bearing types shall be 3/8th inch larger than the anchor bolt diameter.

On fixed bearings the anchor bolt holes in the sole plate/beveled plate (where required) shall be the same size as those used in the masonry plate unless live load rotation requires the use of slotted holes. When slotted holes are required in the sole plate/beveled plate of fixed bearings, the hole size shall be determined as follows: Hole width shall be 3/8th inch plus bolt diameter. Hole lengths shall be 3/8th inch plus bolt diameter plus anticipated horizontal movement of sole plate/beveled plate due to live load rotation.

On expansion bearings the anchor bolt holes in the sole plate/beveled plate (where required) shall be slotted to allow for live load rotation and thermal expansion and contraction. Hole width shall be

3/8th inch plus bolt diameter. The hole length shall be the bolt diameter plus the total thermal expansion plus one inch.

Table 8.1.4 shows the strengths and allowable stresses for the various anchor bolt types and sizes allowed on Thruway structures. For economic reasons, the designer should specify the lowest grade bolt possible; keeping in mind the minimum diameters allowed by **AASHTO 17th Edition** Subsection 10.29.6.2, and that very large bolt diameters may be impractical. Allowable stresses shown in this table may be increased by 50% when horizontal loading includes seismic loads.

ANCHOR BOLT SELECTION TABLE

BOLT TYPE	GRADE	BOLT SIZE (φ)	F_U (ksi)	F_y (ksi)	F_T (ksi) ($0.33F_u$)	F_v (ksi) ($0.17F_U$)
A 325	92	½” To 1” Incl.	120	92	40	20
A 325	81	Over 1” To 1 ½” Incl.	105	81	35	18
A 449	92	¼” To 1” Incl.	120	92	40	20
A 449	81	Over 1” To 1 ½” Incl.	105	81	35	18
A 449	58	Over 1 ½” To 3” Incl.	90	58	30	15
F 1554	105	¼” To 3” Incl.	125	105	41	21
F 1554	55	¼” To 4” Incl.	75	55	25	13
F 1554	36	¼” To 4” Incl.	58	36	19	10

TABLE 8.1.4

F_U = Minimum Tensile Strength, F_Y = Minimum Yield Strength,
F_T = Allowable Tension/Bending Strength, F_V = Allowable Shear Strength

8.1.4.1 - ANCHOR BOLTS FOR PREFORMED FABRIC BEARINGS

For preformed fabric bearings, the anchor bolts shall be designed for shear and bending on the anchor bolt at the top of the pedestal (P is applied to the anchor bolts at the bottom of sole plate) using the following formula:

$$\left(\frac{f_v}{F_v}\right)^2 + \left(\frac{f_T}{F_T}\right)^2 \leq 1.5$$

Note:
Maximum stress due to bending is at the top of the pedestal where:

P = Maximum horizontal force at bearing (divide by # of bolts for load per bolt). This force shall be a minimum of 19% of the total vertical dead load and superimposed dead load.

f_v = Nominal unit shear stress

f_T = Nominal unit bending stress due to external horizontal load

F_v = 0.17 F_U = Allowable shear stress in absence of bending

F_T = 0.33 F_U = Allowable tensile stress in absence of shear

F_U = Minimum tensile strength of bolt

8.1.4.2 - ANCHOR BOLTS FOR MULTI-ROTATIONAL (POT TYPE) BEARINGS

For multi-rotational fixed pot bearings, the anchor bolts shall be designed for shear at the top surface of the pedestal. P is applied to the anchor bolts at the bottom of the masonry plate.

$$f_v \leq F_v$$

See Table 8.1.4

For multi-rotational expansion pot bearings, the anchor bolts shall be designed for shear and bending at the top of the masonry plate nut (P applied to the anchor bolt at the bottom of the sole plate). Use the following formula:

$$\left(\frac{f_v}{F_v}\right)^2 + \left(\frac{f_T}{F_T}\right)^2 \leq 1.5$$

See Table 8.1.4

8.1.4.3 - ANCHOR BOLTS FOR MULTI-ROTATIONAL (DISC TYPE) BEARINGS

For multi-rotational fixed bearings, the anchor bolts shall be designed for shear at the top surface of the pedestal. P is applied to the anchor bolts at the bottom of the masonry plate.

$$f_v \leq F_v$$

See Table 8.1.4

For multi-rotational expansion disc bearings, the anchor bolts shall be designed for shear and bending at the top of the masonry plate nut (P applied to the anchor bolt at the bottom of the sole plate). Use the following formula:

$$\left(\frac{f_v}{F_v}\right)^2 + \left(\frac{f_T}{F_T}\right)^2 \leq 1.5$$

See Table 8.1.4

8.1.4.4 - ANCHOR BOLTS FOR SPHERICAL BEARINGS

For spherical fixed bearings, the anchor bolts shall be designed for shear at the top surface of the pedestal. P is applied to the anchor bolts at the bottom of the masonry plate.

$$f_v \leq F_v$$

See Table 8.1.4

For spherical expansion bearings, the anchor bolts shall be designed for shear and bending at the top of the masonry plate nut (P applied to the anchor bolt at the bottom of the sole plate). Use the following formula:

$$\left(\frac{f_v}{F_v}\right)^2 + \left(\frac{f_T}{F_T}\right)^2 \leq 1.5$$

See Table 8.1.4

8.1.4.5 - ANCHOR BOLTS FOR ELASTOMERIC BEARINGS

For elastomeric fixed bearings, the anchor bolts shall be designed for shear at the top surface of the pedestal. P is applied to the anchor bolts at the bottom of the masonry plate.

$$f_v \leq F_v$$

See Table 8.1.4

For elastomeric expansion bearings, the anchor bolts shall be designed for shear due to P applied at the bottom of the masonry plate as shown above unless the anchor bolts are required to extend up through the sole plate for uplift or buoyancy. In this case the anchor bolts shall be designed for shear due to P applied at the bottom of the masonry plate as shown above and tension due to those tensile forces. Use the following formula:

$$\left(\frac{f_v}{F_v}\right)^2 + \left(\frac{f_T}{F_T}\right)^2 \leq 1.0$$

See Table 8.1.4

8.1.4.6 - ANCHOR BOLTS FOR SEISMIC ISOLATION BEARINGS

For seismic isolation bearings, the anchor bolt design will be dependent on the manufacturer's specifications of the bearing.

8.1.5 - ANCHOR BOLT HOLE EDGE AND END DISTANCE

The designer's attention is directed to the requirements of the **AASHTO 17th Edition** regarding anchor bolt placement and minimum edge distances. For all bearings, the minimum transverse edge distance E(T) from the centerline of a hole to the flame cut edge of a steel plate shall not be less than 1.75 x the Bolt Diameter; and the minimum longitudinal end distance E(L) shall not be less than 1.75 x the Bolt Diameter. In addition, the centerline of any anchor bolt must be a minimum of 8 inches from the exposed edge of the surrounding concrete.

8.2 - CEMENT MORTAR PADS AND PLAIN ELASTOMERIC PADS

Conventional bearing devices are not required at integral abutments and rigid frames because the superstructure is cast continuous with the substructure. The vertical load is transferred to the substructure by plain pads. Two types of plain pads are approved for Authority contracts; cement mortar pads and plain elastomeric pads. Cement mortar pads shall be used at all integral abutments and rigid frames supporting steel superstructures. Cement mortar pads or plain elastomeric pads shall be used when a prestressed concrete superstructure is specified. For integral abutment and rigid frame details and guidelines on use, see Section 4 - Substructures.

8.2.1 - CEMENT MORTAR PADS

When cement mortar pads are used at an integral abutment or rigid frame, the following criteria, as illustrated in Details 4.6.2.2.b, 4.10.1.b, and 8.2.1, shall be met:

A. The mortar pad footprint must be large enough to transfer all the vertical loads to the bridge seat at a pressure less than or equal to $0.30\ f'_c$.

B. The minimum distance from the edge of the pad to the substructure face shall not be less than 3 inches.

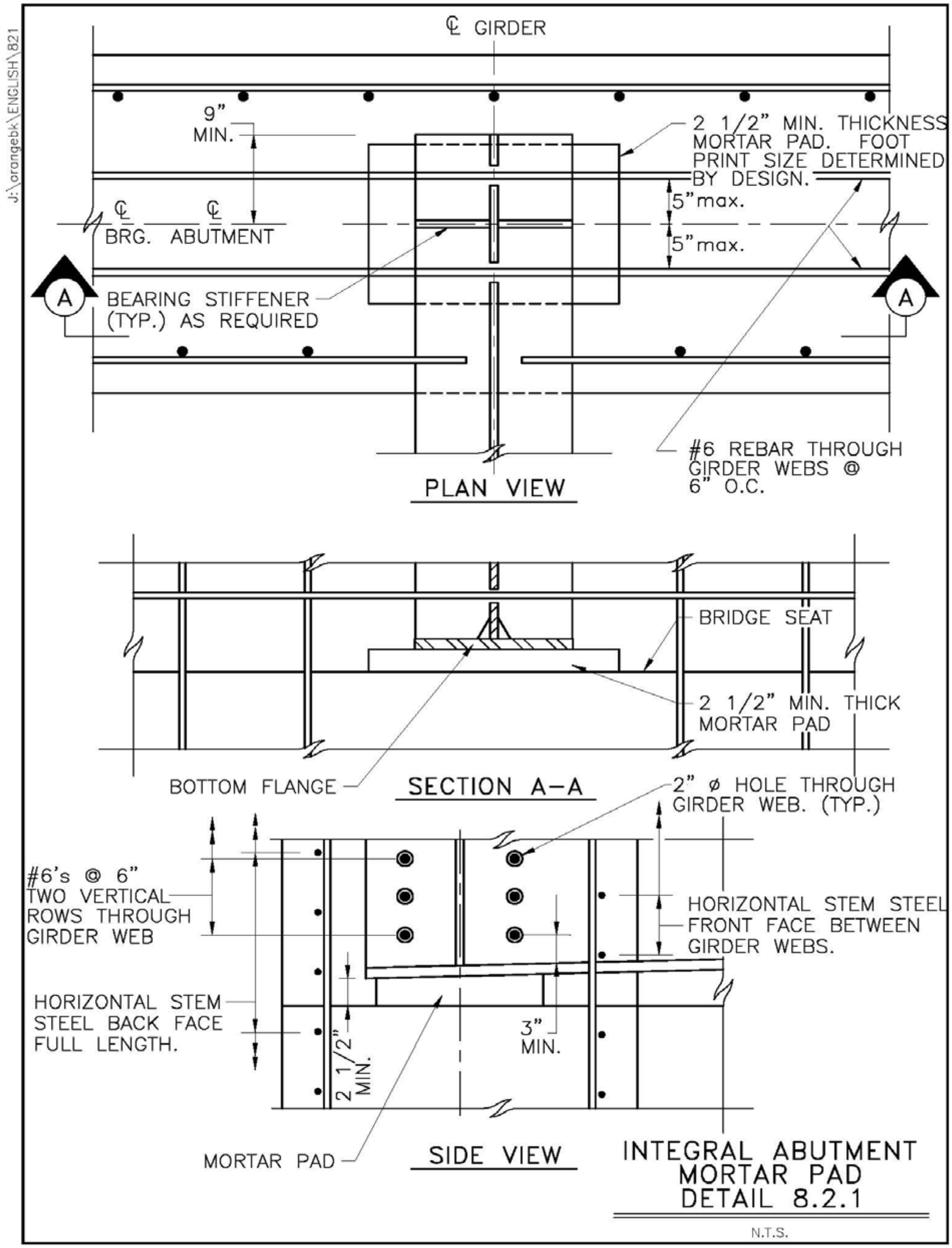
C. Anchor bolts are not required.

D. Transverse reinforcing steel at substructure shall pass through the girder web at or near the centerline of the substructure. If the web plate shear capacity is reduced below the required capacity to support dead load shear, bearing stiffeners shall be added at the centerline of the pad in the vicinity (±5 inches) of the web holes.

E. Vertical reinforcing steel from the substructure stem shall pass through the girder bottom flange and mortar pad at rigid frame connections.

F. The mortar pad thickness shall be at least 2 ½", but shall not exceed 4 inches.

G. The top surface of the mortar pad shall be finished to match the grade of the bottom flange at the centerline of substructure. The grade used shall be that which results from the placement of the structural steel only.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℄ GIRDER
9" MIN.
2 1/2" MIN. THICKNESS MORTAR PAD. FOOT PRINT SIZE DETERMINED BY DESIGN.
5" max.
5" max.
℄ BRG. ℄ ABUTMENT
BEARING STIFFENER (TYP.) AS REQUIRED
A
A
#6 REBAR THROUGH GIRDER WEBS @ 6" O.C.
PLAN VIEW
BRIDGE SEAT
2 1/2" MIN. THICK MORTAR PAD
BOTTOM FLANGE
SECTION A–A
2" ø HOLE THROUGH GIRDER WEB. (TYP.)
#6's @ 6" TWO VERTICAL ROWS THROUGH GIRDER WEB
HORIZONTAL STEM STEEL FRONT FACE BETWEEN GIRDER WEBS.
HORIZONTAL STEM STEEL BACK FACE FULL LENGTH.
2 1/2" MIN.
3" MIN.
MORTAR PAD
SIDE VIEW
INTEGRAL ABUTMENT MORTAR PAD DETAIL 8.2.1
N.T.S.

8.2.2 - PLAIN ELASTOMERIC PADS

When plain elastomeric pads are used at an integral abutment under a prestressed concrete superstructure, the following criteria shall be met:

A. The elastomeric pad footprint must be large enough to transfer all the vertical loads to the bridge seat at a pressure less than or equal to 0.30 f'_c.

B. The minimum distance from the edge of the pad to the abutment face shall not be less than 3 inches.

C. A 1 inch dia. anchor rod is required for each beam extending from the abutment stem through the pad into the beam.

D. Minimum pad thickness shall not be less than 1 ½ inches, but not more than 3 inches. Refer to **AASHTO 17th Edition** Subsection 14.6.6.3.6 - Stability, for maximum thickness requirements.

8.3 - PREFORMED FABRIC BEARINGS

This is a small-to-medium load sliding/rotating bearing. It may be used on Thruway mainline and overhead structures following the restrictions of Subsections 8.3.1.1 and 8.3.2.1.

8.3.1 - PREFORMED FABRIC NON-GUIDED EXPANSION BEARINGS

Preformed fabric expansion bearings shall consist of the following:

A. Preformed fabric bearing pad.

B. **Polytetrafloroethylene (PTFE)** sliding surface bonded to the top of the fabric pad.

C. Steel sole plate welded to the bottom of the bottom flange.

D. Stainless steel plate seal welded to the bottom of the sole plate.

E. Two or four anchor bolts drilled and grouted or cast-in-place (**ASTM** F1554 steel with heavy hex nuts) into the concrete substructure.

F. Rectangular plate washers of 1/8th inch minimum thickness. These plate washers shall be beveled to match the slope of the sole plate.

<u>8.3.1.1 - USE CRITERIA</u>

Preformed fabric expansion bearings may be used when all of the following criteria are met:

A. The horizontal alignment of the structure may be straight or curved, but girders must be straight.

B. The total of the vertical reactions (DL+SDL+LL+I) must be less than or equal to 200 kips.

C. The maximum live load rotation from the centerline of bearings to the front or rear edge of the pad must be no more than 0.005 radians <u>plus</u> a 0.01 radian construction tolerance.

D. May be used at expansion supports of jointless structures and jointed structures.

E. The addition of a steel masonry plate (bonded to the bottom of the preformed fabric pad) and a Bearing Pad only when used on steel pedestals.

<u>8.3.1.2 - INSTALLATION AND DESIGN DETAILS</u>

A. The nuts shall be double nutted to the bolts with a gap (1/8th inch minimum) between the top of the washer and the bottom of the bottom nut to allow for rotation and translation at the bearing. The minimum allowable requirements for the size and imbedment length of the bearing anchor bolts shall be as required by **AASHTO 17th Editio**n Subsection 10.29.6.2.

B. The anchor bolts, nuts, and washers shall be shop galvanized. The anchor bolts shall be designed for shear and bending at the top of pedestal. The size and number of bolts will be dependent on the design requirements at each location.

C. The sole plate shall be shop metalized or galvanized (manufacturer's preference) as per the Authority's current specification. The sole plate shall be beveled to match the grade of the bottom flange of the girder with all non-composite and composite dead loads on the girder. The steel sole plate shall be designed for bending and shear with a 1 inch minimum thickness.

D. The centerline of the bearing pad shall be set square to the beam at the centerline of bearings of the beam (centerline of bolt pattern).

E. The sole plate shall be set according to the ambient temperature in relation to the bearing pad.

F. The sole plate shall be welded to the bottom flange after all dead load and superimposed dead load has been applied.

G. The maximum coefficient of static friction between the stainless steel and the **PTFE** surface is 0.06.

8.3.2 - PREFORMED FABRIC FIXED BEARINGS

Preformed fabric fixed bearings are similar to preformed fabric expansion bearings with the following exceptions:

A. No **PTFE** surface is attached to pad.

B. No stainless steel plate is attached to sole plate.

C. The plate washers shall be square instead of rectangular.

8.3.2.1 - USE CRITERIA

The use criteria for preformed fabric fixed bearings is similar to that of preformed fabric expansion bearings with the following restrictions:

A. Preformed fabric fixed bearings may only be used at the fixed supports of jointed structures and the fixed end of jointless simple-span structures.

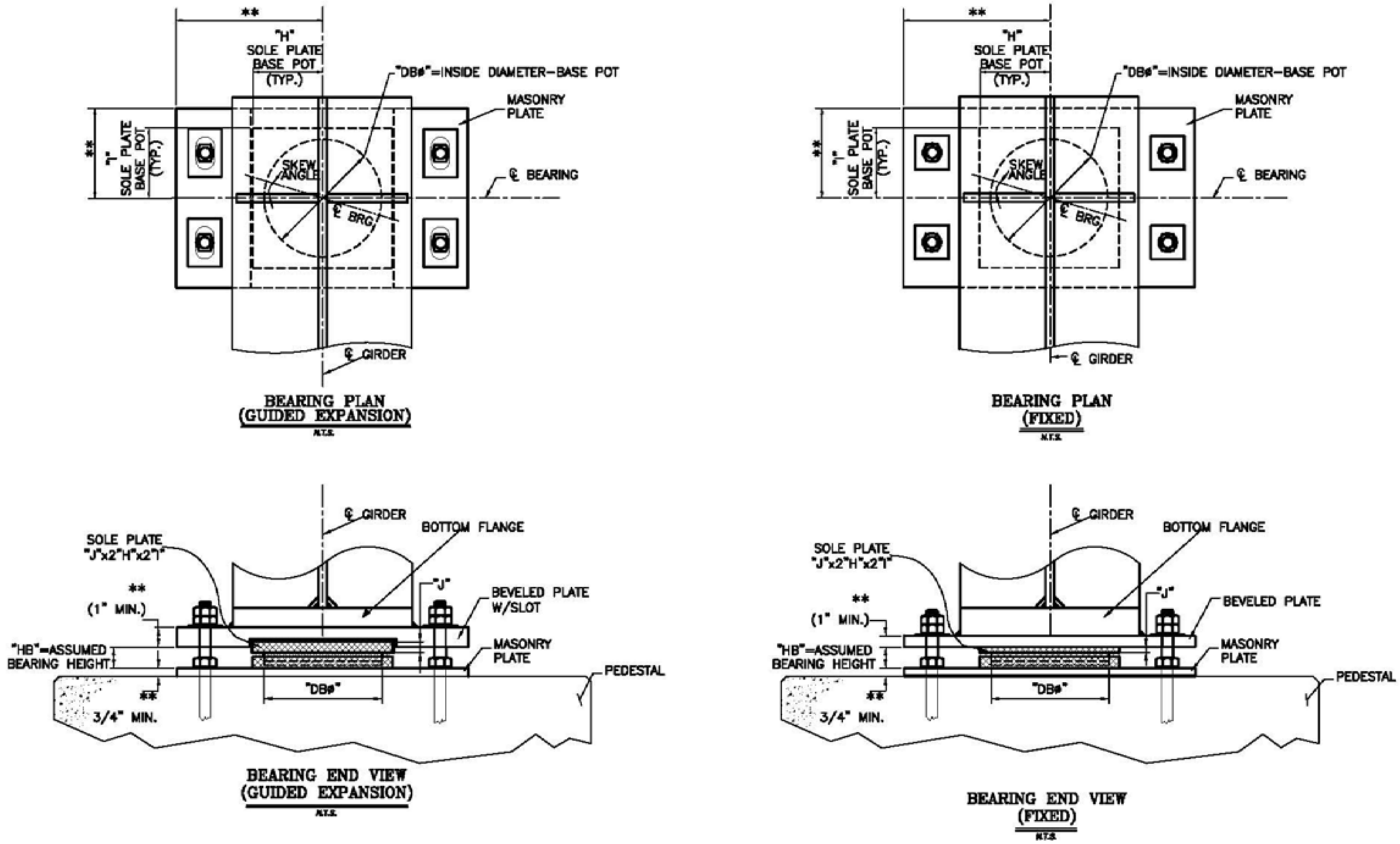
B. Do not use preformed fabric fixed bearings at the intermediate fixed supports of jointless and integral abutment structures.

8.3.2.2 - INSTALLATION AND DESIGN DETAILS

Installation of preformed fabric fixed bearings is similar to preformed fabric expansion bearings with the following exception: The sole plate shall be set square to the beam at the centerline of bearings of the beam (centerline of bolt pattern) directly over the preformed fabric pad.

8.4 - MULTI-ROTATIONAL (POT-TYPE) BEARINGS

This type of bearing is a device that allows rotation through the use of an elastomeric pad contained in a steel "pot"; and translation through the use of flat stainless steel surfaces within a slot against flat **PTFE** surfaces. It may be used on structures with medium-to-high vertical loads (200 to 1000 kips) and normal rotation (less than or equal to 0.02 radians including a 0.01 radian construction tolerance). See Detail 8.4.1 and Table 8.4.1.



INDICATES PARTS DESIGNED BY MANUFACTURER.

** TO BE DETERMINED BY DESIGNER.

FOR ADDITIONAL INFORMATION, SEE THE CURRENT THRUWAY BEARING DETAIL STANDARD SHEETS.

NOTE:
NON GUIDED BEARINGS SHOULD ONLY BE USED WHERE MULTI DIRECTIONAL EXPANSION IS EXPECTED. SUCH AS CURVED GIRDER BRIDGES.

DETAIL 8.4.1
MULTI-ROTATIONAL POT-TYPE BEARING ASSEMBLIES
(REFER TO TABLE 8.4.1 FOR NOTES)
N.T.S.

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NOTE TO DESIGNER:
THE VALUES SHOWN ARE REPRESENTATIVE VALUES FROM A TYPICAL BEARING MANUFACTURER. THE DESIGNER SHOULD CHOOSE THE VALUES FROM THE TABLE THAT MEET THE REQUIREMENTS FOR VERTICAL AND HORIZONTAL CAPACITY ON THE PROJECT. THE DESIGNER SHOULD NOT ATTEMPT TO DESIGN THE BEARINGS BEYOND THESE PRELIMINARY SIZES AND THE GUIDELINES SHOWN ON THE STANDARD SHEETS. IT IS THE CONTRACTOR'S AND BEARING MANUFACTURER'S RESPONSIBILITY TO PROVIDE THE DETAILED DESIGN ON THE SHOP DRAWINGS BASED ON MANUFACTURER'S INDIVIDUAL COMPONENT SPECIFICATIONS AND THE PROJECT REQUIREMENTS FOR VERTICAL AND HORIZONTAL CAPACITY AS WELL AS REQUIRED LIVE LOAD ROTATION LIMITS.

PRELIMINARY DIMENSIONS FOR GUIDED EXPANSION BEARING						
TOTAL VERTICAL LOAD kips	TOTAL HORIZ. LOAD kips	DB∅ INCHES	H INCHES	I INCHES	J INCHES	HB INCHES
100	20.0	6.03	4.75	4.75	0.75	1.43
150	30.0	7.39	5.63	5.44	0.88	1.65
200	40.0	8.53	6.25	6.00	0.88	1.75
250	50.0	9.54	7.06	6.50	1.00	1.98
300	60.0	10.45	7.63	6.94	1.13	2.09
350	70.0	11.28	8.19	7.38	1.13	2.20
400	80.0	12.06	8.50	7.81	1.13	2.31
450	90.0	12.79	8.94	8.13	1.25	2.42
500	100.0	13.49	9.69	8.50	1.38	2.66
600	120.0	14.77	10.56	9.13	1.50	3.12
700	140.0	15.96	11.38	9.75	1.50	3.23
800	160.0	17.06	12.25	10.31	1.50	3.33
900	180.0	18.09	12.81	10.81	1.50	3.32
1000	200.0	19.07	13.44	11.31	1.75	3.67
1100	220.0	20.00	14.31	11.75	1.75	3.78
1200	240.0	20.89	14.94	12.19	1.75	4.00
1300	260.0	21.75	15.50	12.63	1.75	4.23
1400	280.0	22.57	15.94	13.06	1.75	4.22
1500	300.0	23.36	16.50	13.69	1.75	4.20
1600	320.0	24.13	17.13	14.06	1.75	4.45
1700	340.0	24.87	17.56	14.19	2.00	4.68
1800	360.0	25.59	17.94	14.56	2.00	4.67
1900	380.0	26.29	18.75	14.88	2.00	5.15
2000	400.0	26.97	19.31	15.25	2.00	5.13

PRELIMINARY DIMENSIONS FOR FIXED BEARINGS						
TOTAL VERTICAL LOAD kips	TOTAL HORIZ. LOAD kips	DB∅ INCHES	H INCHES	I INCHES	J INCHES	HB INCHES
100	20.0	6.03	3.44	3.44	0.50	1.51
150	30.0	7.39	4.31	4.31	0.50	1.61
200	40.0	8.53	4.94	4.94	0.50	1.71
250	50.0	9.54	5.50	5.50	0.50	1.81
300	60.0	10.45	6.06	6.06	0.50	1.79
350	70.0	11.28	6.63	6.63	0.63	2.03
400	80.0	12.06	6.94	6.94	0.63	2.14
450	90.0	12.79	7.44	7.44	0.63	2.12
500	100.0	13.49	7.88	7.88	0.63	2.23
600	120.0	14.77	8.50	8.50	0.63	2.58
700	140.0	15.96	9.31	9.31	0.75	2.81
800	160.0	17.06	9.94	9.94	0.75	2.91
900	180.0	18.09	10.50	10.50	0.88	3.02
1000	200.0	19.07	11.13	11.13	0.88	3.12
1100	220.0	20.00	11.75	11.75	1.00	3.36
1200	240.0	20.89	12.13	12.13	1.00	3.58
1300	260.0	21.75	12.69	12.69	1.00	3.81
1400	280.0	22.57	13.19	13.19	1.00	3.80
1500	300.0	23.36	13.69	13.69	1.13	3.91
1600	320.0	24.13	14.06	14.06	1.13	4.15
1700	340.0	24.87	14.50	14.50	1.13	4.13
1800	360.0	25.59	14.94	14.94	1.25	4.25
1900	380.0	26.29	15.44	15.44	1.25	4.73
2000	400.0	26.97	15.75	15.75	1.25	4.71

TABLE 8.4.1

MULTI-ROTATIONAL POT-TYPE BEARINGS

8.4.1 - GUIDED EXPANSION POT BEARINGS

Multi-rotational (pot-type) expansion bearings shall consist of the following:

Lower Bearing Assembly

A. A galvanized or metalized, steel masonry plate of ¾ inch minimum thickness (with a fabric bearing pad under the masonry plate).

B. Steel base pot

C. Elastomeric pad

D. Brass sealing ring(s)

Middle Bearing Assembly

E. Steel piston

F. Steel sole plate

G. **PTFE** pad bonded to the top and longitudinal sides of the sole plate.

Upper Bearing Assembly

H. A galvanized or metalized, steel beveled plate of 1 inch minimum thickness with slot in bottom for guided expansion.

I. Stainless steel plate welded to slot surfaces on beveled plate.

J. Four (4) **ASTM** F1554 galvanized anchor bolts, cast-in-place or drilled and grouted into concrete, extending up through the masonry plate and beveled plate (with heavy hex nuts and hardened washers, all galvanized).

K. Galvanized rectangular plate washers, beveled to match the slope of the beveled plate. Plate washers shall have a minimum thickness of 1/8th inch.

8.4.1.1 - USE CRITERIA

Multi-rotational guided expansion bearings may be used when the following conditions apply:

A. The longitudinal beams or girders are curved or straight.

B. The total vertical reaction (DL+SDL+LL+I) is between 200 and 1000 kips.

C. Small-to-moderate live load rotations (less than or equal to 0.02 radians including a 0.01 radian construction tolerance).

D. These bearings may be used at the expansion supports of jointless and jointed structures.

E. These bearings may be used at the expansion intermediate supports of integral abutment multi-span structures.

8.4.1.2 - INSTALLATION AND DESIGN DETAILS

A. The base pot, steel piston, steel sole plate and beveled plate shall be galvanized or metalized in conformance with the bearing manufacturer's recommendations.

B. On bridges with straight girders, the centerline of the lower and middle bearing assemblies shall be square to the girder at the centerline of bearings of the girder (centerline of bolt pattern). On bridges with curved girders, the lower and middle bearing assemblies shall be set at the centerline of bearings of the girder, (centerline of anchor bolt pattern), square to the chord of the girder. The chord of a curved girder is defined as the straight line from centerline of bearings of girder to centerline of bearings of the same girder between two bearing supports.

C. The sole plate shall be welded to the piston prior to assembling the bearing.

D. The lower bearing assembly shall be attached to the substructure with heavy hex nuts and hardened washers fastened "snug tight" to the masonry plate.

E. The upper bearing assembly shall be set according to the ambient temperature in relation to the middle and lower bearing assemblies.

F. The upper bearing assembly and girder will be restricted vertically by double nutting the heavy hex nuts to the anchor bolts above the beveled plate. A gap between the top of the plate washer and the bottom of bottom nut will allow for bearing rotation. The gap dimension (1/8th inch minimum) will depend on the amount of live load rotation at each girder location.

G. The anchor bolts shall be designed for horizontal shear and bending at the top of the masonry plate nuts. The anchor bolts will restrain the superstructure longitudinally, and the anchor bolts and piston will restrain the superstructure transversely. The minimum allowable requirements for the size and imbedment length of the bearing anchor bolts shall be as required by **AASHTO 17th Edition** Subsection 10.29.6.2.

H. The upper bearing assembly shall be attached to the girder by welding the beveled plate longitudinally to the bottom flange after all non-composite and composite dead loads have been applied.

8.4.2 - FIXED POT BEARINGS

Multi-rotational (pot-type) fixed bearings shall consist of the following:

Lower Bearing Assembly

A. A galvanized or metalized, steel masonry plate of ¾ inch minimum thickness (with a fabric bearing pad under the masonry plate).

B. Steel base pot

C. Elastomeric pad

D. Brass sealing ring(s)

Upper Bearing Assembly

E. Steel piston

F. Steel sole plate

G. A galvanized or metalized, steel beveled plate of 1 inch minimum thickness.

H. Four (4) **ASTM** F1554 galvanized anchor bolts, cast-in-place or drilled and grouted into concrete, extending up through the masonry plate and beveled plate (with heavy hex nuts and hardened washers, all galvanized).

I. Galvanized square plate washers, beveled to match the slope of the beveled plate. Plate washers shall have a minimum thickness of $1/8^{th}$ inch.

8.4.2.1 - USE CRITERIA

Multi-rotational fixed bearings may be used when the following conditions apply:

A. The longitudinal beams or girders are curved or straight.

B. The total vertical reaction (DL+SDL+LL+I) is between 200 and 1000 kips.

C. Small-to-moderate live load rotations (less than or equal to 0.02 radians including a 0.01 radian construction tolerance).

D. These bearings may be used at the fixed supports of jointless and jointed structures.

E. These bearings shall be used at the fixed intermediate supports of all integral abutment multi-span structures.

<u>8.4.2.2 - INSTALLATION AND DESIGN DETAILS</u>

A. The base pot, steel piston, steel sole plate and beveled plate shall be galvanized or metalized in conformance with the bearing manufacturer's recommendations.

B. On bridges with straight girders, the centerline of the bearing device shall be square to the girder at the centerline of bearings of the girder (centerline of bolt pattern). On bridges with curved girders, the bearing device shall be set at the centerline of bearings of the girder, (centerline of anchor bolt pattern), square to the chord of the girder. The chord of a curved girder is defined as the straight line from centerline of bearings of girder to centerline of bearings of the same girder between two bearing supports.

C. The sole plate shall be welded to the beveled plate prior to assembling the bearing.

D. The lower bearing assembly shall be attached to the substructure with heavy hex nuts and hardened washers fastened "snug tight" to the masonry plate.

E. The centered bearing shall be welded at the beveled plate/bottom flange location after all composite and non-composite dead loads have been applied.

F. The upper bearing assembly and girder will be restricted vertically by double nutting the heavy hex nuts to the anchor bolts above the beveled plate. A gap between the top of the plate washer and the bottom of bottom nut will allow for bearing rotation. The gap dimension (1/8th inch minimum) will depend on the amount of live load rotation at each girder location.

G. The anchor bolts shall be designed for horizontal shear at the top of pedestal. The bearing pot will restrain the superstructure horizontally. The minimum allowable requirements for

H. the size and imbedment length of the bearing anchor bolts shall be as required by **AASHTO 17th Edition** Subsection 10.29.6.2.

8.5 - MULTI-ROTATIONAL (DISC-TYPE) BEARINGS

This type of bearing is a device that allows rotation through the deflection of a polyurethane pad bonded to top and bottom steel load plates; and translation through the use of a flat stainless steel surface against a flat **PTFE** surface. The horizontal capacity of the fixed bearings is provided by a steel pin at the center of the pad. The pin shall be a minimum of 1 ½ inch in diameter. This pin shall be press fit or threaded the full depth into the bottom load plate and extend partially up into the top load plate. These bearings may be used on structures with low-to-high vertical loads (100 to 2000 kips), normal rotation (less than or equal to 0.02 radians including a 0.01 radian construction tolerance), and any expansion length.

8.5.1 - GUIDED EXPANSION DISC BEARINGS

Expansion bearings shall consist of the following:

Lower Bearing Assembly

A. A galvanized or metalized, steel masonry plate of ¾ inch minimum thickness (with a fabric bearing pad under the masonry plate).

B. Bottom steel load plate (galv. or metalized)

C. Polyurethane pad w/steel pin

D. Top steel load plate (galv. or metalized)

E. **PTFE** layer bonded to top and sides of load plate

Upper Bearing Assembly

F. A galvanized or metalized, steel sole plate of 1 inch minimum thickness, slotted for guided expansion.

G. Stainless steel plate seal welded to inside surfaces of slot in sole plate.

H. Four (4) **ASTM** F1554 galvanized anchor bolts, cast-in-place or drilled and grouted into concrete, extending up through the masonry plate and sole plate (with heavy hex nuts and hardened washers, all galvanized).

I. Galvanized rectangular plate washers, beveled to match the slope of the sole plate. Plate washers shall have a minimum thickness of 1/8th inch.

8.5.1.1 - USE CRITERIA

Expansion bearings may be used when the following conditions apply:

A. The longitudinal beams or girders are curved or straight.

B. The total vertical reaction (DL+SDL+LL+I) is between 100 and 2000 kips.

C. Small-to-moderate live load rotations (less than or equal to 0.02 radians including a 0.01 radian construction tolerance).

D. These bearings may be used at the expansion supports of jointless and jointed structures.

E. These bearings may be used at the expansion intermediate supports of integral abutment multi-span structures.

8.5.1.2 - INSTALLATION AND DESIGN DETAILS

A. The bearing steel shall be galvanized or metalized in conformance with the bearing manufacturer's recommendations.

B. On bridges with straight girders, the centerline of the lower bearing assembly shall be square to the girder at the centerline of bearings of the girder (centerline of bolt pattern). On bridges with curved girders, the lower bearing assembly shall be set at the centerline of bearings of the girder, (centerline of anchor bolt pattern), square to the chord of the girder. The chord of a curved girder is defined as the straight line from centerline of bearings of girder to centerline of bearings of the same girder between two bearing supports.

C. The sole plate shall be welded to the top load plate prior to installing the bearing.

D. The lower bearing assembly shall be attached to the substructure with heavy hex nuts and hardened washers fastened "snug tight" to the masonry plate.

E. The upper bearing assembly shall be set in accordance with the ambient temperature in relation to the lower bearing assembly.

F. The upper bearing assembly and girder will be restricted vertically by double nutting the heavy hex nuts to the anchor bolts above the sole plate. A gap between the top of the plate washer and the bottom of bottom nut will allow for bearing rotation. The gap dimension (1/8th inch minimum) will depend on the amount of live load rotation at each girder location.

G. The anchor bolts shall be designed for horizontal bending and shear at the top of masonry plate nuts. The anchor bolts will restrain the superstructure longitudinally. The pin and anchor bolts will restrain the superstructure transversely. The minimum allowable requirements for the size and imbedment length of the bearing anchor bolts shall be as required by **AASHTO 17th Edition** Subsection 10.29.6.2.

H. The upper bearing assembly shall be attached to the girder by welding the sole plate longitudinally to the bottom flange after all non-composite and composite dead loads have been applied.

8.5.2 - FIXED DISC BEARINGS

Fixed bearings shall consist of the following:

A. A galvanized or metalized, steel masonry plate of ¾ inch minimum thickness (with a fabric bearing pad under the masonry plate).

B. Bottom steel load plate (galv. or metalized)

C. Polyurethane pad w/steel pin

D. Top steel load plate (galv. or metalized)

E. A galvanized or metalized, steel sole plate of 1 inch minimum thickness.

F. Four (4) **ASTM** F1554 galvanized anchor bolts, cast-in-place or drilled and grouted into concrete, extending up through the masonry plate and sole plate (with heavy hex nuts and hardened washers, all galvanized).

G. Galvanized square plate washers, beveled to match the slope of the sole plate. Plate washers shall have a minimum thickness of 1/8th inch.

8.5.2.1 - USE CRITERIA

Fixed bearings may be used when the following conditions apply:

A. The longitudinal beams or girders are curved or straight.

B. The total vertical reaction (DL+SDL+LL+I) is between 100 and 2000 kips.

C. Small-to-moderate live load rotations (less than or equal to 0.02 radians including a 0.01 radian construction tolerance).

D. These bearings may be used at the fixed supports of jointless and jointed structures.

E. These bearings SHALL NOT be used at the fixed intermediate supports of integral abutment multi-span structures.

8.5.2.2 - INSTALLATION AND DESIGN DETAILS

A. The bearing steel shall be galvanized or metalized in conformance with the bearing manufacturer's recommendations.

B. On bridges with straight girders, the centerline of the bearing device shall be square to the girder at the centerline of bearings of the girder (centerline of bolt pattern). On bridges with curved girders, the bearing device shall be set at the centerline of bearings of the girder, (centerline of anchor bolt pattern), square to the chord of the girder. The chord of a curved girder is defined as the straight line from centerline of bearings of girder to centerline of bearings of the same girder between two bearing supports.

C. The sole plate shall be welded to the top load plate prior to assembling the bearing.

D. The bearing device shall be attached to the substructure with heavy hex nuts and hardened washers fastened "snug tight" to the masonry plate.

E. The centered bearing shall be welded at the sole plate/bottom flange location. Welding should only be done after all composite and non-composite dead loads have been applied.

F. The girder will be restricted vertically by double nutting the heavy hex nuts to the anchor bolts above the sole plate. A gap between the top of the plate washer and the bottom of bottom nut will allow for bearing rotation. The gap dimension ($1/8^{th}$ inch minimum) will depend on the amount of live load rotation at each girder location.

G. The anchor bolts shall be designed for shear at the top of pedestal. The pin and anchor bolts will restrain the superstructure longitudinally and transversely. The minimum allowable requirements for the size and imbedment length of the bearing anchor bolts shall be as required by **AASHTO 17th Edition** Subsection 10.29.6.2.

8.6 - SPHERICAL BEARINGS (MULTI ROTATIONAL)

This type of device is made up of flat sliding surfaces (for translation) and spherical sliding surfaces (for rotation). Sliding is accomplished through the use of stainless steel and **PTFE** contact surfaces. These bearings are for use at bearing locations with high vertical loads (500 to 2000 kips) and high rotation (greater than 0.015 radians).

8.6.1 - SPHERICAL GUIDED EXPANSION BEARINGS

See Detail 8.6.1 and Table 8.6.1. Multi-rotational spherical guided expansion bearings shall consist of the following:

Lower Bearing Assembly

A. A galvanized or metalized, steel masonry plate of ¾ inch minimum thickness.

B. A steel bottom plate with a convex top surface of 1 inch minimum thickness.

C. Stainless steel seal welded to convex top surface of bottom plate.

Middle Bearing Assembly

D. A steel top plate with concave bottom surface of ¾ inch minimum thickness.

E. **PTFE** material bonded to concave surface of top plate.

F. **PTFE** material bonded to the top (flat) surface and sides of the top plate.

Upper Bearing Assembly

G. A steel sole plate of 1 inch minimum thickness with longitudinal slot in bottom for guided expansion.

H. Stainless steel seal welded to surfaces of slot in sole plate.

I. Four (4) **ASTM** F1554 galvanized anchor bolts, cast-in-place or drilled and grouted into concrete, extending up through the masonry plate and sole plate (with heavy hex nuts and hardened washers, all galvanized).

J. Galvanized rectangular plate washers, beveled to match the slope of the sole plate. Plate washers shall have a minimum thickness of 1/8th inch.

8.6.1.1 - USE CRITERIA

Spherical Expansion bearings may be used when the following conditions exist:

A. Longitudinal beams or girders are curved or straight.

B. Expansion supports of jointless or jointed structures.

C. Intermediate expansion supports of integral abutment or framed structures.

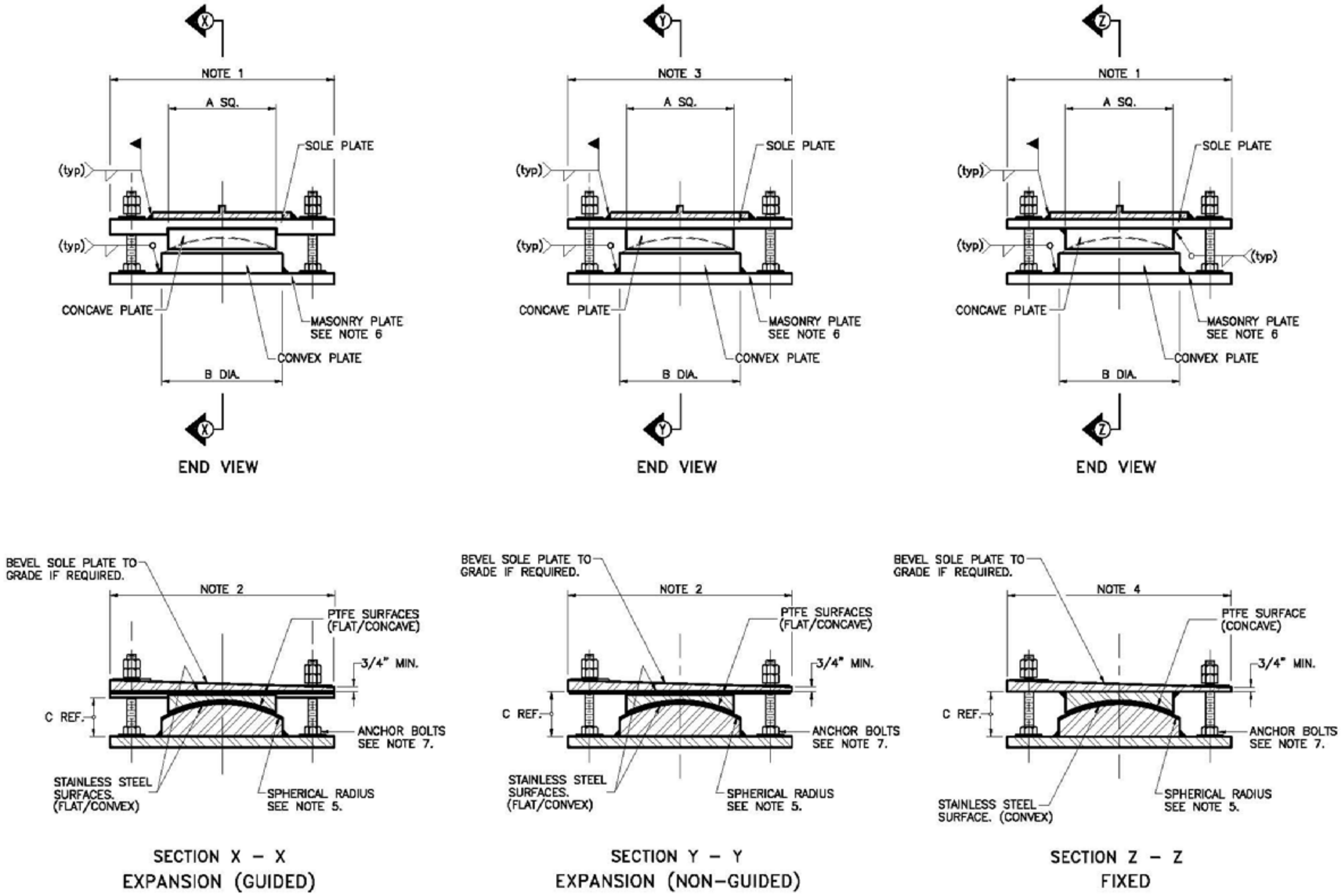
Spherical expansion bearings shall only be used when at least one of the following conditions exist:

A. The total vertical reaction (DL+SDL+LL+I) is between 500 and 2000 kips.

B. Large live load rotations (greater than 0.015 radians plus a 0.01 radian construction tolerance).

C. High bearing-to-masonry plate compressive stresses exist (1000 to 7000 psi).

Due to high allowable internal bearing pressures on the **PTFE** material (3500 psi); spherical bearings are very efficient load transmitters to steel pedestals and/or substructures (i.e. steel pier caps and suspended spans).



DETAIL 8.6.1
SPHERICAL BEARING ASSEMBLIES
(REFER TO TABLE 8.6.1 FOR NOTES)

N.T.S.

NOTE:
NON GUIDED BEARINGS SHOULD ONLY BE USED WHERE MULTI DIRECTIONAL EXPANSION IS EXPECTED. SUCH AS CURVED GIRDER BRIDGES.

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BEARINGS LOADINGS (KIPS)				PLATE DIMENSIONS FOR 3500psi BEARINGS (INCHES)					PLATE DIMENSIONS FOR 6000psi BEARINGS (INCHES)				
				CONCAVE PLATE		CONVEX PLATE	OVERALL HEIGHT EXPAN	OVERALL HEIGHT FIXED	CONCAVE PLATE		CONVEX PLATE	OVERALL HEIGHT EXPAN	OVERALL HEIGHT FIXED
MAXIMUM VERTICAL LOAD	MINIMUM DEAD LOAD	LONG. LOAD	TRANS LOAD	A	RADIUS	B	C	C	A	RADIUS	B	C	C
100	50	10	10	8	9	7	2 9/16	2 3/8	6 1/2	7	5 1/2	2 7/16	2 1/4
200	100	20	20	10 1/4	12	9 1/2	2 11/16	2 1/2	8 1/4	8	7 1/4	2 1/2	2 5/16
300	150	30	30	12	15	11 1/2	2 3/4	2 9/16	9 3/4	10	9	2 11/16	2 1/2
400	200	40	40	13 3/4	18	13 1/2	2 15/16	2 3/4	11	12	10 1/4	2 3/4	2 9/16
500	250	50	50	15 1/4	21	15	3	2 13/16	12	12	11 1/4	3	2 13/16
600	300	60	60	16 1/2	24	16 3/4	3 1/8	2 15/16	13	15	12 1/2	2 15/16	2 3/4
700	350	70	70	17 3/4	24	17 3/4	3 5/16	3 1/8	14	15	13 1/2	3 3/16	3
800	400	80	80	19	27	19 1/4	3 3/8	3 3/16	14 3/4	15	14 1/4	3 3/8	3 3/16
900	450	90	90	19 3/4	27	20	3 1/2	3 5/16	15 1/2	18	15	3 1/4	3 1/16
1000	500	100	100	20 3/4	30	21 1/4	3 9/16	3 3/8	16 1/4	18	16	3 1/2	3 5/16
1100	550	110	110	21 3/4	30	22 1/4	3 3/4	3 9/16	17 1/4	18	16 3/4	3 11/16	3 1/2
1200	600	120	120	22 3/4	33	23 1/2	3 3/4	3 9/16	17 3/4	21	17 3/4	3 9/16	3 3/8
1300	650	130	130	23 1/2	33	24 1/4	3 7/8	3 11/16	18 1/2	21	18 1/4	3 11/16	3 1/2
1400	700	140	140	24 1/4	36	25	3 13/16	3 5/8	19	21	18 3/4	3 13/16	3 5/8
1500	750	150	150	25 1/4	36	26 1/4	4 1/16	3 7/8	19 1/2	21	19 1/4	3 15/16	3 3/4
1600	800	160	160	26	39	27	4	3 13/16	20 1/4	24	20 1/4	3 13/16	3 5/8
1700	850	170	170	26 3/4	39	27 3/4	4 1/8	3 15/16	20 3/4	24	20 3/4	3 15/16	3 3/4
1800	900	180	180	27 1/2	39	28 1/2	4 5/16	4 1/8	21 1/2	24	21 1/2	4 1/8	3 15/16
1900	950	190	190	28	42	29 1/4	4 1/4	4 1/16	22	24	22	4 1/4	4 1/16
2000	1000	200	200	28 3/4	42	30	4 3/8	4 3/16	22 1/4	27	22 1/2	4 1/16	3 7/8

NOTES

1. MINIMUM SOLE PLATE WIDTH MUST BE EQUAL TO "A" PLUS 1 1/2" FOR EXPANSION–GUIDED (PLUS 1" FOR FIXED) AND ALSO WIDER THAN BEAM FLANGE BY 1" TO ACCOMMODATE DOWN HAND WELDING.
2. MINIMUM SOLE PLATE LENGTH MUST BE EQUAL TO MASONRY PLATE LENGTH.
3. MINIMUM FREE EXPANSION SOLE PLATE WIDTH MUST BE EQUAL TO "A" PLUS 1" PLUS MAXIMUM EXPANSION AND WIDER THAN BEAM FLANGE BY 1" TO ACCOMMODATE DOWN HAND WELDING.
4. FIXED SOLE PLATE LENGTH MUST BE EQUAL TO MASONRY PLATE LENGTH.
5. SPHERICAL RADIUS CALCULATED USING LONGITUDINAL AND TRANSVERSE LOADINGS EQUAL TO 10% OF MAXIMUM VERTICAL LOAD, A MINIMUM DEAD LOAD OF 50% OF THE MAXIMUM VERTICAL LOAD AND ± 2° ROTATION.
6. MASONRY PLATE LENGTH, WIDTH AND THICKNESS ARE DEPENDENT ON ALLOWABLE CONCRETE UNIT LOADING, PHYSICAL RESTRICTIONS AND BENDING MOMENTS.
7. ANCHOR BOLT SIZE AND QUANTITIES PER APPROPRIATE CODE.
8. ALL DIMENSION SHOWN ARE FOR GENERAL CONCEPT ONLY AND MAY BE MODIFIED TO MEET SPECIFIC APPLICATION PARAMETERS.

TABLE 8.6.1
SPHERICAL BEARINGS

8.6.1.2 - INSTALLATION AND DESIGN DETAILS

A. The masonry plate, bottom plate, top plate and sole plate shall be galvanized or metalized in conformance with the bearing manufacturer's recommendations.

B. On bridges with straight girders, the centerline of the lower and middle bearing assemblies shall be square to the girder at the centerline of bearings of the girder (centerline of bolt pattern). On bridges with curved girders, the lower and middle bearing assemblies shall be set at the centerline of bearings of the girder, (centerline of anchor bolt pattern), square to the chord of the girder. The chord of a curved girder is defined as the straight line from centerline of bearings of girder to centerline of bearings of the same girder between two bearing supports.

C. The lower bearing assembly shall be attached to the substructure with heavy hex nuts and hardened washers fastened "snug tight" to the masonry plate.

D. The middle bearing assembly shall be placed directly over the centerline of the lower bearing assembly.

E. The upper bearing assembly shall be set according to the ambient temperature in relation to the middle and lower bearing assemblies.

F. The upper bearing assembly and girder will be restricted vertically by double nutting the heavy hex nuts to the anchor bolts above the sole plate. A gap between the top of the plate washer and the bottom of bottom nut will allow for bearing rotation. The gap dimension ($1/8^{th}$ inch minimum) will depend on the amount of live load rotation at each girder location.

G. The anchor bolts shall be designed for horizontal shear and bending at the top of the masonry plate nuts. The anchor bolts will restrain the superstructure longitudinally and transversely.

The minimum allowable requirements for the size and imbedment length of the bearing anchor bolts shall be as required by **AASHTO 17th Edition** Subsection 10.29.6.2.

H. The upper bearing assembly shall be attached to the girder by welding the sole plate longitudinally to the bottom flange after all non-composite and composite dead loads have been applied.

8.6.2 - SPHERICAL FIXED BEARINGS

See Detail Sheet 8.6.1 and Table 8.6.1. Multi-rotational spherical fixed bearings shall consist of the following:

Lower Bearing Assembly

A. A galvanized or metalized, steel masonry plate of ¾ inch minimum thickness.

B. A steel bottom plate with a convex top surface of 1 inch minimum thickness.

C. Stainless steel seal welded to convex top surface of bottom plate.

Upper Bearing Assembly

D. A steel top plate with concave bottom surface of ¾ inch minimum thickness.

E. **PTFE** material bonded to concave surface of top plate.

F. A steel sole plate of 1 inch minimum thickness with longitudinal slot in bottom for guided expansion.

G. Four (4) **ASTM** F1554 galvanized anchor bolts, cast-in-place or drilled and grouted into concrete, extending up through the masonry plate and sole plate (with heavy hex nuts and hardened washers, all galvanized).

H. Galvanized rectangular plate washers, beveled to match the slope of the sole plate. Plate washers shall have a minimum thickness of 1/8th inch.

8.6.2.1 - USE CRITERIA

Spherical fixed bearings may be used when the following conditions exist:

A. Longitudinal beams or girders are curved or straight.

B. Fixed supports of jointless or jointed structures.

C. Intermediate fixed supports of integral abutment or framed structures.

Spherical fixed bearings shall only be used when at least one of the following conditions exist:

A. The total vertical reaction (DL+SDL+LL+I) is between 500 and 2000 kips.

B. Large live load rotations (greater than 0.015 radians plus a 0.01 radian construction tolerance).

C. High bearing-to-masonry plate compressive stresses exist (1000 to 7000 psi).

D. Due to high allowable internal bearing pressures on the **PTFE** material (3500 psi); spherical bearings are very efficient load transmitters to steel pedestals and/or substructures (i.e. steel pier caps and suspended spans).

8.6.2.2 - INSTALLATION AND DESIGN DETAILS

A. The masonry plate, bottom plate, top plate and sole plate shall be galvanized or metalized in conformance with the bearing manufacturer's recommendations.

B. On bridges with straight girders, the centerline of the lower and upper bearing assemblies shall be square to the girder at the centerline of bearings of the girder (centerline of bolt pattern). On bridges with curved girders, the lower and upper bearing assemblies shall be set at the centerline of bearings of the girder, (centerline of anchor bolt pattern), square to the chord of the girder. The chord of a curved girder is defined as the straight line from centerline of bearings of girder to centerline of bearings of the same girder between two bearing supports.

C. The lower bearing assembly shall be attached to the substructure with heavy hex nuts and hardened washers fastened "snug tight" to the masonry plate.

D. The upper bearing assembly shall be placed directly over the centerline of the lower bearing assembly.

E. The upper bearing assembly and girder will be restricted vertically by double nutting the heavy hex nuts to the anchor bolts above the sole plate. A gap between the top of the plate washer and the bottom of bottom nut will allow for bearing rotation. The gap dimension ($1/8^{th}$ inch minimum) will depend on the amount of live load rotation at each girder location.

F. The anchor bolts shall be designed for horizontal shear at the top of the pedestal. The anchor bolts will restrain the superstructure longitudinally and transversely. The minimum allowable requirements for the size and imbedment length of the bearing anchor bolts shall be as required by **AASHTO 17th Edition** Subsection 10.29.6.2.

G. The upper bearing assembly shall be attached to the girder by welding the sole plate longitudinally to the bottom flange after all non-composite and composite dead loads have been applied.

8.7 - ELASTOMERIC BEARINGS

This type of device is a small-to-medium load (up to 450 kips) deforming/rotating bearing. It is constructed of steel plates and vulcanized rubber.

8.7.1 - ELASTOMERIC EXPANSION BEARINGS

Elastomeric expansion bearings shall consist of the following:

A. A galvanized or metalized steel masonry plate of ¾ inch minimum thickness.

B. A single layer plain or multi-layer steel laminated elastomeric pad.

C. Two (one top and one bottom) external galvanized or metalized steel load plates of ¾ inch minimum thickness.

D. A galvanized or metalized, steel sole plate of 1 inch minimum thickness.

E. Two (2) or four (4) **ASTM** F1554 galvanized anchor bolts, cast-in-place or drilled and grouted into concrete, extending up through the masonry plate and sole plate* (with heavy hex nuts and hardened washers, all galvanized).

F. Galvanized square plate washers, beveled to match the slope of the sole plate. Plate washers shall have a minimum thickness of 1/8th inch.*

* - Refer to Subsections 8.1.4 and 8.1.4.5 regarding the applicability of the anchor bolts extending up through the sole plate.

8.7.1.1 - USE CRITERIA

Elastomeric expansion bearings may be used when the following criteria are met:

A. The horizontal alignment of the structure may be straight or curved; girders may be straight or curved.

B. The total vertical reaction (DL+SDL+LL) at each bearing must be no more than 200 kips for rectangular bearings and 450 kips for circular bearings. Pot, Disc, or Spherical bearings shall be used if these loads are exceeded.

C. The maximum live load rotation from the centerline of bearings to the front or rear edge of the pad must be less than or equal to 0.005 radians plus a 0.01 radian construction tolerance.

D. These bearings may be used at expansion supports of jointless and jointed structures.

E. These bearings may be used at the intermediate expansion supports of multi-span integral abutment structures.

8.7.1.2 - INSTALLATION AND DESIGN DETAILS

A. The bearing steel shall be galvanized or metalized in conformance with the bearing manufacturer's recommendations.

B. On bridges with straight girders, the centerline of the bearing device shall be square to the girder at the centerline of bearings of the girder (centerline of bolt pattern). On bridges with curved girders, the bearing device shall be set at the centerline of bearings of the girder, (centerline of anchor bolt pattern), square to the chord of the girder. The chord of a curved girder is defined as the straight line from centerline of bearings of girder to centerline of bearings of the same girder between two bearing supports.

C. The sole plate and masonry plate shall be welded to the external load plates prior to installing the bearing.

D. The bearing device shall be attached to the substructure with heavy hex nuts and hardened washers fastened "snug tight" to the masonry plate.

E. The centered bearing shall be welded at the sole plate/bottom flange location. Welding should only be done after all composite and non-composite dead loads have been applied.

F. The girder will be restricted vertically by double nutting the heavy hex nuts to the anchor bolts above the sole plate. A gap between the top of the plate washer and the bottom of bottom nut will allow for bearing rotation. The gap dimension ($1/8^{th}$ inch minimum) will depend on the amount of live load rotation at each girder location.*

G. The anchor bolts shall be designed for shear and bending at the top of the bottom nut. The anchor bolts will restrain the superstructure longitudinally and transversely. The minimum allowable requirements for the size and imbedment length of the bearing anchor bolts shall be as required by **AASHTO 17^{th} Edition** Subsection 10.29.6.2.*

H. Refer to the appropriate **BD** sheet for Elastomeric Expansion Bearings for the elastomer requirements. The size and number of elastomeric layers will depend on the design vertical loading and the design horizontal movement of the superstructure. The shape of the elastomeric pad (rectangular or circular) will also depend on the design vertical loading of the superstructure.

I. Refer to the appropriate **BD** sheet for Elastomeric Expansion Bearings for the steel internal load plate requirements. These plates shall be bonded to the elastomeric bearing pads between each layer during vulcanization.

J. The external load plates shall be designed for bending if they extend beyond the edge of the bottom flange. The minimum edge distance from the front or rear of the external load plates to the edge of the sole plate or masonry plate is 1 inch.

K. The sole plate shall be beveled to match the grade of the bottom flange when all composite and non-composite dead loads have been applied to the superstructure.

* - Refer to Subsections 8.1.4 and 8.1.4.5 regarding the applicability of the anchor bolts extending up through the sole plate.

8.7.2 - ELASTOMERIC FIXED BEARINGS

Elastomeric fixed bearings are similar to elastomeric expansion bearings with the following changes:

A. Include a steel pin of 1 ½ inch minimum diameter, at the center of the bearing. For details of the steel pin, see the appropriate Thruway Standard Sheet.

B. The plate washers shall be square instead of rectangular.

C. The holes in the sole plate shall be round instead of slotted.

8.7.2.1 - USE CRITERIA

A. The horizontal alignment of the structure may be straight or curved; girders may be straight or curved.

B. The total vertical reaction (DL+SDL+LL) at each bearing must be no more than 200 kips for rectangular bearings and 450 kips for circular bearings. Pot, Disc, or Spherical bearings shall be used if these loads are exceeded.

C. The maximum live load rotation from the centerline of bearings to the front or rear edge of the pad must be less than or equal to 0.005 radians plus a 0.01 radian construction tolerance.

D. These bearings may be used at the fixed supports of jointed and jointless structures.

E. These bearings **shall not** be used at the intermediate fixed supports of integral abutment structures.

8.7.2.2 - INSTALLATION AND DESIGN DETAILS

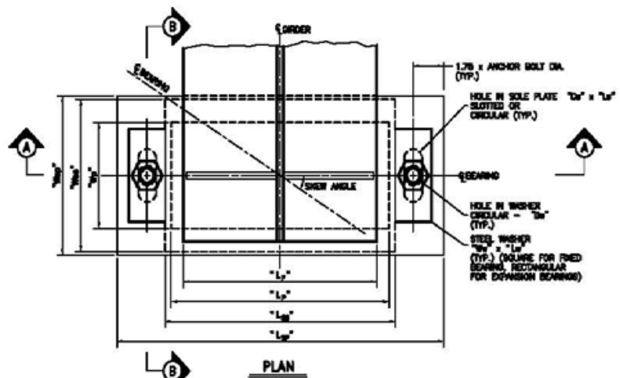
Refer to appropriate **BD** sheet for Design Tables for fixed bearings. The installation and design details for the fixed bearings are similar to those of the expansion bearings with the following addition:

For fixed elastomeric bearings pin of diameter "p" shall be press fit full depth into the bottom external load plate. As an alternate, a threaded connection extending the full thickness of the bottom plate may be used. In no case shall a welded connection be used; this should be noted on the contract plans. The material for the anchor pin shall meet the requirements for either **ASTM** A449, **AASHTO** M270 GR50 or **AASHTO** M270 GR50**W** steel. The pin shall extend up and into a void in the top external load plate to provide the bearing device with additional horizontal capacity.

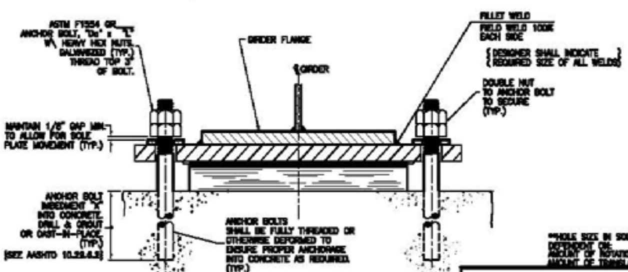
8.8 - SEISMIC ISOLATION BEARINGS

The intent of seismic isolation bearings is to increase the fundamental period of vibration of a structure, which lowers earthquake forces. Lower seismic forces allow the designer some leeway in deciding to replace or retrofit structural elements. The Authority has used isolation bearings to reduce the over stress in substructure elements, which would be caused by a seismic event. This has afforded us the ability to retain existing piles, piers and/or abutments, which would otherwise require replacement if more conventional bearings had been used. There are several systems available worldwide, with which the Authority has only limited experience. Typically, these bearing devises are used on larger bridges. **AASHTO** provides many references and design guidelines for identifying and specifying their use. The use of any seismic isolation system requires the approval of the **DSD**.

The standard bearing sheets shown on the following pages can be found in AutoCAD format on ProjectWise at: pwname://Engineering/Documents/Standard_Sheets/Current Thruway Structures Standard Sheets.



PLAN
N.T.S.



SECTION A–A
N.T.S.

FIXED BEARING DEVICE NOTES:

1. FIXED PREFORMED FABRIC BEARINGS ARE SIMILAR TO EXPANSION BEARING WITH THE FOLLOWING MODIFICATIONS:
   - A. THERE IS NO STAINLESS STEEL SURFACE.
   - B. THERE IS NO PTFE SURFACE.
   - C. THE SOLE PLATE SHALL BE CENTERED DIRECTLY OVER THE PREFORMED FABRIC PAD.
   - D. THE BOLT HOLES IN THE SOLE PLATE MAY BE SLOTTED OR ROUND DEPENDING ON THE AMOUNT OF LIVELOAD ROTATION.
2. FIXED PREFORMED FABRIC BEARINGS SHALL BE PAID FOR UNDER ITEM 25060.2203
3. THE PREFORMED FABRIC PAD SHALL BE CENTERED BETWEEN ANCHOR BOLTS REGARDLESS OF TEMPERATURE.

EXPANSION BEARING SETTING TABLE					
TEMP. (°F)	Δ TO MEAN	TEMP. CORR.(IN.)	"A"	ELONG. CORR.(IN.)	"B"
120°	75°				
105°	60°				
90°	45°				
75°	30°				
60°	15°				
MEAN 45°	–	–			
30°	15°				
15°	30°				
0°	45°				
–15°	60°				
–30°	75°				

A = DISTANCE FROM FRONT EDGE OF PAD TO FRONT EDGE OF SOLE PLATE WITH BEAM AND DIAPHRAGM LOADS ON BEAM.

– "B" = DISTANCE FROM FRONT EDGE OF PAD TO FRONT EDGE OF SOLE PLATE WITH ALL DEAD LOADS AND SUPERIMPOSED DEAD LOADS ON BEAM.

– ELONGATION IS DUE TO DEFLECTION.

– DEFLECTION IS DUE TO D.L. & S.D.L. EXCLUDING BEAM & DIAPHRAGM LOADS.

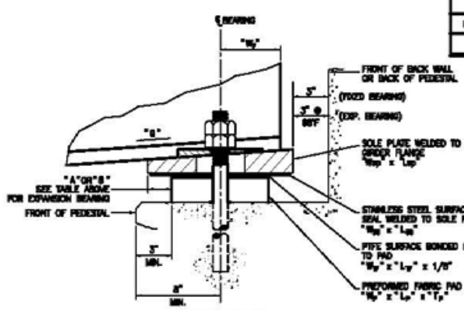
EXPANSION BEARING DEVICE NOTES:

1. THE EXPANSION BEARINGS SHALL CONFORM TO THE SPECIFICATION FOR ITEM 25065.2203.
2. ALL EXPANSION BEARINGS SHALL BE PAID FOR UNDER ITEM 25065.2203 PREFORMED FABRIC BEARING. THE [CONTRACTOR, FABRICATOR OR THRUWAY AUTHORITY WHICHEVER IS APPLICABLE] SHALL SUPPLY PREFORMED FABRIC BEARINGS CONFORMING TO THE REQUIREMENTS OF THE BEARING ITEM AND THIS SHEET.
3. SHOP DRAWINGS SHALL BE SUBMITTED AND SHALL INCLUDE WELDING AND BONDING PROCEDURES.
4. THE CONCRETE SURFACE UNDER THE BEARING SHALL BE LEVEL.
5. ANCHOR BOLTS AND NUTS SHALL BE GALVANIZED IN CONFORMANCE WITH SECTION 719–01 OF THE NEW YORK STATE STANDARD SPECIFICATIONS. THE COST OF GALVANIZING SHALL BE INCLUDED IN THE UNIT PRICE BID FOR THE BEARING ITEM.
6. THE SOLE PLATE AND PLATE WASHERS SHALL BE METALIZED OR GALVANIZED (MANUFACTURE'S PREFERENCE). THE COST OF THIS WORK SHALL BE INCLUDED IN THE UNIT PRICE BID FOR THE BEARING ITEM.
7. THE FIELD WELD CONNECTING THE BOTTOM FLANGE TO THE SOLE PLATE SHALL BE MADE ON BOTH SIDES OF THE FLANGE. AREAS OF METALIZING OR GALVANIZING DAMAGED BY WELDING SHALL BE COATED WITH ZINC RICH PAINT AS PER SECTION 719–01.
8. ANY ADJUSTMENT IN ELEVATION NECESSARY TO ACCOMMODATE THE ACTUAL BEARING THAT IS SUPPLIED SHALL BE MADE BY CHANGING THE TOP OF THE PEDESTAL ELEVATIONS. THE MINIMUM PEDESTAL HEIGHT ALLOWED WILL BE 6 INCHES. NO CHANGE IN BRIDGE SEAT ELEVATION WILL BE ALLOWED WITHOUT WRITTEN APPROVAL OF THE D.S.D.
9. DESIGN CRITERIA:
   - A. PAD TO CONCRETE DESIGN PRESSURE = 680 psi MAXIMUM.
   - B. MINIMUM ALLOWABLE PAD DESIGN ROTATION = 0.015 RADIANS.
   - C. HORIZONTAL CAPACITY OF PAD SHALL BE A MINIMUM OF 10% OF THE VERTICAL DESIGN LOAD.
   - D. HORIZONTAL CAPACITY OF BEARING CONNECTIONS SHALL BE A MINIMUM OF 19% OF VERTICAL DESIGN DEAD LOAD AND SUPERIMPOSED DEAD LOAD.
   - E. MINIMUM VERTICAL DESIGN LOAD (DL+SDL+LL+I) = ______Kips.
   - F. MINIMUM HORIZONTAL DESIGN LOAD 0.19(DL+SDL) = ______Kips.
   - F. THE MAXIMUM COEFFICIENT OF STATIC FRICTION BETWEEN THE STAINLESS STEEL AND THE PTFE SURFACE IS 0.08.
10. STEEL FOR BEARINGS SHALL BE ASTM A709 GR50 UNLESS OTHERWISE NOTED.
11. THE PREFORMED FABRIC PAD SHALL BE CENTERED BETWEEN ANCHOR BOLTS REGARDLESS OF TEMPERATURE. THE SOLE PLATE AT THE EXPANSION BEARING SHALL BE SET ACCORDING TO THE BEARING SETTING TABLE AT LEFT PRIOR TO WELDING TO THE BOTTOM FLANGE.
12. IF THE ANCHOR BOLTS ARE TO BE DRILLED & GROUTED INTO THE CONCRETE, THE COST FOR THIS WORK SHALL BE INCLUDED UNDER THE UNIT PRICE BID FOR THE BEARING ITEM.

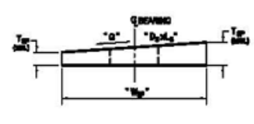
**HOLE SIZE IN SOLE PLATE DEPENDENT ON:
AMOUNT OF ROTATION IN FIXED BEARINGS.
AMOUNT OF TRANSLATION IN EXPANSION BEARINGS

BEARING DIMENSION TABLE																								
SOLE PLATE					STAINLESS STEEL SURFACE		PTFE SURFACE		PREFORMED FABRIC PAD			ANCHOR BOLTS				WASHERS					GIRDER FLANGE			
W_{SP}	L_{SP}	D_SxL_S**	T_{SP} (MIN)	T_{SP} (MAX)	W_{SS}	L_{SS}	W_T	L_T	W_P	L_P	T_P	D_A	L	X	GAP	W_W	L_W	D_W	T_W (MIN)	T_W (MAX)	W_F	L_F	G	SKEW ANGLE

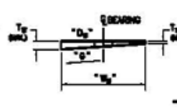
PEDESTAL					
P1	P2	P3	P4	P5	P6



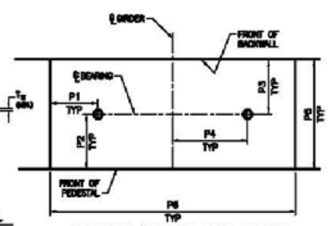
SECTION B–B
N.T.S.



SOLE PLATE DETAIL
N.T.S.



WASHER DETAIL
N.T.S.



PEDESTAL/ANCHOR BOLT LAYOUT
N.T.S.

{NOTE: "{ }" INDICATES NOTES TO DESIGNER. DO NOT INCLUDE IN CONTRACT DRAWINGS.}

DATE	DESCRIPTION	BY	DTL.

REVISIONS

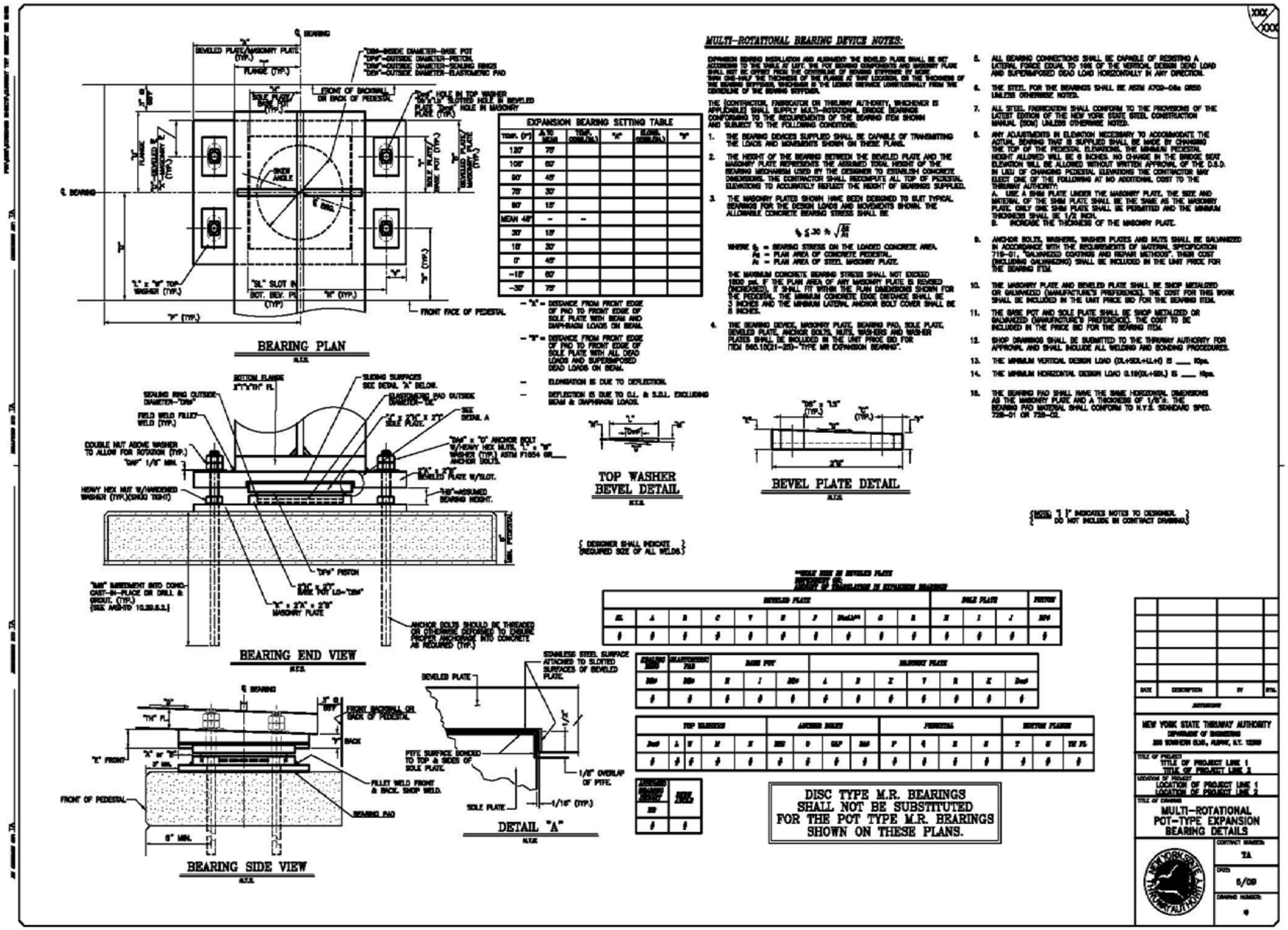
NEW YORK STATE THRUWAY AUTHORITY
DEPARTMENT OF ENGINEERING
200 SOUTHERN BLVD., ALBANY, N.Y. 12209

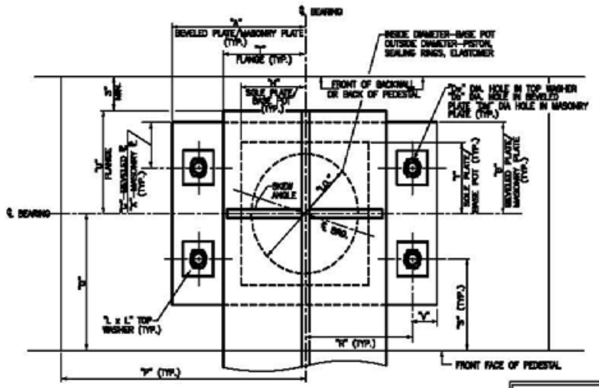
TITLE OF PROJECT
TITLE OF PROJECT LINE 1
TITLE OF PROJECT LINE 2

LOCATION OF PROJECT
LOCATION OF PROJECT LINE 1
LOCATION OF PROJECT LINE 2

TITLE OF DRAWING
PREFORMED FABRIC BEARING DETAILS

CONTRACT NUMBER: TA
DATE: 5/09
DRAWING NUMBER: #

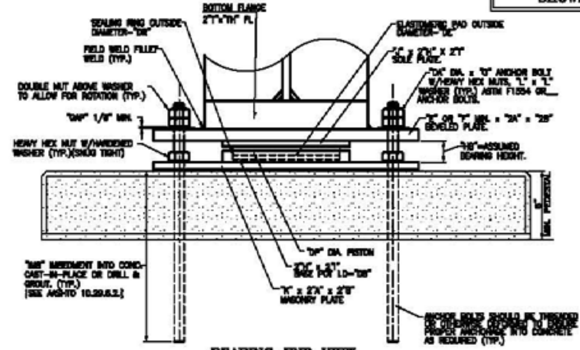

MULTI-ROTATIONAL BEARING DEVICE NOTES:
EXPANSION BEARING SETTING TABLE
BEARING PLAN
BEARING END VIEW
BEARING SIDE VIEW
TOP WASHER BEVEL DETAIL
BEVEL PLATE DETAIL
DETAIL "A"
DISC TYPE M.R. BEARINGS SHALL NOT BE SUBSTITUTED FOR THE POT TYPE M.R. BEARINGS SHOWN ON THESE PLANS.
NEW YORK STATE THRUWAY AUTHORITY
MULTI-ROTATIONAL POT-TYPE EXPANSION BEARING DETAILS



BEARING PLAN

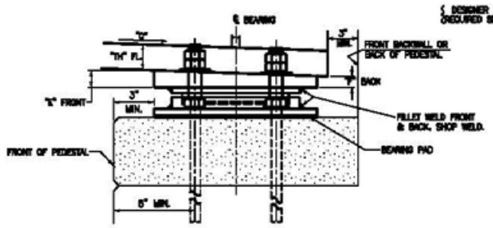
N.T.S.

DISC TYPE M.R. BEARINGS SHALL NOT BE SUBSTITUTED FOR THE POT TYPE M.R. BEARINGS SHOWN ON THESE PLANS.



BEARING END VIEW

N.T.S.



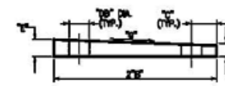
BEARING SIDE VIEW

N.T.S.

{ DESIGNER SHALL INDICATE REQUIRED SIZE OF ALL WELDS. }

TOP WASHER BEVEL DETAIL

N.T.S.



BEVEL PLATE DETAIL

N.T.S.

MULTI-ROTATIONAL POT-TYPE BEARING NOTES:

FIXED BEARING INSTALLATION AND ALIGNMENT: THE CENTERLINE OF THE SOLE PLATES OR OTHER FIXED PORTIONS OF BEARING ASSEMBLIES ATTACHED TO THE STRUCTURAL STEEL SHALL NOT BE OFFSET FROM THE CENTERLINE OF BEARING STIFFENERS OR DIAPHRAGM CONNECTION PLATES BY MORE THAN ONE-HALF THE THICKNESS OF THE FLANGE AT THAT LOCATION, OR THE THICKNESS OF THE BEARING STIFFENER, WHICHEVER IS LESSER.

THE {CONTRACTOR, FABRICATOR OR THRUWAY AUTHORITY, WHICHEVER IS APPLICABLE} SHALL SUPPLY MULTI-ROTATIONAL BRIDGE BEARINGS CONFORMING TO THE REQUIREMENTS OF THE BEARING ITEM SHOWN AND SUBJECT TO THE FOLLOWING CONDITIONS:

1. THE BEARING DEVICES SUPPLIED SHALL BE CAPABLE OF TRANSMITTING THE LOADS AND MOVEMENTS SHOWN ON THESE PLANS.
2. THE HEIGHT OF THE BEARING BETWEEN THE BEVELED PLATE AND THE MASONRY PLATE REPRESENTS THE ASSUMED TOTAL HEIGHT OF THE BEARING MECHANISM USED BY THE DESIGNER TO ESTABLISH CONCRETE DIMENSIONS. THE CONTRACTOR SHALL RECOMPUTE ALL TOP OF PEDESTAL ELEVATIONS TO ACCURATELY REFLECT THE HEIGHT OF BEARINGS SUPPLIED.
3. THE MASONRY PLATES SHOWN HAVE BEEN DESIGNED TO SUIT TYPICAL BEARINGS FOR THE DESIGN LOADS AND MOVEMENTS SHOWN. THE ALLOWABLE CONCRETE BEARING STRESS SHALL BE

   $$f_b \leq .30\ f'c \sqrt{\frac{Ag}{Ai}}$$

   WHERE f_b = BEARING STRESS ON THE LOADED CONCRETE AREA.
   Ag = PLAN AREA OF CONCRETE PEDESTAL.
   Ai = PLAN AREA OF STEEL MASONRY PLATE.

   THE MAXIMUM CONCRETE BEARING STRESS SHALL NOT EXCEED 1500 psi. IF THE PLAN AREA OF ANY MASONRY PLATE IS REVISED (INCREASED), IT SHALL FIT WITHIN THE PLAN DIMENSIONS SHOWN FOR THE PEDESTAL. THE MINIMUM CONCRETE EDGE DISTANCE SHALL BE 3 INCHES AND THE MINIMUM LATERAL ANCHOR BOLT COVER SHALL BE 6 INCHES.
4. THE BEARING DEVICE, MASONRY PLATE, BEARING PAD, SOLE PLATE, BEVELED PLATE, ANCHOR BOLTS, NUTS, WASHERS AND WASHER PLATES SHALL BE INCLUDED IN THE UNIT PRICE BID FOR ITEM 565.17(21-25)- TYPE MR FIXED BEARING.
5. ALL BEARING CONNECTIONS SHALL BE CAPABLE OF RESISTING A LATERAL FORCE EQUAL TO 10% OF THE VERTICAL DESIGN DEAD LOAD AND SUPERIMPOSED DEAD LOAD HORIZONTALLY IN ANY DIRECTION.
6. THE STEEL FOR THE BEARINGS SHALL BE ASTM A709-08a GR50 UNLESS OTHERWISE NOTED.
7. ALL STEEL FABRICATION SHALL CONFORM TO THE PROVISIONS OF THE LATEST EDITION OF THE NEW YORK STATE STEEL CONSTRUCTION MANUAL (SCM) UNLESS OTHERWISE NOTED.
8. ANY ADJUSTMENTS IN ELEVATION NECESSARY TO ACCOMMODATE THE ACTUAL BEARING THAT IS SUPPLIED SHALL BE MADE BY CHANGING THE TOP OF THE PEDESTAL ELEVATIONS. THE MINIMUM PEDESTAL HEIGHT ALLOWED WILL BE 8 INCHES. NO CHANGE IN THE BRIDGE SEAT ELEVATION WILL BE ALLOWED WITHOUT WRITTEN APPROVAL OF THE D.S.D. IN LIEU OF CHANGING PEDESTAL ELEVATIONS THE CONTRACTOR MAY ELECT ONE OF THE FOLLOWING AT NO ADDITIONAL COST TO THE THRUWAY AUTHORITY:
   A. USE A SHIM PLATE UNDER THE MASONRY PLATE. THE SIZE AND MATERIAL OF THE SHIM PLATE SHALL BE THE SAME AS THE MASONRY PLATE. ONLY ONE SHIM PLATE SHALL BE PERMITTED AND THE MINIMUM THICKNESS SHALL BE 1/2 INCH.
   B. INCREASE THE THICKNESS OF THE MASONRY PLATE.
9. ANCHOR BOLTS, WASHERS, WASHER PLATES AND NUTS SHALL BE GALVANIZED IN ACCORDANCE WITH THE REQUIREMENTS OF MATERIAL SPECIFICATION 719-01, "GALVANIZED COATINGS AND REPAIR METHODS". THEIR COST (INCLUDING GALVANIZING) SHALL BE INCLUDED IN THE UNIT PRICE FOR THE BEARING ITEM.
10. THE MASONRY PLATE AND BEVELED PLATE SHALL BE SHOP METALIZED OR GALVANIZED (MANUFACTURE'S PREFERENCE). THE COST FOR THIS WORK SHALL BE INCLUDED IN THE UNIT PRICE BID FOR THE BEARING ITEM.
11. THE BASE POT AND SOLE PLATE SHALL BE SHOP METALIZED OR GALVANIZED (MANUFACTURE'S PREFERENCE). THE COST TO BE INCLUDED IN THE PRICE BID FOR THE BEARING ITEM.
12. SHOP DRAWINGS SHALL BE SUBMITTED TO THE THRUWAY AUTHORITY FOR APPROVAL AND SHALL INCLUDE ALL WELDING AND BONDING PROCEDURES.
13. THE MINIMUM VERTICAL DESIGN LOAD (DL+SDL+LL+I) IS ___ Kips.
14. THE MINIMUM HORIZONTAL DESIGN LOAD 0.10(DL+SDL) IS ___ Kips.
15. THE BEARING PAD SHALL HAVE THE SAME HORIZONTAL DIMENSIONS AS THE MASONRY PLATE AND A THICKNESS OF 1/8"±. THE BEARING PAD MATERIAL SHALL CONFORM TO N.Y.S. STANDARD SPEC. 725-01 OR 725-02.

{NOTE: "{ }" INDICATES NOTES TO DESIGNER. DO NOT INCLUDE IN CONTRACT DRAWING.}

**HOLE SIZE IN BEVELED PLATE DEPENDENT ON AMOUNT OF ROTATION IN FIXED BEARINGS.

BEVELED PLATE									SOLE PLATE			PISTON
A	B	C	V	E	F	Dia. F**	G	K	H	I	J	DP
#	#	#	#	#	#	#	#	#	#	#	#	#

SEALING RING	ELASTOMERIC PAD	BASE POT			MASONRY PLATE						
DR	DE	H	I	DB	A	B	X	Y	R	K	Dia. #
#	#	#	#	#	#	#	#	#	#	#	#

TOP WASHERS				ANCHOR BOLTS				PEDESTAL				BOTTOM FLANGE		
Deg.	L	M	N	DIA	O	DAP	DA	P	Q	R	S	T	U	TH FL
#	#	#	#	#	#	#	#	#	#	#	#	#	#	#

ASSUMED BEARING HEIGHT	SKEW ANGLE
HB	
#	#

DATE	DESCRIPTION	BY	DWN.
	REVISIONS		

NEW YORK STATE THRUWAY AUTHORITY
DEPARTMENT OF ENGINEERING
200 SOUTHERN BLVD., ALBANY, N.Y. 12209

TITLE OF PROJECT: TITLE OF PROJECT LINE 1 / TITLE OF PROJECT LINE 2

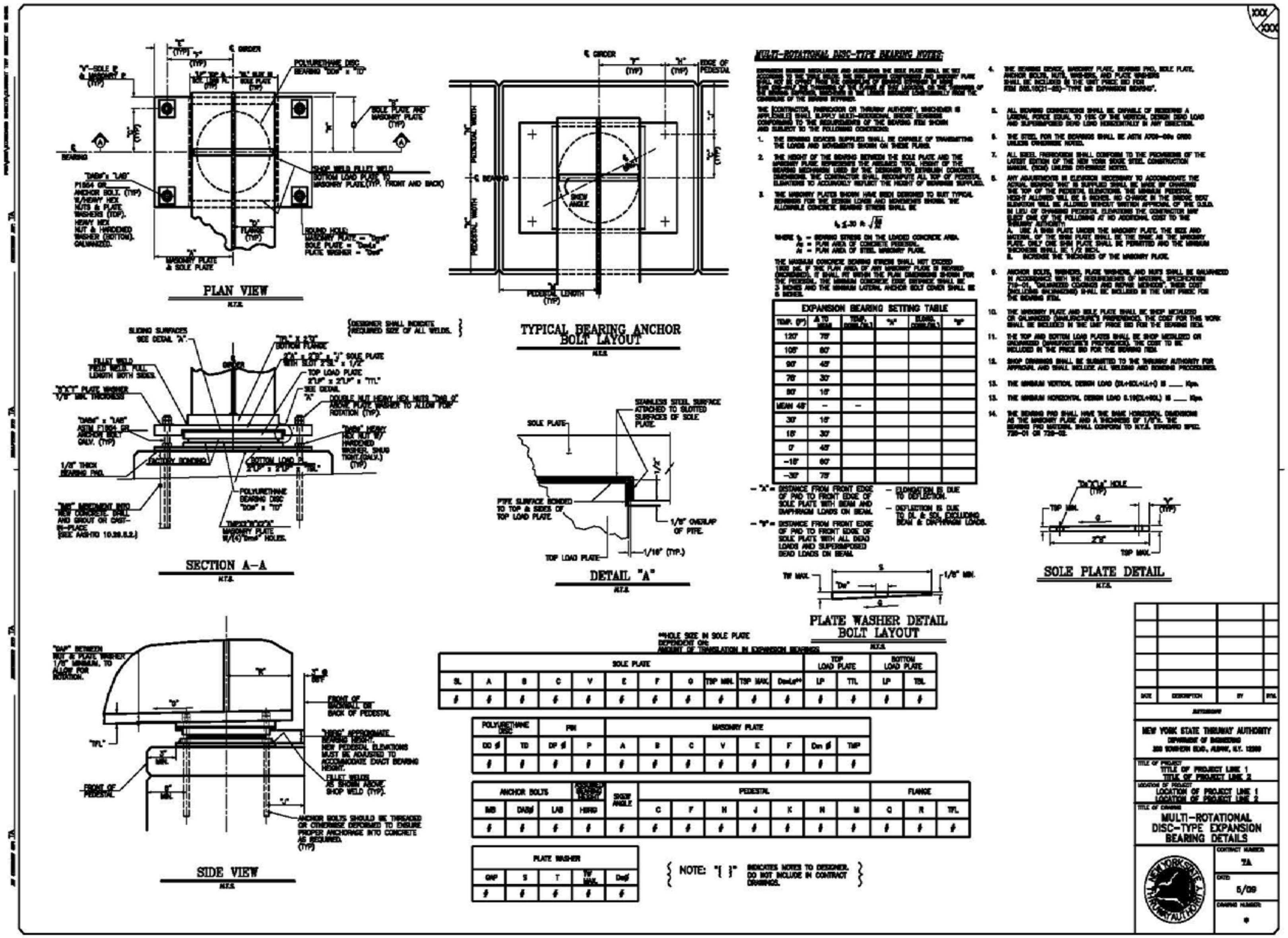
LOCATION OF PROJECT: LOCATION OF PROJECT LINE 1 / LOCATION OF PROJECT LINE 2

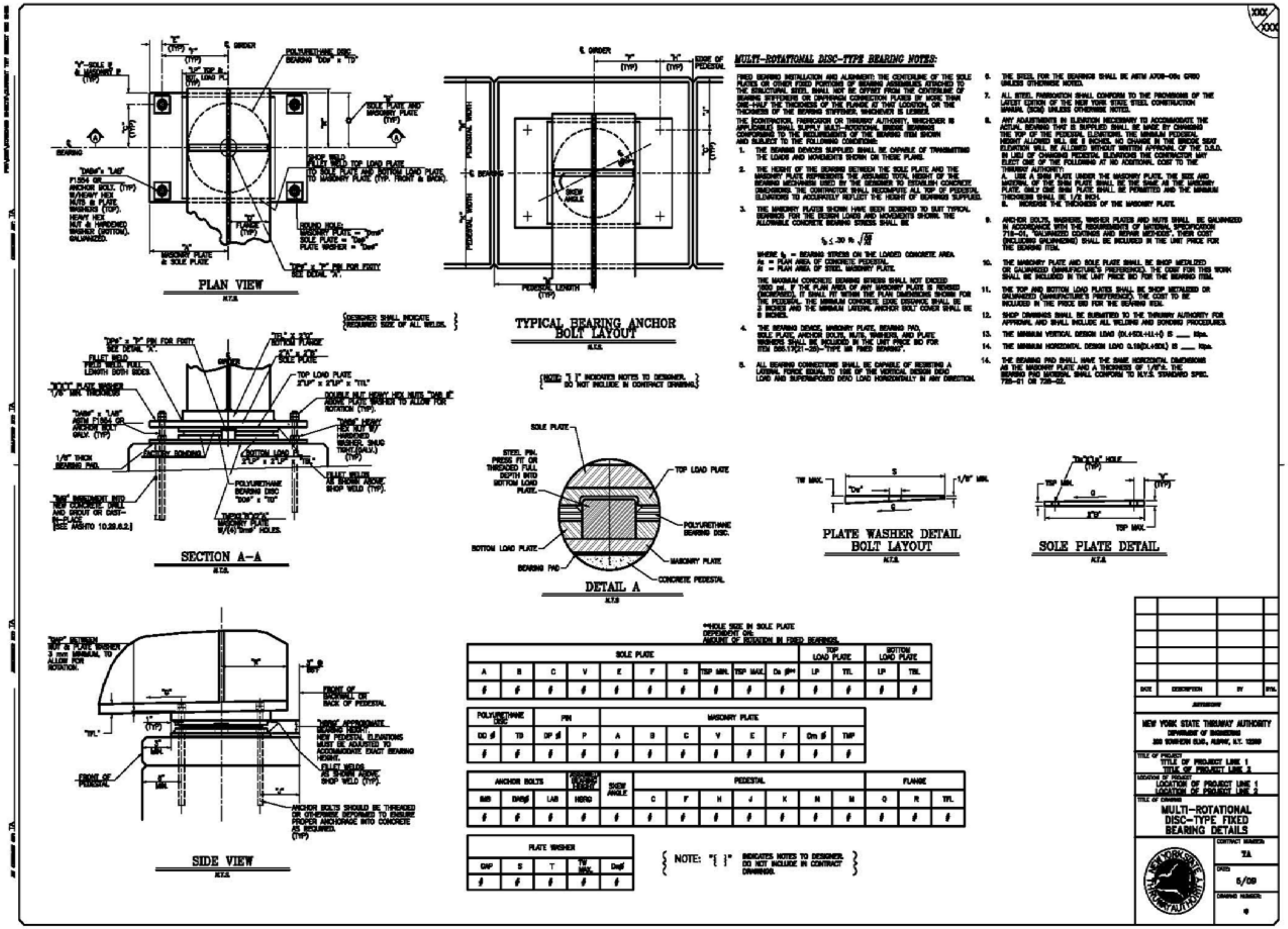
TITLE OF DRAWING: MULTI-ROTATIONAL POT-TYPE FIXED BEARING DETAILS

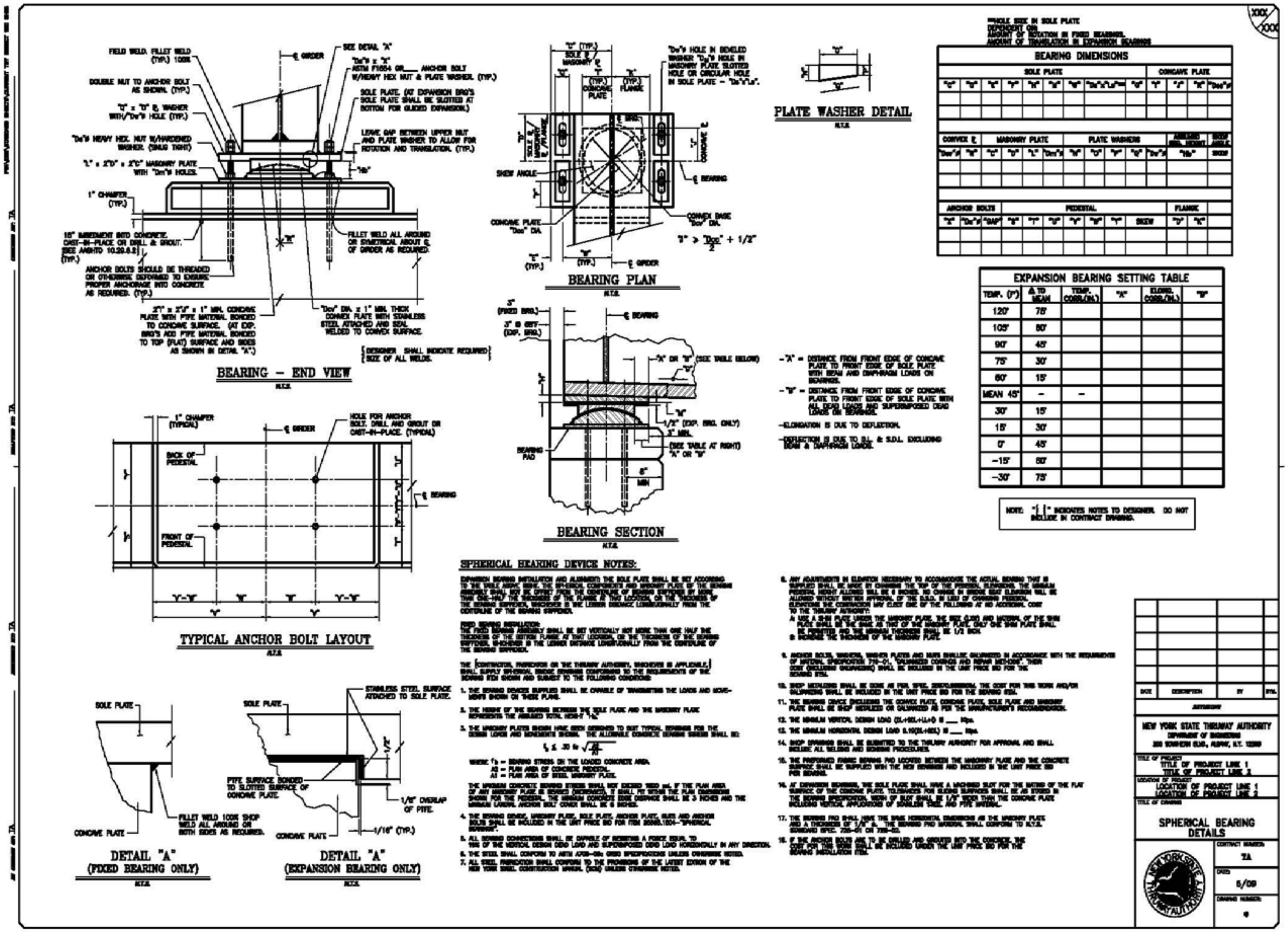
CONTRACT NUMBER: TA

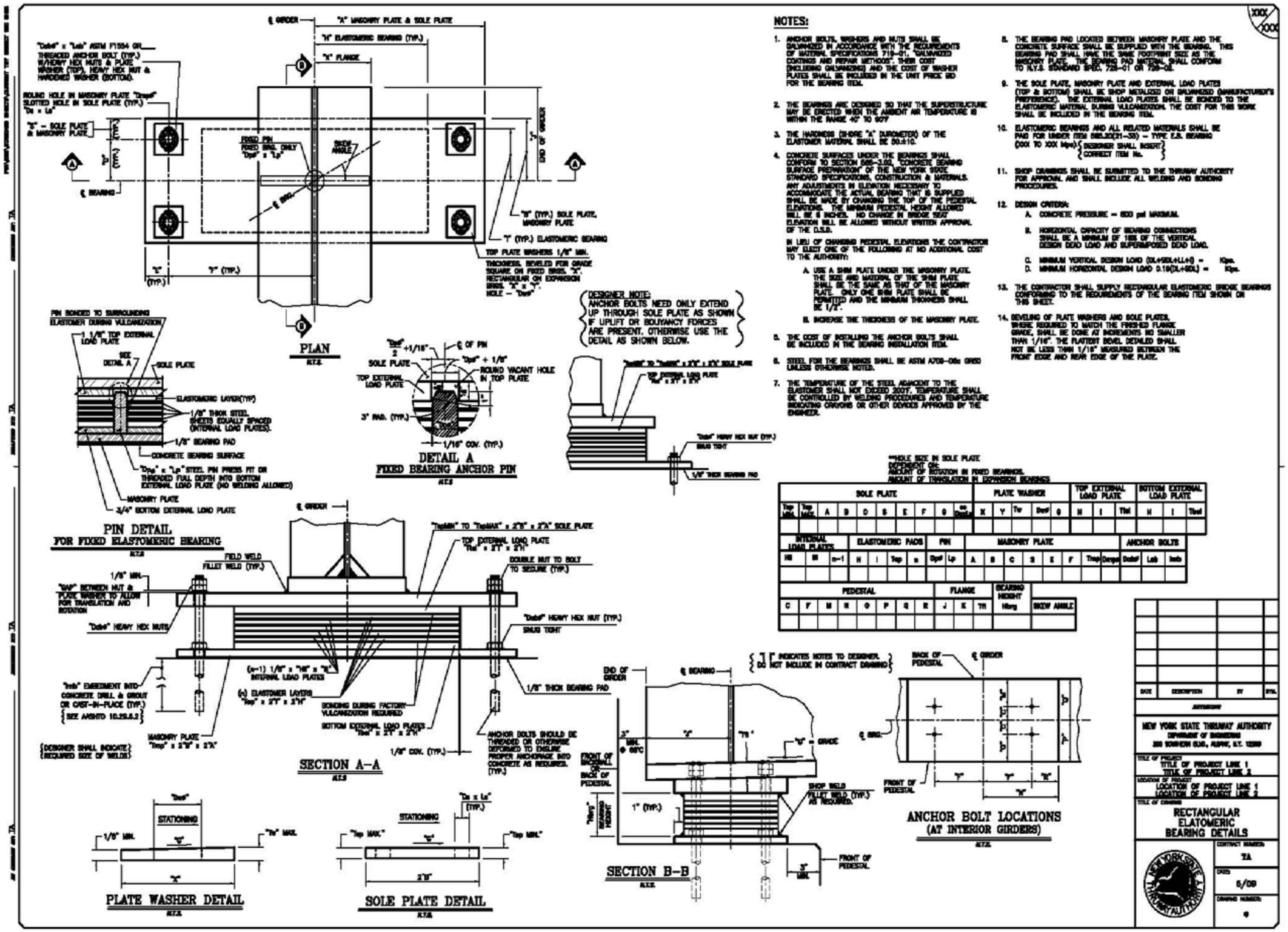
DATE: 5/09

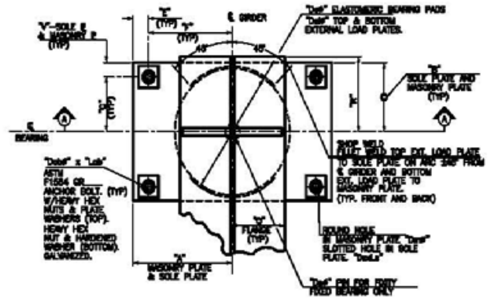
DRAWING NUMBER: #


PLAN VIEW
TYPICAL BEARING ANCHOR BOLT LAYOUT
MULTI-ROTATIONAL DISC-TYPE BEARING NOTES:
EXPANSION BEARING SETTING TABLE
SECTION A-A
DETAIL "A"
SOLE PLATE DETAIL
PLATE WASHER DETAIL BOLT LAYOUT
SIDE VIEW
NEW YORK STATE THRUWAY AUTHORITY
MULTI-ROTATIONAL DISC-TYPE EXPANSION BEARING DETAILS


PLAN VIEW
TYPICAL BEARING ANCHOR BOLT LAYOUT
MULTI-ROTATIONAL DISC-TYPE BEARING NOTES:
SECTION A-A
SOLE PLATE
TOP LOAD PLATE
POLYURETHANE BEARING DISC
BOTTOM LOAD PLATE
BEARING PAD
MASONRY PLATE
CONCRETE PEDESTAL
DETAIL A
PLATE WASHER DETAIL BOLT LAYOUT
SOLE PLATE DETAIL
SIDE VIEW
NEW YORK STATE THRUWAY AUTHORITY
MULTI-ROTATIONAL DISC-TYPE FIXED BEARING DETAILS

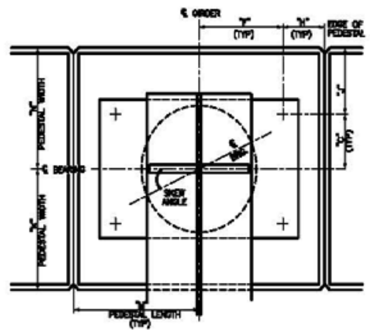

BEARING – END VIEW
BEARING PLAN
PLATE WASHER DETAIL
BEARING DIMENSIONS
EXPANSION BEARING SETTING TABLE
BEARING SECTION
TYPICAL ANCHOR BOLT LAYOUT
SPHERICAL BEARING DEVICE NOTES:
DETAIL "A"
(FIXED BEARING ONLY)
DETAIL "A"
(EXPANSION BEARING ONLY)
NEW YORK STATE THRUWAY AUTHORITY
SPHERICAL BEARING
DETAILS


NOTES:
1. ANCHOR BOLTS, WASHERS AND NUTS SHALL BE GALVANIZED IN ACCORDANCE WITH THE REQUIREMENTS OF MATERIAL SPECIFICATIONS 719-01, "GALVANIZED COATINGS AND REPAIR METHODS". THEIR COST (INCLUDING GALVANIZING) AND THE COST OF WASHER PLATES SHALL BE INCLUDED IN THE UNIT PRICE BID FOR THE BEARING ITEM.
2. THE BEARINGS ARE DESIGNED SO THAT THE SUPERSTRUCTURE MAY BE ERECTED WHEN THE AMBIENT AIR TEMPERATURE IS WITHIN THE RANGE 40° TO 90°F
3. THE HARDNESS (SHORE "A" DUROMETER) OF THE ELASTOMER MATERIAL SHALL BE 50±10.
4. CONCRETE SURFACES UNDER THE BEARINGS SHALL CONFORM TO SECTION 565-3.02, "CONCRETE BEARING SURFACE PREPARATION" OF THE NEW YORK STATE STANDARD SPECIFICATIONS, CONSTRUCTION & MATERIALS. ANY ADJUSTMENTS IN ELEVATION NECESSARY TO ACCOMMODATE THE ACTUAL BEARING THAT IS SUPPLIED SHALL BE MADE BY CHANGING THE TOP OF THE PEDESTAL ELEVATIONS. THE MINIMUM PEDESTAL HEIGHT ALLOWED WILL BE 6 INCHES. NO CHANGE IN BRIDGE SEAT ELEVATION WILL BE ALLOWED WITHOUT WRITTEN APPROVAL OF THE D.S.D.
IN LIEU OF CHANGING PEDESTAL ELEVATIONS THE CONTRACTOR MAY ELECT ONE OF THE FOLLOWING AT NO ADDITIONAL COST TO THE AUTHORITY:
A. USE A SHIM PLATE UNDER THE MASONRY PLATE. THE SIZE AND MATERIAL OF THE SHIM PLATE SHALL BE THE SAME AS THAT OF THE MASONRY PLATE. ONLY ONE SHIM PLATE SHALL BE PERMITTED AND THE MINIMUM THICKNESS SHALL BE 1/2".
B. INCREASE THE THICKNESS OF THE MASONRY PLATE.
5. THE COST OF INSTALLING THE ANCHOR BOLTS SHALL BE INCLUDED IN THE BEARING INSTALLATION ITEM.
6. STEEL FOR THE BEARINGS SHALL BE ASTM A709-06a GR50 UNLESS OTHERWISE NOTED.
7. THE TEMPERATURE OF THE STEEL ADJACENT TO THE ELASTOMER SHALL NOT EXCEED 200°F. TEMPERATURE SHALL BE CONTROLLED BY WELDING PROCEDURES AND TEMPERATURE INDICATING CRAYONS OR OTHER DEVICES APPROVED BY THE ENGINEER.
8. THE BEARING PAD LOCATED BETWEEN MASONRY PLATE AND THE CONCRETE SURFACE SHALL BE SUPPLIED WITH THE BEARING. THIS BEARING PAD SHALL HAVE THE SAME FOOTPRINT SIZE AS THE MASONRY PLATE. THE BEARING PAD MATERIAL SHALL CONFORM TO N.Y.S. STANDARD SPEC. 728-01 OR 728-02.
9. THE SOLE PLATE, MASONRY PLATE AND EXTERNAL LOAD PLATES (TOP & BOTTOM) SHALL BE SHOP METALIZED OR GALVANIZED (MANUFACTURER'S PREFERENCE). THE EXTERNAL LOAD PLATES SHALL BE BONDED TO THE ELASTOMERIC MATERIAL DURING VULCANIZATION. THE COST FOR THIS WORK SHALL BE INCLUDED IN THE BEARING ITEM.
10. ELASTOMERIC BEARINGS AND ALL RELATED MATERIALS SHALL BE PAID FOR UNDER ITEM 565.20(21-38) - TYPE E.B. BEARING (XXX TO XXX kips) {DESIGNER SHALL INSERT CORRECT ITEM No.}
11. SHOP DRAWINGS SHALL BE SUBMITTED TO THE THRUWAY AUTHORITY FOR APPROVAL AND SHALL INCLUDE ALL WELDING AND BONDING PROCEDURES.
12. DESIGN CRITERIA:
A. CONCRETE PRESSURE = 800 psi MAXIMUM.
B. HORIZONTAL CAPACITY OF BEARING CONNECTIONS SHALL BE A MINIMUM OF 10% OF THE VERTICAL DESIGN DEAD LOAD AND SUPERIMPOSED DEAD LOAD.
C. MINIMUM VERTICAL DESIGN LOAD (DL+SDL+LL+I) = Kips.
D. MINIMUM HORIZONTAL DESIGN LOAD 0.10(DL+SDL) = Kips.
13. THE CONTRACTOR SHALL SUPPLY RECTANGULAR ELASTOMERIC BRIDGE BEARINGS CONFORMING TO THE REQUIREMENTS OF THE BEARING ITEM SHOWN ON THIS SHEET.
14. BEVELING OF PLATE WASHERS AND SOLE PLATES, WHERE REQUIRED TO MATCH THE FINISHED FLANGE GRADE, SHALL BE DONE AT INCREMENTS NO SMALLER THAN 1/16". THE FLATTEST BEVEL DETAILED SHALL NOT BE LESS THAN 1/16" MEASURED BETWEEN THE FRONT EDGE AND REAR EDGE OF THE PLATE.
DESIGNER NOTE:
ANCHOR BOLTS NEED ONLY EXTEND UP THROUGH SOLE PLATE AS SHOWN IF UPLIFT OR BOUYANCY FORCES ARE PRESENT. OTHERWISE USE THE DETAIL AS SHOWN BELOW.
PLAN
DETAIL A
FIXED BEARING ANCHOR PIN
PIN DETAIL
FOR FIXED ELASTOMERIC BEARING
SECTION A-A
SECTION B-B
PLATE WASHER DETAIL
SOLE PLATE DETAIL
ANCHOR BOLT LOCATIONS
(AT INTERIOR GIRDERS)
NEW YORK STATE THRUWAY AUTHORITY
RECTANGULAR
ELATOMERIC
BEARING DETAILS
7A
5/09

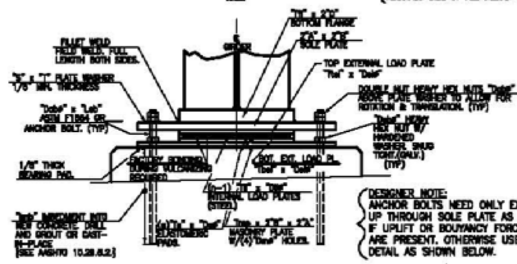


ELASTOMERIC BEARING
PLAN VIEW
N.T.S.

{DESIGNER SHALL INDICATE REQUIRED SIZE OF ALL WELDS.}

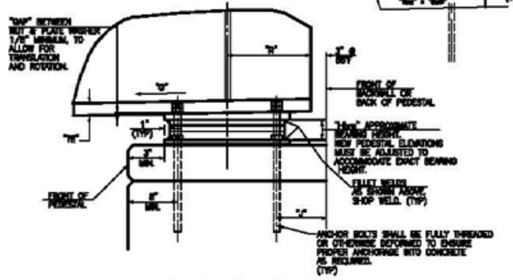


TYPICAL BEARING ANCHOR BOLT LAYOUT
N.T.S.

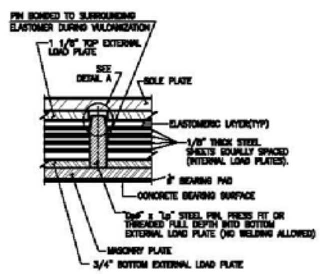


ELASTOMERIC BEARING
SECTION A-A
N.T.S.

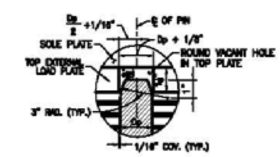
DESIGNER NOTE:
ANCHOR BOLTS NEED ONLY EXTEND UP THROUGH SOLE PLATE AS SHOWN IF UPLIFT OR BOUYANCY FORCES ARE PRESENT. OTHERWISE USE THE DETAIL AS SHOWN BELOW.



ELASTOMERIC BEARING
SIDE VIEW
N.T.S.



PIN DETAIL
FOR FIXED ELASTOMERIC BEARING
N.T.S.



DETAIL A
FIXED BEARING ANCHOR PIN
N.T.S.

NOTES:

1. ANCHOR BOLTS, WASHERS AND NUTS SHALL BE GALVANIZED IN ACCORDANCE WITH THE REQUIREMENTS OF MATERIAL SPECIFICATIONS 719-01. "GALVANIZED COATING AND REPAIR METHODS". THEIR COST(INCLUDING GALVANIZING) SHALL BE INCLUDED IN THE UNIT PRICE BID FOR THE BEARING ITEM. ANY ADJUSTMENTS IN ELEVATION NECESSARY TO ACCOMODATE THE ACTUAL BEARING THAT IS SUPPLIED SHALL BE MADE BY CHANGING THE TOP OF THE PEDESTAL ELEVATIONS. THE MINIMUM PEDESTAL HEIGHT ALLOWED WILL BE 6 INCHES. NO CHANGE IN BRIDGE SEAT ELEVATION WILL BE ALLOWED WITHOUT WRITTEN APPROVAL OF THE D.S.D. IN LIEU OF CHANGING PEDESTAL ELEVATIONS THE CONTRACTOR MAY ELECT ONE OF THE FOLLOWING AT NO ADDITIONAL COST TO THE THRUWAY AUTHORITY:
   A. USE A SHIM PLATE UNDER THE MASONRY PLATE. THE SIZE AND MATERIAL OF THE SHIM PLATE SHALL BE THE SAME AS THAT OF THE MASONRY PLATE. ONLY ONE SHIM PLATE SHALL BE PERMITTED AND MINIMUM THICKNESS SHALL BE 1/2 INCH.
   B. INCREASE THE THICKNESS OF THE MASONRY PLATE.
2. THE HARDNESS (SHORE "A" DUROMETER) OF THE ELASTOMER MATERIAL SHALL BE 60 ±10.
3. CONCRETE SURFACES UNDER THE BEARING SHALL CONFORM TO SECTION 565-3.02, "CONCRETE BEARING SURFACE PREPARATION" OF THE NEW YORK STATE STANDARD SPECIFICATIONS, CONSTRUCTION & MATERIALS.
4. THE COST OF FURNISHING THE ANCHOR BOLTS SHALL BE INCLUDED IN THE BEARING ITEM.
5. STEEL FOR THE BEARINGS SHALL BE ASTM A709-06a GR50 UNLESS OTHERWISE NOTED.
6. THE TEMPERATURE OF THE STEEL ADJACENT TO THE ELASTOMER SHALL NOT EXCEED 200°F. TEMPERATURE SHALL BE CONTROLLED BY WELDING PROCEDURES AND TEMPERATURE INDICATING CRAYONS OR OTHER DEVICES APPROVED BY THE THRUWAY AUTHORITY ENGINEER.
7. BEVELING OF PLATE WASHERS AND SOLE PLATES, WHERE REQUIRED TO MATCH THE FINISHED FLANGE GRADE, SHALL BE DONE AT INCREMENTS NO SMALLER THAN 1/16". THE FLATTEST BEVEL DETAILED SHALL NOT BE LESS THAN 1/16" MEASURED BETWEEN THE FRONT EDGE AND REAR EDGE OF THE PLATE.
8. THE BEARING PAD LOCATED BETWEEN THE MASONRY PLATE AND THE CONCRETE SURFACE SHALL BE SUPPLIED WITH THE BEARING DEVICE AND HAVE THE SAME FOOTPRINT SIZE AS THE MASONRY PLATE. THE BEARING PAD MATERIAL SHALL CONFORM TO N.Y.S. STANDARD SPEC. 728-01 OR 728-02.
9. THE COST OF INSTALLING THE ANCHOR BOLTS SHALL BE INCLUDED IN THE BEARING INSTALLATION ITEM.
10. THE SOLE PLATE, MASONRY PLATE, AND EXTERNAL LOAD PLATES (TOP & BOTTOM) SHALL BE SHOP METALIZED OR GALVANIZED (MANUFACTURER'S PREFERENCE). THE EXTERNAL LOAD PLATES SHALL BE BONDED TO THE ELASTOMERIC MATERIAL DURING VULCANIZATION. THE COST FOR THIS WORK SHALL BE INCLUDED IN THE PRICE BID FOR THE BEARING ITEM.
11. ELASTOMERIC BEARINGS AND ALL RELATED MATERIALS SHALL BE PAID FOR UNDER ITEM 565.20(21-35) - TYPE E.B. BEARING (XXXX TO XXXX kips). {DESIGNER FILL-IN CORRECT ITEM #}
12. SHOP DRAWINGS SHALL BE SUBMITTED TO THE THRUWAY AUTHORITY FOR APPROVAL AND SHALL INCLUDE ALL WELDING AND BONDING PROCEDURES.
13. DESIGN CRITERIA:
   A. CONCRETE PRESSURE = 800 psi MAXIMUM.
   B. HORIZONTAL CAPACITY OF BEARING CONNECTIONS SHALL BE A MINIMUM OF 10% OF THE VERTICAL DESIGN DEAD LOAD AND SUPERIMPOSED DEAD LOAD.
   C. MINIMUM VERTICAL DESIGN LOAD (DL+SDL+LL+I) = Kips.
   D. MINIMUM HORIZONTAL DESIGN LOAD 0.10(DL+SDL) = Kips.
14. THE CONTRACTOR SHALL SUPPLY AND INSTALL CIRCULAR ELASTOMERIC BRIDGE BEARINGS CONFORMING TO THE REQUIREMENTS OF THE BEARING ITEM SHOWN ON THIS SHEET.

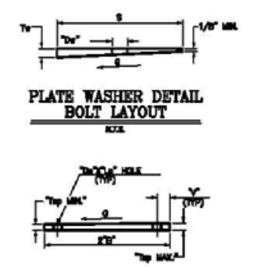


PLATE WASHER DETAIL
BOLT LAYOUT
N.T.S.

SOLE PLATE DETAIL
N.T.S.

**HOLE SIZE IN SOLE PLATE DEPENDENT ON:
AMOUNT OF ROTATION IN FIXED BEARINGS
AMOUNT OF TRANSLATION IN EXPANSION BEARINGS

SOLE PLATE										TOP EXTERNAL LOAD PLATE		BOTTOM EXTERNAL LOAD PLATE	
A	B	C	V	E	F	G	Tsp MIN.	Tsp MAX.	Ds=Ls**	Del#	Tel	Del#	Tbel
#	#	#	#	#	#	#	#	#	#	#	#	#	#

INTERNAL LOAD PLATE(S)			ELASTOMERIC PAD(S)			PIN		MASONRY PLATE							
Dil#	Til	n-1	De#	Te	n	Dp#	Lp	A	B	C	V	E	F	Dm#	Tmp
#	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#

ANCHOR BOLTS			[illegible]	SKEW ANGLE	PEDESTAL							FLANGE		
Imb	Dab#	Lab	Hbrg		C	F	H	J	K	N	M	Q	R	Tfl
#	#	#	#	#	#	#	#	#	#	#	#	#	#	#

PLATE WASHER				
GAP	S	T	Tw	Dw#
#	#	#	#	#

{ NOTE: "{ }" INDICATES NOTES TO DESIGNER. DO NOT INCLUDE IN CONTRACT DRAWINGS. }

DATE	DESCRIPTION	BY	[illegible]

NEW YORK STATE THRUWAY AUTHORITY
DEPARTMENT OF ENGINEERING
200 SOUTHERN BLVD., ALBANY, N.Y. 12209

TITLE OF PROJECT
TITLE OF PROJECT LINE 1
TITLE OF PROJECT LINE 2

LOCATION OF PROJECT
LOCATION OF PROJECT LINE 1
LOCATION OF PROJECT LINE 2

TITLE OF DRAWING
CIRCULAR ELASTOMERIC BEARING DETAILS

CONTRACT NUMBER: TA
DATED: 6/09
DRAWING NUMBER: #