To: SUPERSEDED BY EB 99-024 EFFECTIVE 3/16/99		New York State Department of Transportation ENGINEERING INSTRUCTION	EI 97-028

Title: **BRIDGE DETAIL (BD) SHEETS BG1 THRU BG7 - BEARING DETAILS**

Distribution:
- ☐ Manufacturers (18)
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Approved:

James M. O'Connell — 12-18-97 Date
Deputy Chief Engineer (Structures)

Issuances Affected

This EI issues the following BD sheets:

BD-BG1	BD-BG3	BD-BG5	BD-BG7
BD-BG2	BD-BG4	BD-BG6	

This EI rescinds EI 84-003 and EI 94-018.

This EI rescinds the following BDD sheets:

BDD 83-35	BDD 84-37	BDD 84-39
BDD 83-36A	BDD 84-38	BDD 84-40

This EI rescinds the following blue pages in the Standard Specifications for Highway Bridges:

NY-27M	NY-209A	NY-209C	NY-209E
NY-209	NY-209B	NY-209D	

This EI modifies EB 97-044 by removing the above named BDD sheets from the Bridge Design Data Sheets index and adding BD-BG1 thru BD-BG7 to the Bridge Detail Sheets index.

This EI modifies the bearing specifications in the Standard Specifications of January 2, 1995 by making the following changes:

- Replace Section 565 with the attached revised Section 565.
- Delete subsections 716-02, 716-04 and 716-08.
- Add the attached new Subsections 716-10, 716-11 and 716-12.

Purpose

This EI makes a number of changes involving bridge bearings with the goal of simplifying design, the approval process, material testing, fabrication and construction. These changes only affect metric contracts. Most of the changes involve elastomeric bearings. Designers are directed to use the standard size bearings shown on the BD sheets unless specific conditions require custom bearings. The following outlines the principal changes:

- Shop drawing submittal and approval for elastomeric bearings has been eliminated when there is no change required from the details shown on the contract plans. In those cases, the manufacturer certified drawings will replace approved shop drawings.

- On the Type E.B. fixed bearings, the pintle has been extended to fit into a recess in the sole plate. This change is being made to lock up all the elastomeric layers and to facilitate fabrication.

- In lieu of using anchor bolts with 150 mm embedment and an embedded washer plate, the Contractor will be allowed the option of using anchor bolts with 300 mm embedment without the washer plate. This option will allow the Contractor to set anchor bolts by drilling and grouting.

- The number of pay items has been significantly reduced.

- Plain elastomeric bearings will be accepted on the basis of the bearing manufacturer being on an approved supplier list. No further sampling and testing will be required. Laminated elastomeric bearings with and without external load plates will continue to be sampled and tested for acceptance, in addition to the requirement of the bearing manufacturer being on the approved list.

- BDD sheets for Types S.R. and S.S. bearings have not been replaced with BD sheets. These bearing types are to be used only in rehabilitation situations where only one or two bearings are to be replaced on a bridge. Designers should consult the as-built plans of the bridge for details. The material specifications and item numbers have been retained to provide for this circumstance.

Effective Date

This EI becomes effective with the letting of May 21, 1998.

Contact

Questions and comments can be directed to Arthur Yannotti (518) 485-1148 of the Structures Design and Construction Division.

SECTION 565 - BRIDGE BEARINGS

565-1 DESCRIPTION. The work shall consist of furnishing, placing and setting bridge bearings at the locations indicated on the plans.

565-1.01 Bearing Types. There are various types of bearings. The specific type required will be indicated on the plans. Bearing types are:

A. Type S.R. - Steel Rocker Bearings. These accommodate rotation by pivoting around a pinned joint. They are fabricated in fixed and expansion versions. The expansion version accommodates longitudinal movement by means of a curved rocker rotating on the bearing surface. Steel rocker bearings do not allow for transverse movement. This type of bearing shall only be used in rehabilitation situations where only one or two bearings are to be replaced on a bridge.

B. Type S.S. - Steel Sliding Bearings. These accommodate rotation by means of a rocker. They are fabricated in fixed and expansion versions. The expansion version accommodates movement with a sliding element. Steel sliding bearings do not allow for transverse movement. This type of bearing shall only be used in rehabilitation situations where only one or two bearings are to be replaced on a bridge.

C. Type M.R. - Multi-Rotational Bearings. These accommodate rotation by the deformation of a confined elastomeric element, or an unconfined urethane disc. Multi-rotational bearings are fabricated in fixed and expansion versions. The expansion version accommodates movement by means of sliding elements. Expansion versions may be guided, allowing movement in only one direction, or non-guided, allowing multi-directional movement.

D. Type E.P. - Plain Elastomeric Bearings. These accommodate rotation by the deformation of a plain elastomeric pad. They may be used for both fixed and expansion applications without changes in details. The bearings will accommodate longitudinal, transverse, and rotational movements.

E. Type E.L. - Steel Laminated Elastomeric Bearings. These accommodate rotation by the deformation of a laminated elastomeric and steel pad. They may be used for both fixed and expansion applications without changes in details. The bearings will accommodate longitudinal, transverse, and rotational movements.

F. Type E.B. - Elastomeric Bearings with External Load Plates. These accommodate rotation by the deformation of a plain or steel laminated elastomeric pad. Elastomeric bearings with external load plates are fabricated in fixed and expansion versions. The fixed version will accommodate rotational movements. The expansion bearings will accommodate longitudinal, transverse, and rotational movements.

565-2 MATERIALS

565-2.01 General. Materials shall meet the following requirements:

Concrete Grouting Material	701-05
Plain Elastomeric Bridge Bearings	716-10
Steel Laminated Elastomeric Bridge Bearings	716-11
Cap Screws	ASTM F835M or A574M
Elastomeric Bridge Bearings with External Load Plates	716-12
Disc Design Structural Bridge Bearings	716-06.01
Pot Design Structural Bridge Bearings	716-07.01
Anchor Bolts	723-60
Rubber Impregnated Woven Cotton Fabric	728-01
Rubber Impregnated Random Fiber Pad	728-02
Plain Rubber Pad	728-03
Steel Anchor Dowel	709-01(a)
Paint	Department Approval List - Paints for Structural Steel

Note a). Steel anchor dowels shall meet the requirements of §709-01 - Bar Reinforcement.

565-2.02 Fabrication. Steel components of bridge bearings shall be fabricated in accordance with the applicable requirements of the N.Y.S. Steel Construction Manual (SCM). In addition, component parts of individual bearings shall meet fabrication details as shown in the contract documents.

A. Type S.R. Bearings. These shall conform to the plans and other contract documents.

B. Type S.S. Bearings. These shall conform to the plans and other contract documents.

C. Type M.R. Bearings. These shall conform to the requirements of either §716-06.01 or §716-07.01 as applicable, and other contract documents. When type M.R. bearings are specified, the Contractor may supply either disc design or pot design bearings. Only one bearing design, disc or pot, shall be supplied for any one bridge.

D. Type E.P. Bearings. These shall conform to the requirements of §716-10 and other contract documents.

E. Type E.L. Bearings. These shall conform to the requirements of §716-11 and other contract documents.

F. Type E.B. Bearings. These shall conform to the requirements of §716-12 and other contract documents.

565-2.03 Drawings. Shop drawings shall meet the requirements specified in the following:

Type S.R. and S.S. Bearings	SCM, Section 2
Type M.R. Bearings	716-06.01 or 717-07.01
Type E.L. Bearings	716-11
Type E.B. Bearings	716-12

565-2.04 Protective Coatings

A. Machine finished surfaces in contact, including pins, pin holes, surfaces in sockets at the top of rocker bearings, and bronze or copper plates in sliding contact shall receive one coat of automotive grease as soon as machining is complete. None of these surfaces shall be painted.

B. Stainless steel and polytetrafluoroethylene surfaces shall not be painted or otherwise coated.

C. Metal to metal surfaces to be field welded shall be given a coat of clear lacquer or other protective coating approved by the Engineer, or Inspector, if exposure is to exceed three months prior to welding. The coating shall be removed at the time of welding. Painting, if required, will be done only after the completion of welding. Surfaces to be painted shall be primed and painted in accordance with §565-2.04D.

D. All other metal surfaces shall be cleaned to meet SSPC-SP6, Surface Preparation Specification No. 6 Commercial Blast Cleaning, and painted with three coats of paint. The paint (primer, intermediate and finish coat) shall be selected from the Department's Approved List, Paints for Structural Steel. All coats of paint used shall be produced by the same manufacturer and be applied at a rate sufficient to produce a minimum dry film thickness of 75 μm per coat. Each single paint coat shall be a color different from others. For bearings used in conjunction with painted steel the color of the finish coat shall be the same color as the finish coat of the structural steel. For bearings used in conjunction with unpainted steel, the color of the finish coat shall be a rusty brown color which is a reasonable visual match to Federal Color Standard No. 595, Color 20059.

565-2.05 Shipping. Each bearing shall be shipped as an assembled unit, except for elastomeric bearings. Elastomeric bearings may be shipped in packages containing more than one bearing, provided the package can be handled with normal construction equipment. Bearings shall be packaged in such a manner to protect all rotating and sliding surfaces from the intrusion of outside material. Type M.R. Bearings shall be shipped precompressed to 3.45 MPa.

565-3 CONSTRUCTION DETAILS

565-3.01 Concrete Bearing Surface Elevations

A. General. The elevation of the concrete bearing surface for all types of bearings, except Type M.R. bearings, shall be as given on the plans.

B. Type M.R. Bearings. The elevation of the concrete bearing surface may vary from that given on the plans depending on the vertical dimension of the actual bearing supplied. The Contractor shall notify the Engineer of all required elevation changes. Changes to the roadway profile will not be allowed. All elevation adjustments necessary to maintain the profile shall be made to the concrete bearing surfaces. Any adjustments, including changes to the reinforcement, will be made at no additional cost to the State.

565-3.02 Concrete Bearing Surface Preparation. No bearing shall be placed upon a concrete bearing surface which is deformed, irregular, or poorly finished. The entire bearing surface area shall be floated and troweled.

565-3.03 Setting Anchor Bolts. Anchor bolts shall be set as shown on the plans unless changes are permitted by the D.C.E.S. If anchor bolts are cast in substructure concrete, templates, or other suitable means, shall be used to keep the bolts vertical at the required embedment and in the correct horizontal position during concrete placement. If the Contractor elects to drill the finished, cured concrete in order to set the anchor bolts, the reinforcing steel shall be positioned prior to casting the concrete so that it will not be damaged during drilling. If anchor bolts are drilled and grouted, material and construction details shall be in conformance with subsections §586-2 and §586-3.

565-3.04 Bearing Pad Installation. Bearing pads placed between concrete, or other masonry, and steel masonry plates shall be located to correct alignment and elevation, and placed at the time of masonry plate installation. Bearing pads shall conform to §728-01, §728-02, or §728-03 at the Contractor's option. Each bearing pad shall be the same size in plan as the masonry plate it supports. Holes to accommodate anchor bolts shall be cleanly and accurately cut prior to bearing pad placement.

565-3.05 Bearing Installation and Alignment

A. Type S.R. and Type S.S. Bearings.

1. General.

a. The centerline of sole plates or 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 or connection plate, whichever is the lesser distance.

b. The bearing shall be cleaned and regreased with automotive grease at the time of installation.

2. ***Fixed.*** No additional requirements apply.

3. ***Expansion.*** These may vary from perfect alignment. Therefore, expansion bearings shall be set in accordance with the following.

a. Type S. R. Bearings:

1. The bearing shall be set vertical under full dead load at an ambient temperature of 20°C.

2. The maximum variation from perfect alignment is a function of the bearing height. The bearing height is the distance between the upper and lower contact surfaces of the movable portion of the bearing. For bearings with a height of 510 mm or less, the maximum variation from perfect alignment, taking into account the effect of temperature and load at the time of measurement, shall be calculated by the following formula:

$$M = \pm (13 \text{ mm} + (L/356{,}000))$$

where "M" = maximum variation from perfect alignment measured as the horizontal distance between the centerline of the cap plate and the centerline of the masonry plate in millimeters and "L" = total expansion length in millimeters between the centerline of the movable bearing being considered and the centerline of the fixed bearing, from which motion must progress. Such variations shall not exceed 25 mm offset, or a five (5) degree rotation of the movable portion of the bearings from the required alignment, whichever is less.

The maximum variation of all bearings having a height exceeding 510 mm shall be approved on an individual basis by the D.C.E.S.

3. No bearing adjustments shall be made until the completed structural slab has been in place for at least seven curing days. Any adjustments needed to meet the above requirements may require jacking the superstructure. All adjustments shall be accomplished according to a written procedure submitted by the Contractor for D.C.E.S. approval. All adjustments shall be made at no additional cost to the State.

b. Type S. S. Bearings

1. The sliding plate shall be centered on the masonry plate under full dead lead at an ambient temperature of 20°C.

2. The maximum variation from perfect alignment between the centerlines of the fixed and movable portions of the bearing device, taking into account the effect of temperature and load at the time of measurement, shall not exceed plus or minus 13 mm longitudinally. This variation shall be measured as the horizontal distance between the centerline of the sliding plate and the centerline of the masonry plate. The movable portion of the bearing device shall be fully supported by the fixed portion under all temperature and loading conditions.

3. No bearing adjustments shall be made until the completed structural slab has been in place for at least seven curing days. Any adjustments needed to meet the above requirements may require jacking the superstructure. All adjustments shall be accomplished according to a written procedure submitted by the Contractor for D.C.E.S. approval. All adjustments shall be made at no additional cost to the State.

B. Type M.R. Bearings

1. General. The centerline of 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 or connection plate, whichever is the lesser distance.

2. Fixed. No additional requirements apply.

3. Expansion. These may vary from perfect alignment. Therefore expansion bearings shall be set in accordance with the following:

a. The sliding plate shall be centered on the masonry plate under full dead load at an ambient temperature of 20°C.

b. The maximum variation from perfect alignment between the centerline of the fixed and movable portions of the bearing device, taking into account the effects of temperature and load at the time of measurement, shall not exceed plus or minus 25 mm longitudinally unless otherwise indicated on the plans. This variation shall be measured as the horizontal distance between the centerline of the sliding plate and the centerline of the masonry plate.

c. No bearing adjustments shall be made until the completed structural slab has been in place for at least seven curing days. Any adjustments needed to meet the above requirements may require jacking the superstructure. All adjustments shall be accomplished according to a written procedure submitted by the Contractor for D.C.E.S. approval. All adjustments shall be made at no additional cost to the State.

C. *Type E.P. and Type E.L. Bearings*

1. *General.*

a. These bearings are designed to function properly provided that minimum distortion occurs along the beam axis under full dead load at an ambient temperature of 20°C. Elastomeric bearings shall be installed when the ambient temperature is between 5° and 26° C inclusive. The Contractor may elect to install the bearings when the ambient temperature is outside of the allowable range, provided the Contractor submits, and receives D.C.E.S. approval, of an installation procedure that either resets the bearings when the temperature is in the allowable range or deforms the bearings so that they perform as if they were installed at 20°C.

b. For prestressed concrete superstructures, the bearing shall be anchored to establish the fixed end of the bridge as soon as possible after stringer erection. For adjacent prestressed box beams, or prestressed slab superstructures, the anchorage shall be completed prior to filling the shear keys. The method of anchorage shall be in accordance with the details shown on the plans. Anchor dowel holes shall be core drilled to the nominal size and depth and at the locations required by the plans. In lieu of core drilling, the Contractor may submit an installation procedure that incorporates the use of either preset anchor bolts or pipe sleeves to the D.C.E.S. for approval. Prior to placing the anchor dowel, the hole shall be inspected and approved for filling by the Engineer. Fill material shall be in accordance with the details on the plans.

2. *Fixed.* No additional requirements apply.

3. *Expansion.*

a. These may vary from perfect alignment. The maximum variation from perfect alignment under full dead load shall not exceed the value shown on the plans. This variation shall be measured as the horizontal distance between the centerline of the highest elastomer surface and the centerline of the lowest elastomer surface.

b. No bearing adjustments shall be made until the completed structural slab has been in place for at least seven curing days. Any adjustments needed to meet the above requirements may require jacking the superstructure. All adjustments shall be accomplished according to a written procedure submitted by the Contractor for D.C.E.S. approval. All adjustments shall be made at no additional cost to the State.

D. Type E.B. Bearings.

1. General.

a. The centerline of sole plate or other fixed portions of bearing assemblies, attached to steel stringers, shall not be offset from the centerline of bearing stiffeners of diaphragm connection plates by more than one-half the thickness of the flange at that location, or the thickness of the bearing stiffener or connection plate, whichever is the lesser distance.

b. These bearings are designed to function properly provided that minimal distortion occurs along the beam axis under full dead load at an ambient temperature of 20°C. Elastomeric bearings shall be installed when the ambient temperature is between 5° and 26° C inclusive. The Contractor may elect to install the bearings when the ambient temperature is outside of the allowable range, provided the Contractor submits, and receives D.C.E.S. approval, of an installation procedure that either resets the bearings when the temperature is in the allowable range or deforms the bearings so that they perform as if they were installed at 20°C.

*2. **Fixed.*** No additional requirements shall apply.

3. Expansion.

a. These may vary from perfect alignment. The maximum variation from perfect alignment under full dead load shall not exceed the value shown on the plans. This variation shall be measured as the horizontal distance between the centerline of the highest elastomer surface and the centerline of the lowest elastomer surface.

b. No bearing adjustments shall be made until the completed structural slab has been in place for at least seven curing days. Any adjustments needed to meet the above requirements may require jacking the superstructure. All adjustments shall be accomplished according to a written procedure submitted by the Contractor for D.C.E.S. approval. All adjustments shall be made at no additional cost to the State.

565-3.06 WELDING

A. Type S.R. Bearings. Bearings shall be welded permanently to the structural steel only after all necessary adjustments have been made. All welding shall be done in accordance with the requirements of the SCM. The Contractor shall submit a Welding Procedure Specification to the D.C.E.S. No welding shall be performed until the manufacturer receives an approved Welding Procedure Specification.

B. Type S.S. Bearings. The requirements of §565-3.06A shall apply.

C. Type M.R. Bearings. The requirements of §565-3.06A shall apply except that during field welding operations the temperature of the steel adjacent to the rotational element shall not exceed 90°C. Temperature shall be controlled by welding procedures and monitored using temperature indicating crayons, or other devices. Procedures, crayons, and other devices shall be acceptable to the Engineer. If the temperature limit is exceeded, the D.C.E.S. and the Director, Materials Bureau shall be immediately notified. The D.C.E.S. will provide the proper repair procedure, which may include complete replacement of the bearing. All repair work shall be done at no additional cost to the State.

D. Type E.B. Bearings. The requirements of §565-3.06A and §565-3.06C shall apply.

565-3.07 Grouting Anchor Bolt Holes. All slotted anchor bolt holes in masonry plates shall be filled with concrete grouting material to the top edge of the hole. All excess grout material shall be cleaned from the bearing surfaces in a manner satisfactory to the Engineer. Slotted anchor bolt holes in fixed bearings may be filled any time subsequent to stringer placement. Slotted holes in expansion bearings shall be filled only after all necessary bearing adjustments have been made.

565-3.08 Final Verification. Prior to final acceptance of the bridge, the Engineer will verify that all necessary adjustments have been made; that all steel bearings, or external load plates, are permanently welded or attached with cap screws to the superstructure steel as shown on the contract plans; that all slotted holes are completely filled with grout; that all anchor bolts are firmly tightened; and that all other work required to make the bearings completely functional has been completed.

565-4 METHOD OF MEASUREMENT. Measurement will be taken as the number of bearings installed in accordance with the Contract Documents.

565-5 BASIS OF PAYMENT. The unit price bid for each bearing shall include the cost of all labor, materials, equipment and adjustment necessary to complete the work. All material between the bottom of the superstructure, and the top of the substructure, including anchor bolts and sole plates, shall be included in the price bid for this item.

565-5.01 Progress Payments

A. Type S.R. Bearings

1. Eighty percent of the quantity will be paid for after the bearing is installed.

2. The remainder of the quantity will be paid for after the bearing is aligned as required.

B. Type S.S. Bearings. The requirements of §565-5.01A shall apply.

C. Type M.R. Bearings. The requirements of §565-5.01A shall apply.

565-5.02 Payment will be made under:

Item No.	Item	Pay Unit
565.1121 M	Type S.R. Expansion Bearing (All Load Ranges)	Each
565.1221 M	Type S.R. Fixed Bearing (All Load Ranges)	Each
565.1321 M	Type S.S. Expansion Bearing (All Load Ranges)	Each
565.1421 M	Type S.S. Fixed Bearing (All Load Ranges)	Each
565.1521 M	Type M.R. Expansion Bearing (0 to 1000 kN)	Each
565.1522 M	Type M.R. Expansion Bearing (1001 to 2000 kN)	Each
565.1523 M	Type M.R. Expansion Bearing (2001 to 3000 kN)	Each
565.1524 M	Type M.R. Expansion Bearing (3001 to 4000 kN)	Each
565.1525 M	Type M.R. Expansion Bearing (Over 4000 kN)	Each
565.1721 M	Type M.R. Fixed Bearing (0 to 1000 kN)	Each
565.1722 M	Type M.R. Fixed Bearing (1001 to 2000 kN)	Each
565.1723 M	Type M.R. Fixed Bearing (2001 to 3000 kN)	Each
565.1724 M	Type M.R. Fixed Bearing (3001 to 4000 kN)	Each
565.1725 M	Type M.R. Fixed Bearing (Over 4000 kN)	Each
565.1821 M	Type E.P. Bearing (All Load Ranges)	Each
565.1921 M	Type E.L. Bearing (0 to 250 kN)	Each
565.1922 M	Type E.L. Bearing (251 to 500 kN)	Each
565.1923 M	Type E.L. Bearing (501 to 750 kN)	Each
565.1924 M	Type E.L. Bearing (751 to 1000 kN)	Each
565.1925 M	Type E.L. Bearing (Over 1000 kN)	Each

Item No.	Item	Pay Unit
565.2021 M	Type E.B. Fixed Bearing (0 to 250 kN)	Each
565.2022 M	Type E.B. Fixed Bearing (251 to 500 kN)	Each
565.2023 M	Type E.B. Fixed Bearing (501 to 750 kN)	Each
565.2024 M	Type E.B. Fixed Bearing (751 to 1000 kN)	Each
565.2025 M	Type E.B. Fixed Bearing (Over 1000 kN)	Each
565.2031M	Type E.B. Expansion Bearing (0 to 250 kN)	Each
565.2032 M	Type E.B. Expansion Bearing (251 to 500 kN)	Each
565.2033 M	Type E.B. Expansion Bearing (501 to 750 kN)	Each
565.2034 M	Type E.B. Expansion Bearing (751 to 1000 kN)	Each
565.2035 M	Type E.B. Expansion Bearing (Over 1000 kN)	Each

716-10 PLAIN ELASTOMERIC BRIDGE BEARINGS

SCOPE. This specification covers the material requirements for plain elastomeric bridge bearings. Bearings furnished under this specification shall be adequate for the specified design load, and provide for the thermal expansion and contraction, rotation, camber changes, creep, and shrinkage of structural members.

GENERAL. Plain elastomeric bridge bearings (Type EP bearings) are composed entirely of elastomeric material. They may be used for both fixed and expansion applications without changes in details. The bearings will accommodate longitudinal, transverse, and rotational movements.

Elastomeric bridge bearings shall be designed in accordance with New York State Standard Specifications for Highway Bridges. Unless otherwise specified in the contract documents the design procedure shall be based on a 50-durometer elastomer with a shear modulus equal to 0.68 MPa.

MATERIAL REQUIREMENTS. All materials shall be new, unused material with no reclaimed material incorporated in the finished bearing. The elastomeric compound used in the construction of these bearings shall contain only virgin crystallization resistant polychloroprene (neoprene) or virgin natural polyisoprene (natural rubber) as the raw polymer. The physical properties of the cured elastomeric compound shall be determined by using samples taken from actual bearings and shall meet the requirements of Table 716-1.

TABLE 716-1 PROPERTIES OF ELASTOMERIC MATERIAL

		REQUIREMENTS[1]	
	ASTM TEST METHOD	NEOPRENE	NATURAL RUBBER
PHYSICAL PROPERTIES:			
Durometer Hardness Shore A, (Points)	D2240	50 ± 10	50 ± 10
Tensile Strength, Min., (MPa)	D412	13.8	13.8
Ultimate Elongation, Min., (%)	D412	400	400
Oil Swell, Volume Change, Max., %	D471	120	-
HEAT RESISTANCE:	D573[2]		
Change in Durometer Hardness, Max., (Points)		+10	+10
Change in Tensile Strength, Max., (%)		-15	-25
Change in Ultimate Elongation, Max., (%)		-40	-25
COMPRESSION SET:	D395[3]		
Permissible Set, Max., (%)		35	25
(Method B, plied, Type 2 specimen)			

Note 1:
Tolerances for samples cut from finished parts have already been applied to each of these requirements, No greater tolerances will be allowed.

Note 2:
D573: Neoprene - oven aging, 70 hrs. @ 100°C
Natural Rubber - oven aging, 70 hrs. @ 70°C

Note 3:
D395: Neoprene - oven aging, 22 hrs. @ 100°C
Natural Rubber - oven aging 22 hrs. @ 70°C

Note 4:
For the purpose of determining conformance with these specifications, an observed or calculated value shall be rounded off to the nearest 0.10 Mpa for tensile strength to the nearest 10% for elongation and the nearest 1% change in aged tensile and aged elongation. Hardness and aged hardness shall be rounded off to the nearest point in accordance with AASHTO R-11.

DRAWINGS. Shop drawings will not be required for Type EP bearings.

FABRICATION DETAILS. The finish of the mold used to produce these bearings shall conform to good machine shop practice. Each bearing shall be marked in indelible ink or flexible paint. The marking shall consist of the manufacturer's name and location. The marking shall be placed on at least one side or face that will be visible after erection and, if possible, on two sides or faces.

The bearings shall be cast in a mold under pressure and heat to the specified thickness. They may be molded and vulcanized in large sheets and cut to size. Cutting shall not heat the material, and the finish produced shall be equal to a surface roughness average of 6.3 μm as defined by ANSI B46.1. A type EP bearing that has been cut from a larger piece of material and fabricated to the finished size by bonding or plying smaller pieces together will not be acceptable.

Bearing Tolerances. Finished elastomeric bearings shall conform to the design dimensions, with the tolerances listed in Table 716-2.

TABLE 716-2 BEARING TOLERANCES

Dimension	Tolerance
Overall Vertical	-0, +3 mm
Overall Horizontal	-0, +6 mm
Position of Holes and Slots centerline	±1.6 mm from centerline
Size of Holes and Slots	-0, +1.6 mm

PERFORMANCE CHARACTERISTICS.

Compression Deflection. The compression deflection of each bearing shall not exceed 10.0% of the design effective rubber thickness at a compressive load equal to the actual design load.

The compression deflection shall be determined by loading the bearings to 3.4 MPa and 5.5 MPa. At each load a deflection reading will be taken and the readings used to calculate the slope between the two loads. The slope shall then be used to determine the deflection at the bearing's design load.

The bearing and ambient temperature shall be 23° ± 2°C at the time of testing.

Shear Strain. Two bearings shall be conditioned at -29° ± .5°C for a minimum of 96 hours and subjected to a compressive stress of 3.45 MPa and a shear force, such that the bearings exhibit a shear

strain equal to 25% of their design effective rubber thickness. When measured 15 minutes after the 25% shear strain is achieved, the shearing force required to produce this 25% strain shall not exceed .345 MPa.

The total time lapse between removal from the -29°C environment and completion of test shall not exceed 30 minutes. The compressive stress for the bearings and the shear stresses will be computed on the net plan area of the rubber.

NOTE: For conformance to this specification, an observed or calculated value shall be rounded off (ASTM E29) to the nearest 0.1% for compression deflection, and to the nearest .001 MPa for shear strain.

BASIS OF ACCEPTANCE. Acceptance of this material will be based on tests performed by the Materials Bureau and in accordance with the procedural directives of the Materials Bureau. Upon approval by the Materials Bureau, the name of the manufacturer will be placed on an Approved List. This material will then be accepted based upon the manufacturer's name appearing on the Department's Approved List.

716-11 STEEL LAMINATED ELASTOMERIC BRIDGE BEARINGS

SCOPE. This specification covers the material requirements for laminated elastomeric bridge bearings without external load plates. Bearings furnished under this specification shall be adequate for the specified design load, and provide for the thermal expansion and contraction, rotation, camber changes, creep, and shrinkage of structural members.

GENERAL. Steel laminated elastomeric bridge bearings (Type EL bearings) are composed of multiple layers of elastomeric material separated by steel plates. They may be used for both fixed and expansion applications without changes in details. The bearings will accommodate longitudinal, transverse, and rotational movements.

Elastomeric bridge bearings shall be designed in accordance with New York State Standard Specifications for Highway Bridges. Unless otherwise specified in the contract documents the design procedure shall be based on a 50-durometer elastomer with a shear modulus equal to 0.68 MPa.

MATERIALS REQUIREMENTS. All materials shall be new, unused material with no reclaimed material incorporated in the finished bearing.

Elastomeric Material. The elastomeric compound used in the construction of these bearings shall contain only virgin crystallization resistant polychloroprene (neoprene) or virgin natural polyisoprene (natural rubber) as the raw polymer. The physical properties of the cured elastomeric compound shall be determined by using samples taken from actual bearings and shall meet the requirements of Table 716-3.

TABLE 716-3 PROPERTIES OF ELASTOMERIC MATERIAL

		REQUIREMENTS[1]	
	ASTM TEST METHOD	NEOPRENE	NATURAL RUBBER
PHYSICAL PROPERTIES:			
Durometer Hardness Shore A, (Points)	D2240	50 ± 10	50 ± 10
Tensile Strength, Min., (MPa)	D412	13.8	13.8
Ultimate Elongation, Min., (%)	D412	400	400
Oil Swell, Volume Change, Max., (%)	D471	120	-
HEAT RESISTANCE:	D573[2]		
Change in Durometer Hardness, Max., (Points)		+10	+10
Change in Tensile Strength, Max., (%)		-15	-25
Change in Ultimate Elongation, Max., (%)		-40	-25
COMPRESSION SET:			
Permissible Set, Max., (%)	D395[3]	35	25
(Method B, plied, Type 2 specimen)			

Note 1:
Tolerances for samples cut from finished parts have already been applied to each of these requirements, No greater tolerances will be allowed.

Note 2:
D573: Neoprene - oven aging, 70 hrs. @ 100°C
Natural Rubber - oven aging, 70 hrs. @ 70°C

Note 3:
D395: Neoprene - oven aging, 22 hrs. @ 100°C
Natural Rubber - oven aging 22 hrs. @ 70°C

Note 4:
For the purpose of determining conformance with these specifications, an observed or calculated value shall be rounded off to the nearest 0.10 MPa for tensile strength to the nearest 10% for elongation and the nearest 1% change in aged tensile and aged elongation. Hardness and aged hardness shall be rounded off to the nearest point in accordance with AASHTO R-11.

Internal Steel Plates. Steel plates for internal laminates shall be rolled mild steel conforming to the requirements of AASHTO M183, ASTM A36M, ASTM A611 (Grade C or D) or ASTM A570M (Grade 33 or 36).

DRAWINGS. Shop drawings will not be required for Department approval unless a change in the details shown on the plans is proposed. When Department approved drawings are required, they shall be furnished in accordance with SCM, Section 2.

When the bearing details are identical to the plans, the Contractor shall be responsible for supplying drawings prepared by the manufacturer. The manufacturer shall certify that the bearings depicted on the drawings are in conformance with the contract plans. The Contractor shall submit one copy of these drawings to the Engineer. Five copies of the manufacturer's certified drawings shall be submitted to the Materials Bureau by the manufacturer. The Department's acceptance procedures will commence subsequent to receipt of these drawings. The manufacturer shall note the following on all shop drawings:

a. The Contract number, bridge crossing(s), specification item no. and the type, size and quantity of bearings being produced.

b. The actual design load (dead load plus live load) for each type and size bearing. If bearings of the same type and size are designed for differing load conditions the maximum design load shall be noted.

c. The effective rubber thickness, typical laminate thickness, compressive area, shear area and shape factor.

d. The Manufacturer's name, the location of the fabrication plant and the name and phone number of the manufacturer's representative who will coordinate production, inspection, and sampling and testing with the Materials Bureau.

e. The specification reference and grade of steel used.

FABRICATION DETAILS. The finish of the mold used to produce these bearings shall conform to good machine shop practice. Each bearing shall be marked in indelible ink or flexible paint. The marking shall consist of the manufacturer's name, contract number, lot number, and individual bearing number. The marking shall be placed on at least one side or face that will be visible after erection and, if possible, on two sides or faces.

Type EL bearings shall be cast as a single unit in a mold and bonded and vulcanized under pressure and heat to the specified size and thickness. The internal steel plate(s) shall be commercially blast cleaned to a condition matching that of SSPC-Vis1, Pictorial Standards A SP6, B SP6 or C SP6, and cleaned of all oil or grease before bonding.

Bearing Tolerances. Finished elastomeric bearings shall conform to the design dimensions, with the tolerances listed in Table 716-4, and the following details:

a. **Internal Steel Plates.** The internal steel plates shall be checked for parallelism by measuring the distance between each individual steel plate, and between the top or bottom edge of the bearing to the first adjacent steel plate. For each plate, measurements will be taken at four points, located at 90° intervals around the perimeter. On rectangular bearings