

SUPERSEDED BY
EB 15-031
EFFECTIVE 9/28/15



New York State
Department of
Transportation
ENGINEERING
INSTRUCTION

EI
14-022

Title: REVISION TO STANDARD SPECIFICATION 716-06 AND 716-07 AND ISSUE OF NEW STANDARD SPECIFICATIONS 716-03 AND 716-04

Target Audience:

- ☐ Manufacturers (18)
☐ Local Govt. (31)
☒ Agencies (32)

- ☐ Surveyors (33)
☒ Consultants (34)
☒ Contractors (39)
☐ _____ ()

Approved:


Robert Sack P.E.
Deputy Chief Engineer (Research)

6 Nov 14
Date

ADMINISTRATIVE INFORMATION:

- This Engineering Instruction (EI) is effective beginning with projects submitted for the letting of May 7, 2015.
- This EI does not supersede any other issuance.
- The revisions issued with this EI will be incorporated into the next update of the Standard Specifications.

PURPOSE: The purpose of this EI is to introduce the revised Standard Specifications 716-06, 716-07 and new Standard Specifications 716-03 and 716-04 for bearing components.

TECHNICAL INFORMATION:

- The new specifications: 716-03 POLYETHER URETHANE STRUCTURAL ELEMENT and 716-04 POLYTETRAFLUOROETHYLENE SHEET AND STRIP are being separated from specifications 716-06 and 716-07 for the purpose of tracking the manufacture and acceptance of these bearing components using Site Manager.
- Revised Standard Specifications 716-06 Disc-Design Structural Bridge Bearings and 716-07 Pot Design Structural Bridge Bearings are being issued minus the information found in Standard Specifications 716-03 and 716-04.
- Cost Impact - none

IMPLEMENTATION:

- Site Manager is presently referencing these bearing components with the new specifications identified in this issuance. Design Quality Assurance Bureau will insert the standard specification revision into contract proposals beginning with projects submitted for the letting of 05/07/15.

TRANSMITTED MATERIALS:

This EI transmits standard specification revisions to 716-06 *Disc-Design Structural Bridge Bearings* and 716-07 *Pot Design Structural Bridge Bearings*. Also transmitted are new Standard Specifications 716-03 *Polyether Urethane Structural Element* and 716-04 *Polytetrafluoroethylene Sheet and Strip*. Both Metric and U.S. Customary revisions are attached.

BACKGROUND: Site Manager is a program designed to facilitate the tracking of products from manufacture to installation.

CONTACT: Direct questions regarding this issuance to Guy Hildreth of the Materials Bureau at (518) 485-5431 or via e-mail at Guy.Hildreth@dot.state.ny.us.

Add the following specification to the Standard Specifications dated May 4, 2006:

716-03 POLYETHER URETHANE STRUCTURAL ELEMENT

SCOPE. This specification covers the material requirements for Polyether Urethane Structural Element.

GENERAL. The polyether urethane structural element used in the construction of disc-design bearings shall be molded from a polyether urethane compound.

MATERIAL REQUIREMENTS. The physical properties of the polyether urethane shall conform to the requirements of Table 716-03-1.

TABLE 716-03-1 PHYSICAL REQUIREMENTS OF POLYETHER URETHANE STRUCTURAL ELEMENT			
Physical Property	ASTM Test Method	Requirements	
		Min.	Max.
Hardness, Type D Durometer	D2240	57	67
Tensile Stress, kpa ¹ At 100% elongation At 300% elongation ³	D412	13790 25860	-----
Tensile Strength, kpa ¹	D412	34375	---
Ultimate Elongation, % ¹	D412	220	---
Compression Set ^{1,2} , %	D395	---	40

NOTES:

1. 10% deviation from specified values is permissible.
2. 22 hours at 70°C
3. Only required if 300% is attained.

SAMPLING AND TESTING.

TABLE 716-03-2 POLYETHER URETHANE SAMPLING AND TESTING REQUIREMENTS		
Test	Performed By	Samples Required
Physical Properties Polyether Urethane Rotational Element (except compression set)	Materials Bureau	One 250 x 375 mm sheet of polyether urethane material (thickness of 1.5 – 3.0 mm) per lot. ¹
Compression Set of Polyether Urethane Rotation Element	Materials Bureau	One 100 x 100 mm sheet of polyether urethane material, molded or cut to the thickness requirements of ASTM D395, Method B. ²

NOTES:

1. All submitted sample sheets of polyether urethane material shall be certified by the bearing manufacturer as having been taken from the same batch of polyether urethane material as was used in the actual production bearings.
2. The manufacturer shall have the option of supplying four (4) die cut specimens in accordance with ASTM D395, Method B. All submitted specimens of polyether urethane material shall be certified by the bearing manufacturer as having been taken from the same batch of polyether urethane material as was used in the actual production bearings.

BASIS OF ACCEPTANCE. Polyether Urethane Structural Element will be considered for acceptance in lot quantities in accordance with the procedural directives of the Materials Bureau.

Add the following specification to the Standard Specifications dated May 4, 2006

716-04 POLYTETRAFLUOROETHYLENE SHEET AND STRIP

SCOPE. This specification covers the material requirements for Polytetrafluoroethylene (PTFE) sheet and strip.

GENERAL. Polytetrafluoroethylene (PTFE) sheet and strip shall be manufactured from pure virgin (not processed) unfilled TFE resin; or from TFE resin uniformly blended with either 15% glass fiber or 25% carbon (maximum filler, percent by weight).

MATERIAL REQUIREMENTS. Finished PTFE sheet and strip shall be resistant to all acids, alkalis and petroleum products, stable at temperatures from -220°C to +260°C, non-flammable, non-absorbing of water, and shall conform to the physical requirements of Table 716-04-1.

TABLE 716-04-1 PHYSICAL REQUIREMENTS OF PTFE SHEET AND STRIP				
Physical Property	ASTM Test Method	MINIMUM REQUIREMENTS		
		Unfilled	Filled 15% Glass	Filled 25% Carbon
Ultimate Tensile Strength, kpa	D638M	19300	13790	9000
Ultimate Elongation, %	D638M	200	150	75
Specific Gravity	D792	2.13	2.18	2.05

SAMPLING AND TESTING. One 250 x 375 mm sheet of PTFE material per lot as defined in 716-07. Single sheets of PTFE Material from which the bearing has been fabricated may be submitted to the Materials Bureau for consideration of multiple lot acceptance, provided that the thickness of the material does not vary from lot to lot. All submitted sample sheets shall be certified by the bearing manufacturer as having been taken from the same batch of PTFE material as was used in the actual production of bearings.

BASIS OF ACCEPTANCE. Polytetrafluoroethylene (PTFE) sheet and strip will be considered for acceptance in lot quantities in accordance with the procedural directives of the Materials Bureau.

Make the following changes to the Standard Specifications dated May 4, 2006: Remove Section 716-06 DISC-DESIGN STRUCTURAL BEARINGS in its entirety and replace with:

"716-06 DISC-DESIGN STRUCTURAL BRIDGE BEARINGS

SCOPE. This specification covers the material requirements for disc-design structural bridge bearings. Bearings furnished under this specification shall adequately provide for the thermal expansion and contraction, rotation, camber changes, and creep and shrinkage of structural members, where applicable.

GENERAL. Disc-design structural bridge bearings shall consist of a polyether urethane structural element (disc) confined by upper and lower steel bearing plates. The bearings shall be equipped with a shear restriction mechanism to prevent movement of the disc.

Disc-design structural bridge bearings shall be supplied as fixed bearings; guided expansion bearings; and non-guided expansion bearings as designated by the Contract Documents.

Fixed Bearings. Fixed bearings shall allow rotation but no longitudinal or transverse movement in the bearing plane.

Guided Expansion Bearings. Guided expansion bearings shall allow rotation and longitudinal movement in the bearing plane; transverse movement shall be restricted. To allow longitudinal movement, the upper steel bearing plate shall be faced with polytetrafluoroethylene (PTFE) sheet and support a sliding steel top bearing plate. The mating surface of the sliding steel top bearing plate shall be faced with polished stainless steel. To restrict transverse movement, either a guide bar or keyway system shall be used. If required, the guide bar or keyway systems and their mating steel surfaces shall be faced with strips of either PTFE or PTFE-stainless steel.

Non-Guided Expansion Bearings. Non-guided expansion bearings shall allow rotation, longitudinal, and transverse movement in the bearing plane. To allow longitudinal and transverse movement, the upper steel bearing plate shall be faced with polytetrafluoroethylene (PTFE) sheet and support a sliding steel top bearing plate. The mating surface of the sliding steel top bearing plate shall be faced with polished stainless steel.

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

Polyether Urethane Structural Element. The polyether urethane structural element shall meet the requirements of 716-03.

Steel. All steel except stainless steel components of the bearing shall conform to the requirements of the type of steel designated on the Contract Plans and applicable provisions of the New York State Steel Construction Manual.

Stainless Steel. Stainless steel shall conform to the requirements of ASTM A167, or ASTM A240, Type 304. Stainless steel in contact with PTFE shall be polished to a No. 8, bright mirror finish. The minimum thickness of the stainless steel shall be 1.25 mm.

Polytetrafluoroethylene Sheet and Strip. Polytetrafluoroethylene (PTFE) sheet and strip shall meet the requirements of 716-04.

FABRICATION. The finish of the mold used to produce the bearing elements shall conform to good machine shop practice. Every bearing shall have the Project Identification Number, NYSDOT Lot Number and individual bearing number indelibly marked with ink on a side that will be visible after erection.

The PTFE sheet shall be bonded to its grit blasted steel substrate using an epoxy resin adhesive under

controlled factory conditions in accordance with the instructions of the adhesive manufacturer. Alternately, the PTFE sheet may be recessed into its steel substrate for one-half its thickness. The bearing manufacturer shall have the option of bonding recessed PTFE sheet.

All steel surfaces exposed to the atmosphere, except stainless steel surfaces and metal surfaces to be welded, shall be shop painted with one coat of an approved list product meeting 708-01 Structural Steel Paints Class 1. Prior to painting, the exposed steel surfaces shall be cleaned in accordance with the recommendations of the coating's manufacturer. Metal surfaces to be welded shall be given a coat of clear lacquer, or other protective coating approved by the Engineer, if exposure is to exceed three months prior to welding. The coating shall be removed at the time of welding. No painting will be done to these surfaces prior to the completion of welding.

Except as noted, all bearing surfaces of steel plates shall be finished or machined flat within 0.25 mm. Out-of-flatness greater than 0.25 mm on any plate shall be cause for rejection. The bottom surfaces of lower bearing plates (masonry plates) designed to rest on bearing pads shall not exceed an out of-flatness value of 1.6 mm. Oxygen cut surfaces shall not exceed a surface roughness value of 25 μ m, as defined by ANSI B46.1. Repair, when necessary, shall conform to the requirements of the New York State Steel Construction Manual (When the SCM requires DCES approval, delete the term DCES and replace it with the Regional Director).

The steel base pot of all bearings shall be either integrally machined or continuously welded to its bottom steel masonry plate. Unless otherwise approved by the Regional Director, all welding shall conform to, and all welders shall be qualified in accordance with the requirements of the New York State Construction Manual (When the SCM requires DCES approval, delete the term DCES and replace it with the Regional Director).

Gross bearing dimensions shall have a tolerance of -0, +3.0 mm.

PERFORMANCE CHARACTERISTICS

Compression Strain. The compression stress is based on the net area of the rotational element using the total overall diameter. The compression strain is measured as a percentage of the original thickness of the rotational element.

A load equal to 150% of the bearing's design capacity shall first be applied to seat the bearing components. The 150% load shall then be gradually reduced, over a time period of 30 to 90 seconds, to a pre-load equal to 3% of the bearing's design capacity. Each compression strain shall be recorded relative to the initial 3% pre-load deflection, one minute after the desired stress level has been reached, on deflectometers at four locations 90° apart on the perimeter of the bearing.

The test results will be evaluated as follows:

- The bearing will be visually examined both during and after the test. Any resultant visual defects (such as extruded elastomer, damaged seals, or cracked steel) shall be cause for rejection
- Non-uniform compression deflections at a desired stress level shall be cause for rejection
- The compression strain of each bearing shall conform to the following requirements:

Compression Stress (MPa)	Compression Strain, Max. %
6.9	5.0
13.8	8.5
20.7	11.0
27.6	13.2
35.0	16.0

Sliding Coefficient of Friction. For all guided and non-guided expansion disc-design bearings, the coefficients of friction shall be measured at the bearing's design capacity, on the fifth and fiftieth cycles, at a sliding speed of 25 mm per minute.

The sliding coefficient of friction shall be calculated as the horizontal load required to maintain continuous sliding of one bearing, divided by the bearing's design capacity vertical load. The vertical load shall have been applied continuously for a minimum of 12 hours prior to testing.

The test results will be evaluated as follows:

- The measured sliding coefficients of friction shall not exceed 75% of the maximum design coefficient of friction
- The bearing will be visually examined both during and after the test. Any resultant visual defects (such as bond failure, physical destruction, cold flow of PTFE, or damaged components) shall be cause for rejection.

Rotation. For all disc-design bearings, the polyether urethane element shall be capable of maintaining its initial uniform contact with the steel bearing plates throughout a rotation range of 0.02 radians under a compressive load equal to 150% of the design capacity of the bearing.

The test results will be evaluated as follows:

- The bearing will be visually examined both during and after the test. Any resultant visual defects shall be cause for rejection
- Continuous and uniform contact between the polyether urethane element and bearing plates, and between the sliding steel top and upper bearing plates shall be maintained for the duration of the test.

Any observed lift-off shall be cause for rejection.

DRAWINGS. The Contractor shall submit detailed shop drawings, drawn by the Manufacturer only, in conformance with the applicable requirements of the New York State Steel Construction Manual, for approval by the Regional Director prior to the start of fabrication.

In addition to the above requirements, the Manufacturer shall note the following on the shop drawings.

- The total quantity of each kind of disc-design bearing required, i.e., fixed, guided expansion, or non-guided expansion, grouped first according to type (load range) and then by actual design capacity
- The thickness and plan area of the polyether urethane structural elements required
- The maximum design coefficient of friction as noted on the Contract Plans
- The type of PTFE sheet (filled or unfilled) and, if applicable, the type and amount (by weight) of the filler
- The type(s) of steel(s) to be used
- If applicable, any welding process used in the bearing manufacture that does not conform to the approved processes of New York State Steel Construction Manual shall be clearly described and detailed.
- The location of the fabrication plant
- The Manufacturer's name and the name of the manufacturer's representative who will be responsible for coordinating production, inspection, sampling and testing with the Materials Bureau.

The Contractor shall also provide the Materials Bureau with written notification thirty (30) days prior to the start of bearing fabrication. This notification shall include all of the information required as identified above. A copy of this notification shall be sent to the Regional Director.

SAMPLING AND TESTING. The manufacturer shall furnish the required number of samples to perform testing in accordance with Table 716-06-3.

Lot Size. Sampling, testing and acceptance consideration will be made on a lot basis. A lot shall be defined as those bearings presented for inspection at a specific time or date. A lot shall be further defined as the smallest number of bearings as determined by the following criteria:

- A lot shall not exceed a single contract or project quantity
- A lot shall not exceed 25 bearings
- A lot shall consist of those bearings that can be manufactured with polyether urethane rotation elements from one batch of polyether urethane material. The mass of one batch shall not exceed 205 kg.

- A lot shall consist of those bearings of the same type, regardless of load capacity. Bearing types shall be fixed type bearings or expansion type bearings. Guided and non-guided expansion bearings will be considered as a single type.

Schedule. The manufacturer shall complete the required testing and determine compliance with this specification before submitting the lot(s) for inspection, sampling and acceptance consideration. A minimum of thirty (30) days shall be allowed for the Department's inspection, sampling and testing of production bearings and component materials.

Sampling Method. The manufacturer shall select, at random, the required sample bearing(s) from the completed lots of bearings for testing by the manufacturer.

The Department's representative shall select, at random, the required sample bearing(s) from completed lots of bearings, and samples of the polyether urethane and the PTFE materials for testing by the Materials Bureau. All samples shall be taken in accordance with the Department's written instructions.

TABLE 716-06-3 DISC BEARING SAMPLING AND TESTING REQUIREMENTS

Test	Performed By	Samples Required
Rotation	Manufacturer	One production bearing per lot ₁
Coefficient of Friction	Manufacturer	One production bearing per lot ₁
Compression Strain	Materials Bureau	Three production bearings per lot ₂
Physical Properties Polyether Urethane Rotational Element	Materials Bureau	See requirements of 716-03
Physical Properties of PTFE Sheet	Materials Bureau	See requirements of 716-04

NOTES:

1. Sample production bearings of such size that cannot be tested by the manufacturer at 150% design capacity for rotation shall be tested at actual design capacity. Bearings which are tested at actual design capacity will be tested at that capacity because it is not possible, or not practical in the Department's opinion to test them at a higher capacity. Therefore, bearings tested at 150% design capacity which are rejected, will not be retested below 150% design capacity for the purpose of rendering such bearings acceptable. Sample production bearings that cannot be tested by the manufacturer at their actual design capacity for rotation and/or friction shall be tested by an outside laboratory selected by the Materials Bureau. The Manufacturer shall assume the cost of this testing and submit the certified test results to the Materials Bureau.

2. Bearings with load capacities greater than 1760 kN will be tested by an outside laboratory approved by the Materials Bureau. The Department will assume the cost of this testing. The Contractor shall be responsible for transportation, scheduling and related costs. All bearings will be made available for return to the Contractor.

Finish and Accessories. All exterior surfaces of sampled production bearings shall be smooth and free from irregularities or protrusions that might interfere with testing procedures.

Bearings with tapered sole plates which are selected for testing by the Materials Bureau, shall be delivered to the test site accompanied by a single unattached matching beveled plate. This plate shall be made of the same material and be the same size and thickness as the tapered plate. Additionally, the single beveled plate shall be so constructed that when placed in contact with the tapered sole plate the two shall form a single body, rectangular in shape and uniform in thickness.

Shipping Costs. The Contractor shall assume the cost of transporting all samples from the place of manufacture to the Materials Bureau and return, or, if applicable, to the project site.

BASIS OF ACCEPTANCE. Acceptance of Disc Bearings will be based on the manufacturer's name appearing on the Department's Approved List for Disc Bearings (716-06). Bearings will be considered for acceptance in project lot quantities, or portions thereof, at the manufacturing site in accordance with the procedural directives of the Materials Bureau."

Make the following changes to the Standard Specifications dated May 1, 2006: Remove the Standard Specification 716-07 POT-DESIGN STRUCTURAL BRIDGE BEARINGS in its entirety and replace with:

"716-07 POT-DESIGN STRUCTURAL BRIDGE BEARINGS

SCOPE. This specification covers the material requirements for pot-design structural bridge bearings. Bearings furnished under this specification shall adequately provide for the thermal expansion and contraction, rotation, camber changes, and creep and shrinkage of structural members, where applicable.

GENERAL. Pot-design structural bridge bearings shall be supplied as fixed bearings; guided expansion bearings; and non-guided expansion bearings as designated by the Contract Documents.

Fixed Bearings. Fixed bearings shall allow rotation but no longitudinal or transverse movement in the bearing plane. Fixed bearings shall consist of an elastomeric rotational element, confined and sealed by a steel piston and steel base pot.

Guided Expansion Bearings. Guided expansion bearings shall allow rotation and longitudinal movement in the bearing plane; transverse movement shall be restricted. Guided expansion bearings shall consist of an elastomeric rotational element, confined and sealed by a steel piston and steel base pot. To allow longitudinal movement, the upper surface of the steel piston shall be faced with polytetrafluoroethylene (PTFE) sheet and support a sliding steel top bearing plate. The mating surface of the sliding steel bearing plate shall be faced with polished stainless steel. To restrict transverse movement, either a guide bar or keyway system shall be used. If required, the guide bar or keyway systems and their mating steel surfaces shall be faced with strips of either PTFE or PTFE-stainless steel.

Non-Guided Expansion Bearings. Non-guided expansion bearings shall allow rotation, longitudinal, and transverse movement in the bearing plane. Non-guided expansion bearings shall consist of an elastomeric rotational element, confined and sealed by a steel piston and steel base pot. To allow longitudinal and transverse movement, the upper surface of the steel piston shall be faced with polytetrafluoroethylene (PTFE) sheet and support a sliding steel top bearing plate. The mating surface of the sliding steel bearing plate shall be faced with polished stainless steel.

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

Elastomeric Rotational Element. The elastomeric rotational element used in the construction of potdesign bearings shall contain only virgin crystallization resistant polychloroprene (neoprene) or virgin natural polyisoprene (natural rubber) as the raw polymer. The physical properties of neoprene and natural rubber used in these bearings shall conform to ASTM or AASHTO requirements, with modifications as noted, in Table 716-07-1.

TABLE 716-07-1 PHYSICAL REQUIREMENTS OF ELASTOMERIC BEARING MATERIAL		
Elastomeric Compound	ASTM Requirement	AASHTO Standard Specifications for Bridge
Neoprene	D2000, Line Call Out M2BC517A14B34	Section 2.25.2, Materials, 50 Durometer Hardness
Natural Rubber	D2000, Line Call Out M4AA517A13B33	Section 2.25.2, Materials, 50 Durometer Hardness

NOTES:

1. The Shore A Durometer hardness shall be 50 ± 10 points.
2. Samples for compression set tests shall be prepared using a Type 2 die. The compression set of the neoprene specimens shall not exceed 35%. The compression set of the natural rubber specimens shall not exceed 25%.
3. For the purpose of determining conformance with these specifications, an observed or calculated value shall be rounded off

to the nearest 10 kPa for tensile strength, to the nearest 10% for elongation, and to the nearest 1% for the change in aged tensile and aged elongation. Hardness and aged hardness shall be rounded off to the nearest point.

Sealant. If used, the type of sealant between the steel base pot and the top steel bearing plate shall be as recommended by the Manufacturer.

Sealing Rings. The sealing rings between the steel piston and the elastomeric rotational element shall be brass formed to the size recommended by the Manufacturer.

Steel. All steel except stainless steel components of the bearing shall conform to the requirements of the type of steel designated on the Contract Plans and applicable provisions of the New York State Steel Construction Manual (When the SCM requires DCES approval, delete the term DCES and replace it with the Regional Director).

Stainless Steel. Stainless steel shall conform to the requirements of ASTM A167, or ASTM A240, Type 304. Stainless steel in contact with PTFE sheet shall be polished to a No. 8. bright mirror finish. The minimum thickness of the stainless steel shall be 1.25 mm.

Polytetrafluoroethylene Sheet and Strip. Polytetrafluoroethylene (PTFE) sheet and strip shall meet the requirements of 716-04.

FABRICATION. The finish of the mold used to produce the elastomeric rotational elements shall conform to good machine shop practices. Every bearing shall have the Contract D#, Project Identification Number, NYSDOT Lot Number and individual bearing number indelibly marked with ink on a side that will be visible after erection.

The PTFE shall be bonded to its grit blasted steel substrate using an epoxy resin adhesive under controlled factory conditions in accordance with the instructions of the adhesive manufacturer. Alternately, the PTFE sheet may be recessed into its steel substrate for one-half its thickness. The bearing manufacturer shall have the option of bonding recessed PTFE sheet.

All steel surfaces exposed to the atmosphere, except stainless steel surfaces and metal surfaces to be welded shall be shop painted with one coat of coal-tar epoxy. Coal-tar epoxy paint shall meet the requirements of SSPC Paint Specification No. 16, and be applied at a minimum wet film thickness of 0.25 mm. Prior to painting, the exposed steel surfaces shall be cleaned with the recommendations of the coating's manufacturer. Metal surfaces to be welded shall be given a coat of clear lacquer, or other protective coating approved by the Engineer, if exposure is to exceed three months prior to welding. The coating shall be removed at the time of welding.

Except as noted, all bearing surfaces of steel plates shall be finished or machined flat within 0.25 mm. Out-of-flatness greater than 0.25 mm on any plate shall be cause for rejection. The bottom surface of lower bearing plates (masonry plates) designed to rest on bearing pads shall not exceed an out-of-flatness value of 1.6 mm. Oxygen cut surfaces shall not exceed a surface roughness value of 25 μ m, as defined by ANSI B46.1. Repair, when necessary shall conform to the requirements of the New York State Steel Construction Manual.

The steel base pot of all bearings shall be either integrally machined or continuously welded to its bottom steel masonry plate. Unless otherwise approved by the Regional Director, all welding shall conform to, and all welders shall be qualified in accordance with, the requirements of the New York State Steel Construction Manual (When the SCM requires DCES approval, delete the term DCES and replace it with the Regional Director).

Gross bearing dimensions shall have a tolerance of -0, +3.0 mm.

PERFORMANCE CHARACTERISTICS

Sliding Coefficient of Friction. For all guided and non-guided expansion type pot-design bearings, the sliding coefficients of friction shall be measured at the bearing's design capacity, on the fifth and fiftieth cycles, at a sliding speed of 25 mm per minute.

The sliding coefficient of friction shall be calculated as the horizontal load required to maintain continuous sliding of one bearing, divided by the bearing's design capacity vertical load. The vertical load shall have been applied continuously for a minimum of 12 hours prior to testing.

The test results will be evaluated as follows:

- The measured sliding coefficients of friction shall not exceed 75% of the maximum design coefficient of friction
- The bearing will be visually examined both during and after the test. Any resultant visual defects (such as bond failure, physical destruction, cold flow of PTFE, or damaged bearing components) shall be cause for rejection.

Rotation. For all pot-design bearings, the elastomeric rotational element shall be capable of maintaining its initial uniform contact with the steel piston and steel base pot throughout a rotation range of 0.02 radians, under a compressive load equal to 150% of the design capacity of the bearing.

The test results will be evaluated as follows:

- The bearing will be visually examined both during and after the test. Any resultant defects shall be cause for rejection
- The sole plate, top bearing plate, and steel piston shall maintain continuous and uniform contact for the duration of the test. Any observed lift-off will be cause for rejection.

DRAWINGS. The Contractor shall submit detailed shop drawings, drawn by the Manufacturer only, in conformance with the applicable requirements of the New York State Steel Construction Manual, for approval by the Regional Director prior to the start of the fabrication. (When the SCM requires DCES approval, delete the term DCES and replace it with the Regional Director).

In addition to the above requirements, the Manufacturer shall note the following on the shop drawings:

- The total quantity of each kind of pot-design bearing required, (i.e. fixed, guided expansion, or nonguided expansion), grouped first according to type (load range) and then by actual design capacity
- The thickness and plan area of the elastomeric rotational elements and the internal diameters of the steel base pots required
- The maximum design coefficient of friction as noted on the Contract Plans
- The type of PTFE sheet (filled or unfilled) and, if applicable, the type and amount (by weight) of filler
- The type(s) of steel(s) to be used
- If applicable, any welding process used in the bearing manufacture that does not conform to the approved processes of the New York State Steel Construction Manual shall be clearly described and detailed. (When the SCM requires DCES approval, delete the term DCES and replace it with the Regional Director).
- The location of the fabrication plant
- The Manufacturer's name and the name of the manufacturer's representative will be responsible for coordinating production, inspection, sampling and testing with the Materials Bureau.

The Contractor shall also provide the Materials Bureau with written notification thirty (30) days prior to the start of the bearing fabrication. This notification shall include all of the information required as identified above. A copy of this notification shall be sent to the Regional Director.

SAMPLING AND TESTING

Lot Size. Sampling, testing and acceptance consideration will be made on a lot basis. A lot shall be defined as the smallest number of bearings as determined by the following criteria:

- A lot shall not exceed a single contract or project quantity
- A lot shall not exceed 25 bearings

- A lot shall consist of those bearings of the same type, regardless of load capacity. Bearing types shall be fixed type bearings or expansion type bearings. Guided and non-guided expansion bearings will be considered a single type.

Sampling and Testing Requirements. The manufacturer shall furnish the required number and size of samples to perform testing in accordance with Table 716-07-3.

A minimum of thirty (30) days shall be allowed for the Department's inspection, sampling and testing of production bearings and component materials.

All exterior surfaces of sampled production bearings shall be smooth and free from irregularities or protrusions that might interfere with testing procedures.

The manufacturer shall select, at random, the required sample bearing(s) from completed lots of bearings for testing by the manufacturer. The manufacturer shall complete the required testing and determine compliance with this specification before submitting the lot(s) for inspection, sampling and acceptance consideration.

The Department's representative shall select, at random, samples of elastomeric and PTFE materials for testing by the Materials Bureau. All samples shall be taken in accordance with the Department's written instructions.

The Contractor shall assume the cost of transporting all samples from the place of manufacture to the Materials Bureau and return, or, if applicable, to the project site.

TABLE 716-07-3 POT BEARING SAMPLING AND TESTING REQUIREMENTS

Test	Performed By	Samples Required
Rotation	Manufacturer	One production bearing per lot ¹
Coefficient of Friction	Manufacturer	One production bearing per lot ¹
Physical Properties of Elastomeric Rotational Element Materials Bureau	Materials Bureau	One Elastomeric element per lot. ²
Physical Properties of PTFE Sheet	Materials Bureau	See 716-04

NOTES:

1. Sample production bearings of such size that cannot be tested by the manufacturer at 150% design capacity for rotation shall be tested at actual design capacity. Bearings which are tested at actual design capacity will be tested at that capacity because it is not possible, or not practical in the Department's opinion to test them at a higher capacity. Therefore, bearings tested at 150% design capacity which are rejected, will not be retested below 150% design capacity for the purpose of rendering such bearings acceptable. Sample production bearings that cannot be tested by the manufacturer at their actual design capacity for rotation and/or friction shall be tested by an outside laboratory selected by the Materials Bureau. The Manufacturer shall assume the cost of this testing and submit the certified test results to the Materials Bureau.

2. At the time of sampling the Department representative shall remove an elastomeric rotational element from a production bearing (not from a bearing that requires compressive strain testing) and forward it to the Materials Bureau for test. This testing will be destructive and the manufacturer shall, at the cost of the manufacturer, replace the sample elastomeric element.

BASIS OF ACCEPTANCE. Acceptance of Pot Bearings will be based on the manufacturer's name appearing on the Department's Approved List for Pot Bearings (716-07). Bearings will be considered for acceptance in project lot quantities, or portions thereof, at the manufacturing site in accordance with the procedural directives of the Materials Bureau."

Add the following specification to the Standard Specifications dated May 1, 2008:

716-03 POLYETHER URETHANE STRUCTURAL ELEMENT

SCOPE. This specification covers the material requirements for Polyether Urethane Structural Element.

GENERAL. The polyether urethane structural element used in the construction of disc-design bearings shall be molded from a polyether urethane compound.

MATERIAL REQUIREMENTS. The physical properties of the polyether urethane shall conform to the requirements of Table 716-03-1.

TABLE 716-03-1 PHYSICAL REQUIREMENTS OF POLYETHER URETHANE STRUCTURAL ELEMENT			
Physical Property	ASTM Test Method	Requirements	
		Min.	Max.
Hardness, Type D Durometer	D2240	57	67
Tensile Stress, psi ¹ At 100% elongation At 300% elongation ³	D412	2000 3750	-----
Tensile Strength, psi ¹	D412	5000	---
Ultimate Elongation, % ¹	D412	220	---
Compression Set ^{1,2} , %	D395	---	40

NOTES:

1. 10% deviation from specified values is permissible.
2. 22 hours at 158°F
3. Only required if 300% is attained

SAMPLING AND TESTING.

TABLE 716-03-2 POLYETHER URETHANE SAMPLING AND TESTING REQUIREMENTS		
Test	Performed By	Samples Required
Physical Properties Polyether Urethane Rotational Element (except compression set)	Materials Bureau	One 10 x 15 inch sheet of polyether urethane material (thickness of 1/16 - 1/8 inch) per lot. ¹
Compression Set of Polyether Urethane Rotation Element	Materials Bureau	One 4 x 4 inch sheet of polyether urethane material, molded or cut to the thickness requirements of ASTM D395, Method B. ²

NOTES:

1. All submitted sample sheets of polyether urethane material shall be certified by the bearing manufacturer as having been taken from the same batch of polyether urethane material as was used in the actual production bearings.
2. The manufacturer shall have the option of supplying four (4) die cut specimens in accordance with ASTM D395, Method B. All submitted specimens of polyether urethane material shall be certified by the bearing manufacturer as having been taken from the same batch of polyether urethane material as was used in the actual production bearings.

BASIS OF ACCEPTANCE. Polyether Urethane Structural Element will be considered for acceptance in lot quantities in accordance with the procedural directives of the Materials Bureau.

Add the following specification to the Standard Specifications dated May 1, 2008:

716-04 POLYTETRAFLUOROETHYLENE SHEET AND STRIP

SCOPE. This specification covers the material requirements for Polytetrafluoroethylene (PTFE) sheet and strip.

GENERAL. Polytetrafluoroethylene (PTFE) sheet and strip shall be manufactured from pure virgin (not processed) unfilled TFE resin; or from TFE resin uniformly blended with either 15% glass fiber or 25% carbon (maximum filler, percent by weight).

MATERIAL REQUIREMENTS. Finished PTFE sheet and strip shall be resistant to all acids, alkalis and petroleum products, stable at temperatures from -360°F to +500°F, non-flammable, non-absorbing of water, and shall conform to the physical requirements of Table 716-04-1.

TABLE 716-04-1 PHYSICAL REQUIREMENTS OF PTFE SHEET AND STRIP				
Physical Property	ASTM Test Method	MINIMUM REQUIREMENTS		
		Unfilled	Filled 15% Glass	Filled 25% Carbon
Ultimate Tensile Strength, psi	D638M	2800	2000	1300
Ultimate Elongation, %	D638M	200	150	75
Specific Gravity	D792	2.13	2.18	2.05

SAMPLING AND TESTING. One 10 x 15 inch sheet of PTFE material per lot as per 716-07. Single sheets of PTFE Material from which the bearing has been fabricated may be submitted to the Materials Bureau for consideration of multiple lot acceptance, provided that the thickness of the material does not vary from lot to lot. All submitted sample sheets shall be certified by the bearing manufacturer as having been taken from the same batch of PTFE material as was used in the actual production of bearings.

BASIS OF ACCEPTANCE. Polytetrafluoroethylene (PTFE) sheet and strip will be considered for acceptance in lot quantities in accordance with the procedural directives of the Materials Bureau.

Make the following changes to the Standard Specification dated May 1, 2008: remove Section 716-06 DISC-DESIGN STRUCTURAL BRIDGE BEARINGS in its entirety and replace with:

"716-06 DISC-DESIGN STRUCTURAL BRIDGE BEARINGS

SCOPE. This specification covers the material requirements for disc-design structural bridge bearings. Bearings furnished under this specification shall adequately provide for the thermal expansion and contraction, rotation, camber changes, and creep and shrinkage of structural members, where applicable.

GENERAL. Disc-design structural bridge bearings shall consist of a polyether urethane structural element (disc) confined by upper and lower steel bearing plates. The bearings shall be equipped with a shear restriction mechanism to prevent movement of the disc.

Disc-design structural bridge bearings shall be supplied as fixed bearings; guided expansion bearings; and non-guided expansion bearings as designated by the Contract Documents.

Fixed Bearings. Fixed bearings shall allow rotation but no longitudinal or transverse movement in the bearing plane.

Guided Expansion Bearings. Guided expansion bearings shall allow rotation and longitudinal movement in the bearing plane; transverse movement shall be restricted. To allow longitudinal movement, the upper steel bearing plate shall be faced with polytetrafluoroethylene (PTFE) sheet and support a sliding steel top bearing plate. The mating surface of the sliding steel top bearing plate shall be faced with polished stainless steel. To restrict transverse movement, either a guide bar or keyway system shall be used. If required, the guide bar or keyway systems and their mating steel surfaces shall be faced with strips of either PTFE or PTFE-stainless steel.

Non-Guided Expansion Bearings. Non-guided expansion bearings shall allow rotation, longitudinal, and transverse movement in the bearing plane. To allow longitudinal and transverse movement, the upper steel bearing plate shall be faced with polytetrafluoroethylene (PTFE) sheet and support a sliding steel top bearing plate. The mating surface of the sliding steel top bearing plate shall be faced with polished stainless steel.

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

Polyether Urethane Structural Element. The polyether urethane structural element shall meet the requirements of 716-03.

Steel. All steel except stainless steel components of the bearing shall conform to the requirements of the type of steel designated on the Contract Plans and applicable provisions of the New York State Steel Construction Manual.

Stainless Steel. Stainless steel shall conform to the requirements of ASTM A167, or ASTM A240, Type 304. Stainless steel in contact with PTFE shall be polished to a No. 8, bright mirror finish. The minimum thickness of the stainless steel shall be 0.05 inches.

Polytetrafluoroethylene Sheet and Strip. Polytetrafluoroethylene (PTFE) sheet and strip shall meet the requirements of 716-04.

FABRICATION. The finish of the mold used to produce the bearing elements shall conform to good machine shop practice. Every bearing shall have the Project Identification Number, NYSDOT Lot Number and individual bearing number indelibly marked with ink on a side that will be visible after erection.

The PTFE sheet shall be bonded to its grit blasted steel substrate using an epoxy resin adhesive under controlled factory conditions in accordance with the instructions of the adhesive manufacturer. Alternately, the PTFE sheet may be recessed into its steel substrate for one-half its thickness. The bearing manufacturer shall have the option of bonding recessed PTFE sheet.

All steel surfaces exposed to the atmosphere, except stainless steel surfaces and metal surfaces to be welded, shall be shop painted with one coat of an approved list product meeting 708-01 Structural Steel Paints Class 1. Prior to painting, the exposed steel surfaces shall be cleaned in accordance with the recommendations of the coating's manufacturer. Metal surfaces to be welded shall be given a coat of clear lacquer, or other protective coating approved by the Engineer, if exposure is to exceed three months prior to welding. The coating shall be removed at the time of welding. No painting will be done to these surfaces prior to the completion of welding.

Except as noted, all bearing surfaces of steel plates shall be finished or machined flat within 0.010 inch. Out-of-flatness greater than 0.010 inch on any plate shall be cause for rejection. The bottom surfaces of lower bearing plates (masonry plates) designed to rest on bearing pads shall not exceed an out-of-flatness value of 1/16 inch. Oxygen cut surfaces shall not exceed a surface roughness value of 1 mil, as defined by ANSI B46.1. Repair, when necessary, shall conform to the requirements of the New York State Steel Construction Manual (When the SCM requires DCES approval, delete the term "DCES" and replace it with "the Regional Director").

The steel base pot of all bearings shall be either integrally machined or continuously welded to its bottom steel masonry plate. Unless otherwise approved by the Regional Director, all welding shall conform to, and all welders shall be qualified in accordance with the requirements of the New York State Construction Manual (When the SCM requires DCES approval, delete the term "DCES" and replace it with "the Regional Director").

Gross bearing dimensions shall have a tolerance of -0, +1/8 inch.

PERFORMANCE CHARACTERISTICS

Compression Strain. The compression stress is based on the net area of the rotational element using the total overall diameter. The compression strain is measured as a percentage of the original thickness of the rotational element.

A load equal to 150% of the bearing's design capacity shall first be applied to seat the bearing components. The 150% load shall then be gradually reduced, over a time period of 30 to 90 seconds, to a pre-load equal to 3% of the bearing's design capacity. Each compression strain shall be recorded relative to the initial 3% pre-load deflection, one minute after the desired stress level has been reached, on deflectometers, at four locations 90° apart on the perimeter of the bearing.

The test results will be evaluated as follows:

- The bearing will be visually examined both during and after the test. Any resultant visual defects (such as extruded elastomer, damaged seals, or cracked steel) shall be cause for rejection
- Non-uniform compression deflections at a desired stress level shall be cause for rejection
- The compression strain of each bearing shall conform to the following requirements:

Compression Stress (psi)	Compression Strain, Max. %
1000	5.0
2000	8.5
3000	11.0
4000	13.2
5000	16.0

Sliding Coefficient of Friction. For all guided and non-guided expansion disc-design bearings, the coefficients of friction shall be measured at the bearing's design capacity, on the fifth and fiftieth cycles, at a sliding speed of 1 inch per minute.

The sliding coefficient of friction shall be calculated as the horizontal load required to maintain continuous sliding of one bearing, divided by the bearing's design capacity vertical load. The vertical load shall have been applied continuously for a minimum of 12 hours prior to testing.

The test results will be evaluated as follows:

- The measured sliding coefficients of friction shall not exceed 75% of the maximum design coefficient of friction
- The bearing will be visually examined both during and after the test. Any resultant visual defects (such as bond failure, physical destruction, cold flow of PTFE, or damaged components) shall be cause for rejection.

Rotation. For all disc-design bearings, the polyether urethane element shall be capable of maintaining its initial uniform contact with the steel bearing plates throughout a rotation range of 0.02 radians under a compressive load equal to 150% of the design capacity of the bearing.

The test results will be evaluated as follows:

- The bearing will be visually examined both during and after the test. Any resultant visual defects shall be cause for rejection
- Continuous and uniform contact between the polyether urethane element and bearing plates, and between the sliding steel top and upper bearing plates shall be maintained for the duration of the test. Any observed lift-off shall be cause for rejection.

DRAWINGS. The Contractor shall submit detailed shop drawings, drawn by the Manufacturer only, in conformance with the applicable requirements of the New York State Steel Construction Manual, for approval by the Regional Director prior to the start of fabrication.

In addition to the above requirements, the Manufacturer shall note the following on the shop drawings.

- The total quantity of each kind of disc-design bearing required, i.e., fixed, guided expansion, or non-guided expansion, grouped first according to type (load range) and then by actual design capacity
- The thickness and plan area of the polyether urethane structural elements required
- The maximum design coefficient of friction as noted on the Contract Plans
- The type of PTFE sheet (filled or unfilled) and, if applicable, the type and amount (by weight) of filler
- The type(s) of steel(s) to be used
- If applicable, any welding process used in the bearing manufacture that does not conform to the approved processes of New York State Steel Construction Manual shall be clearly described and detailed.
- The location of the fabrication plant
- The Manufacturer's name and the name of the manufacturer's representative who will be responsible for coordinating production, inspection, sampling and testing with the Materials Bureau.

The Contractor shall also provide the Materials Bureau with written notification thirty (30) days prior to the start of bearing fabrication. This notification shall include all of the information required as identified above. A copy of this notification shall be sent to the Regional Director.

SAMPLING AND TESTING. The manufacturer shall furnish the required number of samples to perform testing in accordance with Table 716-06-3.

Lot Size. Sampling, testing and acceptance consideration will be made on a lot basis. A lot shall be defined as those bearings presented for inspection at a specific time or date. A lot shall be further defined as the smallest number of bearings as determined by the following criteria:

- A lot shall not exceed a single contract or project quantity
- A lot shall not exceed 25 bearings
- A lot shall consist of those bearings that can be manufactured with polyether urethane rotation elements from one batch of polyether urethane material. The mass of one batch shall not exceed 450 lbs.

- A lot shall consist of those bearings of the same type, regardless of load capacity. Bearing types shall be fixed type bearings or expansion type bearings. Guided and non-guided expansion bearings will be considered as a single type.

Schedule. The manufacturer shall complete the required testing and determine compliance with this specification before submitting the lot(s) for inspection, sampling and acceptance consideration. A minimum of thirty (30) days shall be allowed for the Department's inspection, sampling and testing of production bearings and component materials.

Sampling Method. The manufacturer shall select, at random, the required sample bearing(s) from the completed lots of bearings for testing by the manufacturer.

The Department's representative shall select, at random, the required sample bearing(s) from completed lots of bearings, and samples of the polyether urethane and the PTFE materials for testing by the Materials Bureau. All samples shall be taken in accordance with the Department's written instructions.

TABLE 716-06-3 DISC BEARING SAMPLING AND TESTING REQUIREMENTS

Test	Performed By	Samples Required
Rotation	Manufacturer	One production bearing per lot ₁
Coefficient of Friction	Manufacturer	One production bearing per lot ₁
Compression Strain	Materials Bureau	Three production bearings per lot ₂
Physical Properties Polyether Urethane Rotational Element	Materials Bureau	See requirements of 716-03
Physical Properties of PTFE Sheet	Materials Bureau	See requirements of 716-04

NOTES:

1. Sample production bearings of such size that cannot be tested by the manufacturer at 150% design capacity for rotation shall be tested at actual design capacity. Bearings which are tested at actual design capacity will be tested at that capacity because it is not possible, or not practical in the Department's opinion to test them at a higher capacity. Therefore, bearings tested at 150% design capacity which are rejected, will not be retested below 150% design capacity for the purpose of rendering such bearings acceptable. Sample production bearings that cannot be tested by the manufacturer at their actual design capacity for rotation and/or friction shall be tested by an outside laboratory selected by the Materials Bureau. The Manufacturer shall assume the cost of this testing and submit the certified test results to the Materials Bureau.

2. Bearings with load capacities greater than 600 kip will be tested by an outside laboratory approved by the Materials Bureau. The Department will assume the cost of this testing. The Contractor shall be responsible for transportation, scheduling and related costs. All bearings will be made available for return to the Contractor.

Finish and Accessories. All exterior surfaces of sampled production bearings shall be smooth and free from irregularities or protrusions that might interfere with testing procedures.

Bearings with tapered sole plates which are selected for testing by the Materials Bureau, shall be delivered to the test site accompanied by a single unattached matching beveled plate. This plate shall be made of the same material and be the same size and thickness as the tapered plate. Additionally, the single beveled plate shall be so constructed that when placed in contact with the tapered sole plate the two shall form a single body, rectangular in shape and uniform in thickness.

Shipping Costs. The Contractor shall assume the cost of transporting all samples from the place of manufacture to the Materials Bureau and return, or, if applicable, to the project site.

BASIS OF ACCEPTANCE. Acceptance of Disc Bearings will be based on the manufacturer's name appearing on the Department's Approved List for Disc Bearings (716-06). Bearings will be considered for acceptance in project lot quantities, or portions thereof, at the manufacturing site in accordance with the procedural directives of the Materials Bureau."

Make the following changes to the Standard Specifications dated May 1, 2008: remove the Section 716-07 POT-DESIGN STRUCTURAL BRIDGE BEARINGS in its entirety and replace with:

"716-07 POT-DESIGN STRUCTURAL BRIDGE BEARINGS

SCOPE. This specification covers the material requirements for pot-design structural bridge bearings. Bearings furnished under this specification shall adequately provide for the thermal expansion and contraction, rotation, camber changes, and creep and shrinkage of structural members, where applicable.

GENERAL. Pot-design structural bridge bearings shall be supplied as fixed bearings; guided expansion bearings; and non-guided expansion bearings as designated by the Contract Documents.

Fixed Bearings. Fixed bearings shall allow rotation but no longitudinal or transverse movement in the bearing plane. Fixed bearings shall consist of an elastomeric rotational element, confined and sealed by a steel piston and steel base pot.

Guided Expansion Bearings. Guided expansion bearings shall allow rotation and longitudinal movement in the bearing plane; transverse movement shall be restricted. Guided expansion bearings shall consist of an elastomeric rotational element, confined and sealed by a steel piston and steel base pot. To allow longitudinal movement, the upper surface of the steel piston shall be faced with polytetrafluoroethylene (PTFE) sheet and support a sliding steel top bearing plate. The mating surface of the sliding steel bearing plate shall be faced with polished stainless steel. To restrict transverse movement, either a guide bar or keyway system shall be used. If required, the guide bar or keyway systems and their mating steel surfaces shall be faced with strips of either PTFE or PTFE-stainless steel.

Non-Guided Expansion Bearings. Non-guided expansion bearings shall allow rotation, longitudinal, and transverse movement in the bearing plane. Non-guided expansion bearings shall consist of an elastomeric rotational element, confined and sealed by a steel piston and steel base pot. To allow longitudinal and transverse movement, the upper surface of the steel piston shall be faced with polytetrafluoroethylene (PTFE) sheet and support a sliding steel top bearing plate. The mating surface of the sliding steel bearing plate shall be faced with polished stainless steel.

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

Elastomeric Rotational Element. The elastomeric rotational element used in the construction of potdesign bearings shall contain only virgin crystallization resistant polychloroprene (neoprene) or virgin natural polyisoprene (natural rubber) as the raw polymer. The physical properties of neoprene and natural rubber used in these bearings shall conform to ASTM or AASHTO requirements, with modifications as noted, in Table 716-07-1.

TABLE 716-07-1 PHYSICAL REQUIREMENTS OF ELASTOMERIC BEARING MATERIAL		
Elastomeric Compound	ASTM Requirement	AASHTO Standard Specifications for Bridge
Neoprene	D2000, Line Call Out M2BC517A14B34	Section 2.25.2, Materials, 50 Durometer Hardness
Natural Rubber	D2000, Line Call Out M4AA517A13B33	Section 2.25.2, Materials, 50 Durometer Hardness

NOTES:

1. The Shore A Durometer hardness shall be 50 ± 10 points.
2. Samples for compression set tests shall be prepared using a Type 2 die. The compression set of the neoprene specimens shall not exceed 35%. The compression set of the natural rubber specimens shall not exceed 25%.
3. For the purpose of determining conformance with these specifications, an observed or calculated value shall be rounded off

to the nearest 10 psi for tensile strength, to the nearest 10% for elongation, and to the nearest 1% for the change in aged tensile and aged elongation. Hardness and aged hardness shall be rounded off to the nearest point.

Sealant. If used, the type of sealant between the steel base pot and the top steel bearing plate shall be as recommended by the Manufacturer.

Sealing Rings. The sealing rings between the steel piston and the elastomeric rotational element shall be brass formed to the size recommended by the Manufacturer.

Steel. All steel except stainless steel components of the bearing shall conform to the requirements of the type of steel designated on the Contract Plans and applicable provisions of the New York State Steel Construction Manual (When the SCM requires DCES approval, delete the term DCES and replace it with the Regional Director).

Stainless Steel. Stainless steel shall conform to the requirements of ASTM A167, or ASTM A240, Type 304. Stainless steel in contact with PTFE sheet shall be polished to a No. 8, bright mirror finish. The minimum thickness of the stainless steel shall be 0.050 inch.

Polytetrafluoroethylene Sheet and Strip. Polytetrafluoroethylene (PTFE) sheet and strip shall meet the requirements of 716-04.

FABRICATION. The finish of the mold used to produce the elastomeric rotational elements shall conform to good machine shop practices. Every bearing shall have the Contract D#, Project Identification Number, NYSDOT Lot Number and individual bearing number indelibly marked with ink on a side that will be visible after erection.

The PTFE shall be bonded to its grit blasted steel substrate using an epoxy resin adhesive under controlled factory conditions in accordance with the instructions of the adhesive manufacturer. Alternately, the PTFE sheet may be recessed into its steel substrate for one-half its thickness. The bearing manufacturer shall have the option of bonding recessed PTFE sheet.

All steel surfaces exposed to the atmosphere, except stainless steel surfaces and metal surfaces to be welded shall be shop painted with one coat of coal-tar epoxy. Coal-tar epoxy paint shall meet the requirements of SSPC Paint Specification No. 16, and be applied at a minimum wet film thickness of 10 mils. Prior to painting, the exposed steel surfaces shall be cleaned with the recommendations of the coating's manufacturer. Metal surfaces to be welded shall be given a coat of clear lacquer, or other protective coating approved by the Engineer, if exposure is to exceed three months prior to welding. The coating shall be removed at the time of welding.

Except as noted, all bearing surfaces of steel plates shall be finished or machined flat within 0.010 inch. Out-of-flatness greater than 0.010 inch on any plate shall be cause for rejection. The bottom surface of lower bearing plates (masonry plates) designed to rest on bearing pads shall not exceed an out-of-flatness value of 1/16 inch. Oxygen cut surfaces shall not exceed a surface roughness value of 1 mil, as defined by ANSI B46.1. Repair, when necessary shall conform to the requirements of the New York State Steel Construction Manual.

The steel base pot of all bearings shall be either integrally machined or continuously welded to its bottom steel masonry plate. Unless otherwise approved by the Regional Director, all welding shall conform to, and all welders shall be qualified in accordance with, the requirements of the New York State Steel Construction Manual (When the SCM requires DCES approval, delete the term DCES and replace it with the Regional Director).

Gross bearing dimensions shall have a tolerance of -0, +1/8 inch.

PERFORMANCE CHARACTERISTICS

Sliding Coefficient of Friction. For all guided and non-guided expansion type pot-design bearings, the sliding coefficients of friction shall be measured at the bearing's design capacity, on the fifth and fiftieth cycles, at a sliding speed of 1 inch per minute.

The sliding coefficient of friction shall be calculated as the horizontal load required to maintain continuous sliding of one bearing, divided by the bearing's design capacity vertical load. The vertical load shall have been applied continuously for a minimum of 12 hours prior to testing.

The test results will be evaluated as follows:

- The measured sliding coefficients of friction shall not exceed 75% of the maximum design coefficient of friction
- The bearing will be visually examined both during and after the test. Any resultant visual defects (such as bond failure, physical destruction, cold flow of PTFE, or damaged bearing components) shall be cause for rejection.

Rotation. For all pot-design bearings, the elastomeric rotational element shall be capable of maintaining its initial uniform contact with the steel piston and steel base pot throughout a rotation range of 0.02 radians, under a compressive load equal to 150% of the design capacity of the bearing:

The test results will be evaluated as follows:

- The bearing will be visually examined both during and after the test. Any resultant defects shall be cause for rejection
- The sole plate, top bearing plate, and steel piston shall maintain continuous and uniform contact for the duration of the test. Any observed lift-off will be cause for rejection.

DRAWINGS. The Contractor shall submit detailed shop drawings, drawn by the Manufacturer only, in conformance with the applicable requirements of the New York State Steel Construction Manual, for approval by the Regional Director prior to the start of the fabrication. (When the SCM requires DCES approval, delete the term DCES and replace it with the Regional Director).

In addition to the above requirements, the Manufacturer shall note the following on the shop drawings.

- The total quantity of each kind of pot-design bearing required, (i.e. fixed, guided expansion, or nonguided expansion), grouped first according to type (load range) and then by actual design capacity
- The thickness and plan area of the elastomeric rotational elements and the internal diameters of the steel base pots required
- The maximum design coefficient of friction as noted on the Contract Plans
- The type of PTFE sheet (filled or unfilled) and, if applicable, the type and amount (by weight) of Filler.
- The type(s) of steel(s) to be used
- If applicable, any welding process used in the bearing manufacture that does not conform to the approved processes of the New York State Steel Construction Manual shall be clearly described and detailed. (When the SCM requires DCES approval, delete the term DCES and replace it with the Regional Director).
- The location of the fabrication plant
- The Manufacturer's name and the name of the manufacturer's representative will be responsible for coordinating production, inspection, sampling and testing with the Materials Bureau.

The Contractor shall also provide the Materials Bureau with written notification thirty (30) days prior to the start of the bearing fabrication. This notification shall include all of the information required as identified above. A copy of this notification shall be sent to the Regional Director.

SAMPLING AND TESTING

Lot Size. Sampling, testing and acceptance consideration will be made on a lot basis. A lot shall be defined as the smallest number of bearings as determined by the following criteria:

- A lot shall not exceed a single contract or project quantity
- A lot shall not exceed 25 bearings
- A lot shall consist of those bearings of the same type, regardless of load capacity. Bearing types shall be fixed type bearings or expansion type bearings. Guided and non-guided expansion bearings will be considered a single type.

Sampling and Testing Requirements. The manufacturer shall furnish the required number and size of samples to perform testing in accordance with Table 716-07-3.

A minimum of thirty (30) days shall be allowed for the Department's inspection, sampling and testing of production bearings and component materials.

All exterior surfaces of sampled production bearings shall be smooth and free from irregularities or protrusions that might interfere with testing procedures.

The manufacturer shall select, at random, the required sample bearing(s) from completed lots of bearings for testing by the manufacturer. The manufacturer shall complete the required testing and determine compliance with this specification before submitting the lot(s) for inspection, sampling and acceptance consideration.

The Department's representative shall select, at random, samples of elastomeric and PTFE materials for testing by the Materials Bureau. All samples shall be taken in accordance with the Department's written instructions.

The Contractor shall assume the cost of transporting all samples from the place of manufacture to the Materials Bureau and return, or, if applicable, to the project site.

TABLE 716-07-3 POT BEARING SAMPLING AND TESTING REQUIREMENTS

Test	Performed By	Samples Required
Rotation	Manufacturer	One production bearing per lot ₁
Coefficient of Friction	Manufacturer	One production bearing per lot ₁
Physical Properties of Elastomeric Rotational Element Materials Bureau	Materials Bureau	One Elastomeric element per lot. ₂
Physical Properties of PTFE Sheet	Materials Bureau	See 716-04

NOTES:

1. Sample production bearings of such size that cannot be tested by the manufacturer at 150% design capacity for rotation shall be tested at actual design capacity. Bearings which are tested at actual design capacity will be tested at that capacity because it is not possible, or not practical in the Department's opinion to test them at a higher capacity. Therefore, bearings tested at 150% design capacity which are rejected, will not be retested below 150% design capacity for the purpose of rendering such bearings acceptable. Sample production bearings that cannot be tested by the manufacturer at their actual design capacity for rotation and/or friction shall be tested by an outside laboratory selected by the Materials Bureau. The Manufacturer shall assume the cost of this testing and submit the certified test results to the Materials Bureau.

2. At the time of sampling the Department representative shall remove an elastomeric rotational element from a production bearing (not from a bearing that requires compressive strain testing) and forward it to the Materials Bureau for test. This testing will be destructive and the manufacturer shall, at the cost of the manufacturer, replace the sample elastomeric element.

BASIS OF ACCEPTANCE. Acceptance of Pot Bearings will be based on the manufacturer's name appearing on the Department's Approved List for Pot Bearings (716-07). Bearings will be considered for acceptance in project lot quantities, or portions thereof, at the manufacturing site in accordance with the procedural directives of the Materials Bureau."