

ITEM 565.1504-25 - SPHERICAL BEARINGS (MULTI-ROTATIONAL)

1. DESCRIPTION:

- 1.01 Under this work, the Contractor shall furnish and install spherical bearings as indicated on the drawings and specified hereinafter.
- 1.02 Rotation is accommodated by translation of two spherical steel surfaces separated by an unconfined Polytetrafluoroethylene (PTFE) pad. Expansion is accommodated by a sliding flat plate with a PTFE pad.
- 1.03 Manufacturer's certification for all materials used in the construction of the bearings shall be submitted to the Engineer prior to fabrication.

2. MATERIALS:

- 2.01 Materials shall meet the requirements of the following Subsections of Section 700 - Materials of the New York State Standard Specifications.

Structural Steel	715.01
Anchor Bolts	723.60
(Glass Filled) Polytetrafluoroethylene (PTFE) Material	716.06
Stainless Steel	716.06
Concrete Grouting Material	701.05
Bridge Bearing Pads	728.01 or 728.02

- 2.02 As an option to glass filled PTFE above: Fabric PTFE material self-lubricating sliding surfaces shall be composed of [REDACTED] manufactured from oriented multifilament [REDACTED]. The resin from which these fibers are produced shall be [REDACTED] meeting the requirements of [REDACTED]. Specific gravity shall be [REDACTED] as determined by [REDACTED]

The PTFE fabric shall have a minimum thickness of [REDACTED] and a maximum thickness of [REDACTED]” after compression. The test for cold flow is to be [REDACTED]
Properties of PTFE fiber shall be as follows:

Load Borne without Cold Flow	[REDACTED]
Ultimate Tensile Strength	[REDACTED]
Elongation at Break	[REDACTED]
Initial Modulus	[REDACTED]
Maximum Co-efficient of Static Friction @ 3500 psi	[REDACTED]
Maximum Coefficient of Dynamic Friction @ 3500 psi	[REDACTED]

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2. MATERIALS: (cont'd)

2.02 (cont'd)

The Application Test Method for determination of Ultimate Tensile Strength and Elongation at Break shall be [REDACTED]

Welding to a steel plate which has a bonded PTFE surface may be permitted providing welding procedures are established which restrict the maximum temperature reached by the bond area to less than [REDACTED] as determined by temperature indicating wax pencils or other suitable means.

The PTFE fabric shall be mechanically interlocked with the steel substrate plate under factory controlled conditions in a manner approved by the Engineer. The interlock should be equally distributed over no less than [REDACTED] of the bearing area and shall be sufficiently strong to develop [REDACTED] of the allowed vertical load in the horizontal shear plan. Adhesive material may be used to supplement the mechanical bond but the [REDACTED] development shall be by mechanical interlock only.

The stainless steel surface mating to the PTFE should be an accurate, flat or spherical surface as required by the design and shall have a surface finish of [REDACTED]. The stainless steel surface shall be attached by welding or other suitable mechanical means approved by the Engineer.

- 2.03 **Bearing Surface:** All bearing surfaces of steel plates shall be finished flat within [REDACTED]". Out-of-flatness greater than [REDACTED] on any plate shall be cause for rejection. Oxygen cut surfaces shall not exceed a surface roughness value of [REDACTED], as defined by [REDACTED]. Repair, when necessary, shall conform to the requirements of the New York State Steel Construction Manual.

All welding shall conform to, and all welders shall be qualified in accordance with the requirements of the New York State Steel Construction Manual.

Gross bearing dimensions shall have a tolerance of [REDACTED]

- 2.04 **Testing and Certification:** The Authority requires Certification Of Conformance, for all bearings and bearing components, with the requirements of the contract documents and the approved shop drawings. In addition, the Authority requires testing of the bearings and/or bearing components according to the specifications with the following qualifications:

1. On projects with less than fifty (50) bearings, bearings shall be accepted on certification and visual inspection.
2. The testing frequency shall be one (1) bearing of each type for every fifty (50) new bearings, or portion thereof beyond fifty (50), required on this project.
3. Manufacturer's Certification and Certified test results shall be sent to the Engineer-In-Charge (E.I.C.) for approval prior to shipping of completed bearings to the project site.
4. **All** costs for shipping to and from testing facilities, certifications, and furnishing bearings for destructive testing shall be paid by the Bearing Manufacturer.

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2. MATERIALS: (cont'd)

2.04 Testing and Certification: (cont'd)

5. The bearings and/or bearing components shall be tested by an independent certified laboratory approved by the Authority. The Engineer shall be notified four (4) weeks prior to the anticipated shipping date, so that specific testing requirements can be determined (by the Engineer) And arrangements made for such testing by the Authority.
6. **All bearings** shall be visually inspected for conformance with the contract documents and the approved shop drawings upon completion in the shop by the bearing manufacturer's quality control representative, **and** at the project site upon delivery by the E.I.C.

The Coefficient of Friction shall be evaluated in a test which simulates the application parameters. The Static Coefficient of Friction shall be determined at breakaway by dividing the horizontal force to start motion by the vertically applied force which shall be equivalent to application pressure. The Dynamic Coefficient of Friction shall be determined by the same method, but at a speed not exceeding 1" per minute in order to approximate actual conditions.

Sampling and Testing Requirements. The manufacturer shall furnish the required number of samples to perform testing in accordance with Table 1.

A minimum of thirty (30) days shall be allowed for the 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 Authority shall select, at random, the required sample bearing(s) from completed lots of bearings for testing by the Authority. He shall complete the required testing and determine compliance with this specification before submitting the lot for inspection, sampling and acceptance consideration.

The Authority's representative shall select, at random, the required sample bearing(s), and sample PTFE material for testing. All samples shall be taken in accordance with the Authority's written instructions.

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

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2. MATERIALS: (cont'd)

2.04 Testing and Certification: (cont'd)

Table 1

Sampling and Testing Requirements

<u>Test</u>	<u>Performed By</u>	<u>Samples Required</u>
Rotation	Thruway Authority	One production bearing per lot (Note 1).
Coefficient of Friction	Thruway Authority	One production bearing per lot (Note 1).
Compression Strain	Thruway Authority	For bearings with load capacities less than 600,000 lbs.; three production bearings per lot (Note 2).
Physical Properties of PTFE Sheet	Thruway Authority	One 10" X 15" sheet of PTFE material per project (Note 3).

Note 1: Sample production bearings of such size that cannot be tested 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 Authority'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.

Note 2: Sample production bearings that cannot be tested at 150% design capacity for compression strain shall be tested at their actual design capacity.

Note 3: The sample sheet of PTFE material shall be certified by the manufacturer as having been taken from the same batch of material as was used in the actual production bearings.

Note 4: Bearings used for testing will be returned to the fabricator upon completion of testing.

Basis of Acceptance - Bearings and bearing components will be considered for acceptance in project lot quantities upon satisfactory completion of all certifications and testing, and in addition, individually upon satisfactory completion of the visual inspections.

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2. MATERIALS: (cont'd)

2.05 Coatings:

- A. After fabrication of the bearing device, but prior to attachment of the stainless steel and PTFE surfaces, the bearing shall be hot dip galvanized (ASTM A123). Galvanization may be ground off where required to attach stainless steel surfaces or perform field welding. Repair to galvanized areas shall be in accordance with Section 719.01 of the NYS Standard Specifications. Field Welds and Weld areas shall be coated with a zinc rich paint.
- B. As an alternative to Hot Dip Galvanizing, the bearing device may be shop metalized. Metalizing shall be applied in conformance with the Contract Plans and Specifications. Metalizing shall be done after fabrication but prior to attachment of the Stainless Steel and PTFE Surface. Metalized, sealed surfaces may be ground off where required to attach Stainless Steel Surfaces or perform field welding. Areas of damaged coating or field welding shall be coated with a zinc rich paint as recommended by the Thermal Spray Supplier for repairs.

2.06 Fabrication shall conform to the details shown on the drawings.

2.07 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 1/4 inch 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.

3. CONSTRUCTION DETAILS:

- 3.01 A. **Marking.** Each member shall be identified with an erection mark corresponding with the member identification mark on the approved shop drawings.

Identification marks may be painted on members that will receive field coats of paint. Identification marks on unpainted steel shall be impressed into the member (with a low stress stamp) in a non-stressed or low stressed area of the member. The Fabricator shall identify to the Contractor his procedure for marking material.

- B. **Storing.** Material at the Fabricator's plant shall be stored above ground on platforms, skids or other suitable supports. It shall be kept clean, properly drained and protected from unwanted corrosion. Free circulation of air shall be provided around all surfaces.

- C. **Shipping.** The Fabricator shall not ship any material, either to the project or to another manufacturer, without the Authority's approval. The Manufacturer's Quality Control Representative will place his seal of approval on all material that has been accepted and will approve the loading, positioning and anchorage of all material being shipped.

3.02 Field Handling & Storing

- A. The Contractor is responsible for providing equipment that is adequate for safely lifting and placing without damage, all material furnished. Permanent distortion caused by handling or storage will be cause for rejection.

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3. CONSTRUCTION DETAILS: (cont'd)

3.02 Field Handling & Storing (cont'd)

- B. The edges of nicks or bumps caused by handling shall be carefully ground to a 1/16" radius.
- C. Storage requirements in Subsection 3.01 shall be applicable for all material stored in the field.

3.03 Installation

- A. Bearings shall be set level and in the exact position specified with full and uniform bearing. Pedestals detailed to be on slope shall be set at the elevation and position specified.
- B. Anchor bolts shall be positioned to the alignment and dimensions specified or approved in the shop drawings. When pre-set or cast-in-place anchorages are not specified, the Contractor may drill holes and set the anchor bolts in a non-shrink concrete grout.
- C. Bearings shall initially be positioned to account for a mean temperature of 45° and for any bottom chord or flange elongation due to dead load deflection. As erection progresses, fixed bearings may be fully welded and expansion bearings tack welded to their respective members to prevent displacement. When full dead load has been applied to the structural system, any adjustments necessary shall be made to correct bearing position and inclination for a mean temperature of 45° (anchor bolts for sliding bearings shall be in the center of their slots).
- D. Bearings shall be reset if they are out of position by more than the following tolerance:
 - Fixed bearings — theoretical centerline of bearing.
 - Sliding bearings — the corrected position.
- E. Parts shall be accurately assembled as shown on the plans. Material shall be carefully handled so that no members or pieces will be bent, broken or damaged. Hammering that will injure or deform members will not be permitted. Bearing surfaces and contact surfaces shall be clean. Members shall be erected to the position specified and externally supported until all connections have been completed.
- F. Field welding shall conform to all applicable requirements of the New York State Steel Construction Manual.

4. METHOD OF MEASUREMENT:

- 4.01 The quantity to be measured for payment will be the number of each unit complete and in place.
- 4.02 All bearing device materials including bearing pads and anchor bolt assemblies shall be included as part of the measured unit. Anchor bolt assemblies include bolts, threaded rods, nuts, washers and beveled plates required for attachment of bearing devices to the superstructure and substructure.

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5. BASIS OF PAYMENT:

- 5.01 The accepted quantities will be paid for at the contract unit price for the items specified, which price shall be full compensation for detailing, furnishing, handling, transporting and placing the material specified, including surface preparation protective coating, testing, anchor bolt assemblies, mortar, bearing pads, welding and the furnishing of all labor, tools, equipment and incidentals necessary to complete the work.