SECTION 912

BEARINGS

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912.01 SCOPE

The scope of this specification is to cover the supply, fabrication and installation of all plain and steel reinforced elastomeric bearings and pot bearings in structures. Pot bearings shall be defined as free sliding, constrained sliding and/or fixed structural

bearings consisting of a metal piston supported by a single moulded disc of unreinforced elastomer that is confined within a metal cylinder.

Bearing materials, manufacture, fabrication and installation shall comply with the latest edition of CSA-S6 “Canadian Highway Bridge Design Code” or OPSS 1202 “Bearings – Elastomeric Plain and Steel Laminated” and OPSS 1203 “Bearings – Rotational and Sliding Surface” for elastomeric and pot bearings respectively. In the event of a conflict between the two, the more severe criteria shall control.

912.02 MATERIALS

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

912.02.01 Elastomeric Bearings

Bearings shall be fabricated from elastomeric materials. Virgin natural polyisoprene (natural rubber) or virgin polychloroprene (neoprene) shall be the only raw polymer permitted.

Internal steel plates shall be not less than 3mm thick nor greater than 5mm. Plates shall be mild steel and conform to CSA G40.21 “Structural Quality Steels”

The elastomer compound shall exhibit grade 5 low temperature behaviour. Both natural rubber and neoprene shall be either 50 ± 5 or 60 ± 5 durometer as stated on the contract drawings. The shop drawings shall indicate the low temperature behaviour grade and durometer number.

912.02.02 Pot Bearings

The Contractor shall furnish a manufacturer's certification that materials proposed for use on the project have been pretested and will meet the requirements as set forth in the manufacturer's current literature.

Elastomer and rubber components shall meet Grade 5 classification as per CSA S6.

Sliding pot bearings shall have a PTFE and stainless steel interface.

912.03 MANUFACTURE AND APPROVAL

912.03.01 Elastomeric Bearings

912.03.01.01 Manufacture

All pads shall have a smooth finish. Any steel plates shall be free from burrs and sharp edges; all laminations shall have a uniform thickness.

All elastomeric bearings shall have a minimum rotational capacity of ±0.005 radians. All elements shall be capable of maintaining its initial uniform contact at ± 0.005 radians rotation.

Steel laminated bearings shall be moulded as a single unit under pressure and heat, steel plates shall be completely bonded on all surfaces.

912.03.01.02 Approval

Bridge bearings shall be as designated in the contract or from an accepted source.

The Contractor shall submit 1 hardcopy and 1 electronic copy of the bearing shop drawings to the Department for review and allow 14 calendar days for review. These drawings shall be stamped and sealed by a Professional Engineer registered in the Province of Newfoundland and Labrador.

A copy of the bearing shop drawings shall be available on site at all times prior to and during the installation of the bearings.

Bearing materials, manufacture, fabrication and installation shall comply with the CSA-S6-14.

Bridge bearings designed from an accepted source shall also submit at least 14 calendar days prior to commencement of the bearing installation 1 hardcopy and 1 electronic copy of the design calculations for the bearings to the Department.

The shop drawings for the bearings shall clearly indicated the following as a minimum:

a) Bearing layout and orientation.
b) Dimensions and details of the bearings. Dimensions refer to length, width, diameter and thickness.
c) Details of each component of the bearing including the top or bottom plate, or both, including anchorages or dowels or both.
d) Installation details.

e) Load resistance at serviceability and ultimate limit states, including maximum compressive permanent and total loads.
f) Compression Stiffness, maximum movement capacity in shear, shear stiffness and rotation capacity.
g) Individual alphanumeric identification of each bearing.

912.03.01.03 Identification

All bearings shall be indelibly marked with the name of the manufacturer, the part number, bearing identification number, elastomer type, elastomer grade and the date of manufacture on the side visible after erection.

912.03.01.04 Quality Assurance

The manufacturer shall submit a certificate of compliance to the Owner's Representative prior to installation. The certificate of compliance shall contain the material properties, grades and relevant standards of all bearing materials. The manufacturer shall certify the bearing(s) meet the design requirements.

912.03.02 Pot Bearings

912.03.02.01 Fabrication and Manufacture

This work shall consist of the fabrication, manufacture and finishing of pot type structural bearing devices of the type shown on the plans for the locations as shown on the plans. These structural bearings shall adequately provide for all movements, loads, forces and rotations of structural members where applicable.

Bearings shall be factory set and clamped for equal expansion and contraction and plant assembled. Temporary connections shall not be removed until the bearings are set in their final positions.

The stainless steel sliding surface interface sheet shall conform to ASTM A167 "Standard Specification for Stainless and Heat Resisting Chromium –Nickle Steel Plate, Sheet, and Strip." Type 304 with a bright annealed mirror Number 8 finish on one side and continuously welded to the top plate.

All pot bearings shall have a minimum rotational capacity of ±0.02 radians. All elements shall be capable of maintaining its initial uniform contact at ± 0.02 radians rotation. The coefficient of friction between the PTFE and stainless steel plates at maximum permissible bearing load shall be 0.03 or less. Pot bearings are to be lubricated and unfilled. Exposed steel surface shall be coated with cold galvanizing compound (2 coats).

The bearing device manufacturer shall be pre-qualified with a five year proven history of successful product manufacture.

All welding shall be in accordance with CSA W59 “Welded Steel Construction.” The company undertaking welding fabrication shall be certified in Division 1 or Division 2.1 of CSA W47.1 “Fusion Welding of Steel Company Certification”

Unidirectional or constrained sliding bearings should be manufactured with a gap tolerance at the guides of 0.5 mm. All bearing surfaces of steel plates shall be finished flat within 0.25 mm. Overall manufacturing height tolerance shall be ± 3 mm.

Anchorage pins, studs and connections shall be designed and supplied by the fabricator for the maximum horizontal force and minimum/maximum vertical force indicated on the drawings.

912.03.02.02 Approval

The pot bearing manufacturer shall be as designated in the contract documents or an accepted equal. Bearings shall be accepted by shop drawings and the manufacturer shall supply the Owner’s Representative with a catalogue.

The Contractor shall submit 1 hardcopy and 1 electronic copy of the bearing shop drawings and calculations to the Department for review and allow 14 calendar days for review. These drawings shall be stamped and sealed by a Professional Engineer registered in the Province of Newfoundland and Labrador.

The shop drawings for the bearings shall clearly indicate the following as a minimum:

a) Bearing layout and orientation.
b) Dimensions of each component of the bearing including: top plate, sliding surface, bearing surface, piston, elastomeric disc, base pot, anchor pins, anchor studs and welds and the overall dimensions of the finished bearing. Dimensions refer to length, width, diameter and thickness.
c) Minimum and maximum horizontal and vertical load resistance at serviceability and ultimate limit states including maximum compressive permanent and total loads.
d) Longitudinal and transverse movement capacity.
e) Bearing rotation capacity in radians.
f) Direction and range of movement.
g) A detailed bill of materials.
h) Individual alphanumeric identification of each bearing.

912.03.02.03 Identification

All bearings shall be indelibly marked with the name of the manufacturer, the part number, bearing identification number, elastomer type, elastomer grade and the date of manufacture on the side visible after erection.

912.03.02.04 Quality Assurance

The manufacturer shall submit a certificate of compliance to the Owner's Representative prior to installation. The certificate of compliance shall contain the material properties, grades and relevant standards of all bearing materials. The manufacturer shall certify the bearing(s) meet the design requirements.

912.04 INSTALLATION

The bearings shall be protected from damage, distortion, excessive heat, and deleterious matter during the handling, transportation, storage and installation.

All welding within 3 metres of any bearing shall be specifically prohibited unless written approval is obtained from the Owner's Representative. Such approval will require specific measures to protect the bearings where so required by the Owner's Representative.

The bearings shall only be disassembled by the Contractor with the permission of the bearing supplier, The Bearing supplier's representative shall be present during disassembly and reassembly. Upon completion of the structure, the top and bottom surfaces of the bearings shall be in full contact with the structure.

Grouting operations shall be according to the manufacturer's recommendations, except that the temperature of the air, concrete and bearings shall not be less than 10 degrees Celsius at the time of grouting and shall be maintained at not less than 10 degrees Celsius for a minimum of 96 hours after grout is placed. Where pintles are specified in the Contract Documents, they shall engage the steel plate of the bearings through the entire thickness of that plate.

Temporary clamping devices shall be used to maintain correct orientation and setting and to prevent movement or separation of the bearing components during the handling, transportation, and installation. The clamping devices shall not be used for lifting or suspending the bearings. Clamping devices shall be removed after bearing is in its final position, with all permanent connections made, and after all grout and concrete in contact with the bearing have been placed.

Upon completion of the installation of the bearings on the substructure and prior to any loading on the bearings, the Owner's Representative shall conduct an interim inspection to verify that the installation has been carried out in general conformance with Contract Documents and issue the Contractor written permission to proceed.

912.04.01 Elastomeric Bearings

Bearings when received on site shall be stored in a location and under conditions accepted by the Owner's Representative and in accordance with the Manufacturer's requirements.

The bearings shall be installed in the exact location as called for in the contract. The centerline of the bearing along the direction of movement shall be parallel to the direction of movement of the bridge at that bearing location.

Tolerances of installation (including manufacturing tolerances) shall be ± 5 mm vertically and ± 3mm horizontally. A minimum of 90% of both the top and bottom surfaces of the bearing shall be in contact with the respective surfaces. Should these tolerances be exceeded the bearings may still be accepted by the Department, at the Department's discretion, if the bearing designer provides a stamped and signed as-built drawing and calculations showing the bearing is still compliant with the design code CSA S6-14.

Variation from a dead level plane shall not exceed 1mm in 500mm.

Any abnormal appearance of the bearings shall be cause for rejection.

912.04.02 Pot Bearings

The manufacturer shall ship each bearing fully assembled. The bearings are not to be disassembled prior to final installation without the knowledge of the design authority and manufacturer.

Bearings when received on site shall be unloaded and stored in accordance with the manufacturer's recommendations. The Owner's Representative shall accept the same.

The bearings shall be installed in the location and orientation as indicated on the contract drawings. Constrained sliding or uni-directional bearings shall be properly aligned to allow for the movement of the structure as indicated on the contract

drawings. The bearings shall not be installed in the field prior to the Owner's Representative's acceptance.

Where the bearings are of a guided or constrained type, the Contractor shall establish the bearing alignment using surveying instruments. The tolerance for variation in alignment, i.e. plan view, is ± 0.0067 radians (0.382 degrees) where the bearing is required to move 75 mm or less. The bearings shall have dead level bearing surfaces, i.e. top and bottom plates. Dead level shall be defined as ± 0.001745 radians (0.10 degrees), i.e. ± 1.745 mm in 1000 mm.

In positioning, the bearing centre of the base should correspond to the centre of the support. Rotation of the bearing should not be permitted to occur during concrete placing operations. The top plate shall be supported on all sides to prevent deflection of the same during the concrete placing operations.

The base plate shall be bedded by the contractor on non-shrink grout. It is of extreme importance that the final bedding be free from high or hard spots, voids, etc. The Contractor shall supply durable load bearing wedges to support all bearings when they are placed on the non-shrink grout pad. Wooden wedges are not acceptable. The bearing base plate shall be set in position using a flowable non-shrink grout unless otherwise indicated on the shop drawings. For uni-directional and multi-directional bearings, adjust the upper plate to proper setting as instructed by the Owner's Representative prior to affixing to the structure. Ensure form work is well sealed to prevent concrete from flowing onto the bearing prior to placing deck concrete.

Installation requirements shall be written on the shop drawings. Bearings are to be installed as per the manufacturer's recommendations.

912.05 MEASUREMENT FOR PAYMENT

Each individual bearing fully assembled shall be considered as one unit regardless of the bearing type, kind, size, capacity, function, location of installation in the structure or source of manufacture. Measurement for payment purposes shall be the total number of such units installed.

Bearings used against concrete creep blocks and concrete corbels shall not be included in measurement for payment and are incidental to the works.

912.06 BASIS OF PAYMENT

Payment at the contract price for "Supply And Install Bearings" in the Unit Price Table shall be full compensation for all labour, equipment, access, materials and services

required to supply, fabricate, transport to the job site, store on site, handle and install the bearings in the specified location and provide any associated design calculations. Any anchorages, grout and dowel pins required are considered incidental and no separate payments will be made.

The tendered price per each unit for "Supply and Install Bearings" shall be the average price per unit regardless of the bearing type, kind, size, capacity, function, location of installation in the structure or source of manufacture excluding bearings used against creep blocks and concrete corbels which are incidental to the works.

Any necessary engineering and adjustment shall be considered incidental to the work.

No payment will be made until a certificate of compliance has been received by the Owner’s Representative.