



**ONTARIO
PROVINCIAL
STANDARD
SPECIFICATION**

**METRIC
OPSS.MUNI 922
APRIL 2017**

(Formerly OPSS 922, November 2009)

Note: The MUNI implemented in April 2017 replaces OPSS 922 COMMON, November 2009 with no technical content changes.

**CONSTRUCTION SPECIFICATION FOR
INSTALLATION OF BEARINGS**

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922.01 SCOPE

This specification covers the construction requirements for the installation of bearings.

922.01.01 Specification Significance and Use

This specification has been developed for use in municipal oriented Contracts. The administration, testing, and payment policies, procedures, and practices reflected in this specification correspond to those used by many municipalities in Ontario.

Use of this specification or any other specification shall be according to the Contract Documents.

922.01.02 Appendices Significance and Use

Appendices are not for use in provincial contracts as they are developed for municipal use, and then, only when invoked by the Owner.

Appendices are developed for the Owner's use only.

Inclusion of an appendix as part of the Contract Documents is solely at the discretion of the Owner. Appendices are not a mandatory part of this specification and only become part of the Contract Documents as the Owner invokes them.

Invoking a particular appendix does not obligate an Owner to use all available appendices. Only invoked appendices form part of the Contract Documents.

The decision to use any appendix is determined by an Owner after considering their contract requirements and their administrative, payment, and testing procedures, policies, and practices. Depending on these considerations, an Owner may not wish to invoke some or any of the available appendices.

922.02 REFERENCES

When the Contract Documents indicate that municipal-oriented specifications are to be used and there is a municipal-oriented specification of the same number as those listed below, references within this specification to an OPSS shall be deemed to mean OPSS.MUNI, unless use of a provincial-oriented specification is specified in the Contract Documents. When there is not a corresponding municipal-oriented specification, the references below shall be considered to be the OPSS listed, unless use of a provincial-oriented specification is specified in the Contract Documents.

This specification refers to the following standards, specifications, or publications:

Ontario Provincial Standard Specifications, Material

OPSS 1202 Bearings - Elastomeric Plain and Steel Laminated
OPSS 1203 Bearings - Rotational and Sliding Surface

CSA Standards

A23.1-04/A23.2-04 Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete

ASTM International

C 928-05 Standard Specification for Packaged, Dry, Rapid-Hardening Cementitious Materials for Concrete Repairs

922.03 DEFINITIONS

For the purpose of this specification, the following definitions apply:

Anchor means a device employed to secure a bearing to the structure or to restrict movement of the structure or both.

Bearing means a structural device that transmits load while permitting translation or rotation or both.

Certificate of Conformance means a document issued by the Quality Verification Engineer confirming that the specified components of the Work are in general conformance with the requirements of the Contract Documents.

Engineer means a Professional Engineer licensed by the Professional Engineers Ontario to practice in the province of Ontario.

Product Drawings means drawings prepared by the manufacturer that have been approved by the Owner for use with the product.

Quality Verification Engineer (QVE) means an Engineer retained by the Contractor qualified to provide the services specified in the Contract Documents.

Superstructure means all parts of a bridge above the bearings.

922.04 DESIGN AND SUBMISSION REQUIREMENTS

922.04.01 Submission Requirements

922.04.01.01 Layout and Installation Drawings

922.04.01.01.01 General

The Contractor shall submit 3 sets of bearing layout and installation drawings to the Contract Administrator at least 1 week prior to commencement of bearing installation, for information purposes only. An Engineer's seal and signature shall be affixed on the layout and installation drawings verifying that the drawings are consistent with the Contract Documents.

The Contractor shall have a copy of these drawings at the site prior to and during site installation of the bearings.

922.04.01.01.02 Elastomeric Bearings

The layout and installation drawings for elastomeric bearings shall clearly indicate the following:

- a) Bearing layout and orientation.
- b) Dimensions and details of the bearings.
- c) Details of 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) Individual alphanumeric identification of each bearing.

922.04.01.01.03 Rotational and Sliding Surface Bearings

The layout and installation drawings for rotational and sliding surface bearings shall clearly indicate the following:

- a) Bearing layout and orientation.
- b) Top and bottom plate details, including anchorages.
- c) Installation details.
- d) Method of attachment of bearings to the top and bottom plates.
- e) Bearing identification letter and numbers.

922.04.01.02 Jacking

When jacking of the superstructure is specified in the Contract Documents, the Contractor shall submit 3 sets of the jacking drawings to the Contract Administrator at least 1 week prior to commencement of jacking, for information purposes only. The submission shall include the method and location, type, and capacity of jacks to be used; the type and location of the gauges; and the calibration certificates for both the jacks and gauges. An Engineer shall affix his or her seal and signature on the jacking drawings verifying that the drawings are consistent with the Contract Documents and sound engineering practices.

When jacking is not specified in the Contract Documents, the Contractor shall submit 5 sets of the jacking proposal drawings to the Contract Administrator at least 3 weeks prior to the commencement of jacking, for approval. The submission shall include the method and location, type, and capacity of jacks to be used; the type and location of the gauges; and the calibration certificates for both the jacks and gauges and, where necessary, the details of support for the jacks. Proposals shall bear the seals and signatures of the design and checking Engineers.

A copy of each jacking proposal drawing shall be returned as one of the following:

- a) Stamped with the wording that allows for permission to construct. In this case, work can commence on receipt of the drawing by the Contractor.
- b) Stamped with the wording that allows for permission to construct as noted. In this case, work can start on receipt of the drawings by the Contractor. The drawings shall be updated as noted and shall be sealed and signed by an Engineer stating the drawings have been revised according to the noted comments.
- c) Showing only required changes. In this case, the drawings shall be updated as required and the submission process repeated.

When another authority is involved with the Contract, all submissions shall be made at least 5 weeks prior to the commencement of work.

The Contractor shall have a copy of the jacking drawings or the approved jacking proposal drawings at the site prior to and during the jacking operation.

922.05 MATERIALS

922.05.01 Bearings

Bearings shall be according to OPSS 1202 or OPSS 1203 and as specified in the Contract Documents.

922.05.02 Grout

Grout shall be cement based, non-shrink, non-staining, and approved by the Owner.

Grout shall have a minimum nominal 7-Day compressive strength of 35 MPa.

922.07 CONSTRUCTION

922.07.01 General

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

The bearings shall not be disassembled by the Contractor without 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 °C at the time of grouting and shall be maintained at not less than 10 °C for a minimum of 96 hours after grout is placed.

922.07.02 Bearing Seats

The bearing seats shall be finished level and to an elevation established by subtracting the thickness of the bearings supplied from the top of bearing elevations specified in the Contract Documents. For elastomeric bearings, the finish of the concrete surface shall be smooth and not vary more than 1 mm along a straightedge placed in any direction across an area that extends at least 25 mm beyond the outside limits of the bearing. For other types of bearings, deviation along the straightedge shall not vary more than 3 mm.

Any concrete surface area prepared by grinding shall not allow water to pond in the area. For elastomeric bearings, the bearing seat areas prepared by grinding shall be intentionally roughened such that the surface has an equivalent to trowel finish. All surface areas shall be inspected and deemed acceptable by the Contract Administrator prior to installation of bearings.

922.07.03 Alignment

The longitudinal and transverse centrelines of the bearings shall be installed within ± 3 mm of the position specified in the Contract Documents. The centreline of the bearing along the direction of movement shall be parallel to the direction of movement of the bridge at that bearing location.

922.07.04 Installation of Anchors

The diameter, length, and material of the anchor and the diameter and depth of the anchor hole shall be as specified in the Contract Documents.

Where coring of the bearing seats to receive anchors is permitted, care shall be taken to ensure that the coring is done without damaging or cutting the steel reinforcement. Where permitted, coring shall not commence earlier than 3 weeks prior to bearing installation. In lieu of coring, the holes may be formed.

The holes shall be protected against entry of moisture and shall be completely filled with grout, when the anchors are installed.

922.07.05 Grouting

Where the anchors for rotational and sliding surface bearings require core drilling or preformed holes, the bearings shall be bedded over their entire area on grout that does not contain any voids. The use of permanent shims to achieve the theoretical elevation at the top of the bearing shall not be allowed.

The thickness of the grout bedding for rotational and sliding surface bearings shall be 12 mm ± 3 mm. The substrate shall be roughened by bushhammering, cleaned, and prewetted prior to grouting. Transfer of superstructure load to the bearings shall not be allowed until the grout has reached a minimum strength of 30 MPa.

The grout material shall be mixed, handled, and cured according to the manufacturer's instructions.

Elastomeric bearings shall not be placed directly on grout.

922.07.06 Tolerances

Bearings shall be set level to within a 500H:1V slope in any direction. The top of the bearing shall be set at the theoretical elevation specified in the Contract Documents, within the following tolerances:

Concrete deck and precast I-type girders	± 5 mm
Steel plate girders	0 to + 3.0 mm
Steel and precast concrete box girders	0 to + 2.0 mm

922.07.07 Temporary Attachments

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 each 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.

922.07.08 Jacking

Jacking operations shall be carried out under the direct supervision of an Engineer.

The lifting or lowering of the structure shall be carried out in one uniform and synchronized jacking operation. At no time during jacking operations shall the difference between any of the jacking points be more than 3 mm at the same abutment or pier cap.

When jacking is required in order to adjust the bearings, the structure shall be jacked the minimum amount required to allow the bearings to come back to a vertical position.

922.07.09 Quality Control

922.07.09.01 Certificate of Conformance

A completed Certificate of Conformance shall be submitted to the Contract Administrator upon completion of the work. The Qualification Verification Engineer's seal and signature shall be affixed on the completed Certificate of Conformance confirming that the following are in general conformance with the requirements of the layout and installation drawings, Working Drawings, product drawings, and Contract Documents for the bearings:

- a) Fabrication
- b) Installation
- c) Adjustments, when applicable

922.07.09.02 Sampling and Supplying of Bearings

After the bearings have been fabricated, the Contractor shall notify the Contract Administrator in writing of the identification and availability of the bearings.

Where strip bearings have been specified for precast boxes placed side-by-side, each bearing strip shall be supplied at least 600 mm longer than required. A sample, 600 mm in length, shall be cut in the field from one end of each strip bearing and supplied for testing.

Elastomeric bearings beyond the number of bearings specified for installation shall be supplied as specified in the Contract Documents.

All bearings shall be available for sampling either at the project site or at a location acceptable to the Contract Administrator. Sample bearings for testing purposes shall be selected by the Contract Administrator from all the bearings of each size and thickness fabricated for the Contract. The Contract Administrator shall advise the Contractor in writing which bearings have been selected for testing. The Contractor shall deliver these bearings to the location specified in the Contract Documents.

922.07.09.03 Grout Testing

Three 7-Day compressive strength cubes shall be made and tested according to ASTM C 928 for each day that grout is being placed.

For early strength testing, additional cubes shall be tested.

922.08 QUALITY ASSURANCE

922.08.01 Testing

The Contractor shall allow 60 Days from the time of submission of elastomeric bearings for the Owner's testing program.

The number, type, and size of elastomeric bearing samples to be selected for destructive testing shall be as specified in the Contract Documents.

922.08.02 Rejection

If a sample plain elastomeric bearing fails, all plain elastomeric bearings represented by that sample shall be rejected.

If the number of laminated elastomeric bearings specified is less than 10, failure of the sample bearing shall mean that all laminated elastomeric bearings are rejected.

If the number of laminated elastomeric bearings specified is 10 or more, failure of a sample bearing shall mean that all laminated elastomeric bearings of that size and thickness are rejected.

Rejected bearings, whether installed or not, shall be removed from the job site. Bearings supplied as replacements for rejected bearings shall be sampled, tested, and approved or rejected on the same basis as the original bearings.

922.09 MEASUREMENT FOR PAYMENT

922.09.01 Bearings

For measurement purposes, a count shall be made of the number of the bearings installed and of the bearings supplied for destructive testing. Alternatively, bearings may be a lump sum item.

922.10 BASIS OF PAYMENT

922.10.01 Bearings - Item

Payment at the Contract price for the above tender item shall be full compensation for all labour, Equipment, and Material to do the Work.

When bearings are a lump sum item, payment at the Contract price for the tender item Bearings shall include full compensation for the bearings supplied for destructive testing.

**Appendix 922-A, November 2009
FOR USE WHILE DESIGNING MUNICIPAL CONTRACTS**

Note: This is a non-mandatory Commentary Appendix intended to provide information to a designer, during the design stage of a contract, on the use of the OPS specification in a municipal contract. This appendix does not form part of the standard specification. Actions and considerations discussed in this appendix are for information purposes only and do not supersede an Owner's design decisions and methodology.

Designer Action/Considerations

The designer should specify the following in the Contract Documents:

- When jacking of a structure is required. (922.04.01.02)
- Type of bearing. (922.05.01)
- Top of bearing elevation. (922.07.02)
- Bearing location. (922.07.03)
- Bearing anchor dimensions and material. (922.07.04)
- Bearing anchor hole dimensions. (922.07.04)
- Number of sample bearings and delivery location of samples for testing. (922.07.09.02)
- Number, type, and size of elastomeric bearings for destructive testing. (922.08.01)

OPSS 922 contains information that is not used by municipalities in their Contracts. To ensure completeness of the municipal Contract Documents, the designer should invoke Appendix 922-B. The appendix contains information that modifies OPSS 922 so it can be used by a municipality in its Contracts.

The designer should ensure that the General Conditions of Contract and the 100 Series General Specifications are included in the Contract Documents.

Related Ontario Provincial Standard Drawings

No information provided here.

**Appendix 922-B, November 2009
FOR USE IN MUNICIPAL CONTRACTS, WHEN REFERENCED IN THE CONTRACT DOCUMENTS**

Note: This is a non-mandatory Additional Information Appendix intended to provide supplementary requirements for the OPS specification in a municipal contract, when the appendix is invoked by the Owner. It is written in mandatory language to permit invoking it by reference in the Contract Documents. If the appendix has not been invoked by reference in the Contract Documents, it does not apply.

Supplementary Requirements for Using OPSS 922 in Municipal Contracts

OPSS 922, Installation of Bearings, is amended as follows:

922.03 DEFINITIONS

Section 922.03 is amended by the deletion of the definitions for Certificate of Conformance and Quality Verification Engineer.

922.04.01.01.01 General

Clause 922.04.01.01.01 is deleted in its entirety and replaced by the following:

The Contractor shall submit 5 sets of bearing layout and installation drawings to the Contract Administrator at least 3 weeks prior to commencement of bearing installation, for information purposes only. An Engineer shall affix his or her seal and signature on the layout and installation drawings verifying that the drawings are consistent with the Contract Documents and sound engineering practices.

The Contractor shall have a copy of these drawings at the site prior to and during site installation of the bearings.

922.04.01.02 Jacking

Clause 922.04.01.02 is deleted in its entirety and replaced by the following:

When jacking of the superstructure is specified in the Contract Documents or is required due to the Contractor's method of construction, the Contractor shall submit 5 sets of the jacking or jacking proposal drawings to the Contract Administrator at least 3 weeks prior to the commencement of jacking, for review. The submission shall include the method and location, type, and capacity of jacks to be used; the type and location of the gauges; and the calibration certificates for both the jacks and gauges and, where necessary, the details of support for the jacks.

All jacking drawings shall bear the seal and signature of an Engineer verifying that the drawings are consistent with the Contract Documents and sound engineering practices.

Proposals shall bear the seals and signatures of the design and checking Engineers.

Appendix 922-B

922.04.01 Design and Submission Requirements

Subsection 922.04.01 is amended by the addition of the following:

922.04.01.03 Return of Submissions

Two copies of each submission shall be returned as one of the following:

- a) Stamped with the wording that allows for permission to construct. In this case, work can commence on receipt of the drawings by the Contractor.
- b) Stamped with the wording that allows for permission to construct as noted. In this case, work can start on receipt of the drawings by the Contractor. The drawings shall be updated as noted and shall be sealed and signed by an Engineer stating the drawings have been revised according to the noted comments.
- c) Showing only required changes. In this case, the drawings shall be updated as required and the submission process repeated.

When another authority is involved with the Contract, all submissions shall be made at least 5 weeks prior to the commencement of work.

The Contractor shall have a copy of the stamped updated or accepted drawings at the site during any jacking operation.

922.07.09.01 Certificate of Conformance

Clause 922.07.09.01 is deleted in its entirety.

