



**MATERIAL SPECIFICATION FOR
RUBBER ADJUSTMENT UNITS FOR MAINTENANCE HOLES,
CATCH BASINS, AND VALVE CHAMBERS**

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1853.01 SCOPE

This specification covers the material and performance requirements for rubber adjustment units for maintenance holes, catch basins, and valve chambers.

1853.01.01 Specification Significance and Use

This specification is written as a municipal-oriented specification. Municipal-oriented specifications are developed to reflect the administration, testing, and payment policies, procedures, and practices of many municipalities in Ontario.

Use of this specification or any other specification shall be as specified in the Contract Documents.

1853.01.02 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.

1853.02 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:

CSA Standards

S6-06 Canadian Highway Bridge Design Code

ASTM International

D 412-06a Vulcanized Rubber and Thermoplastic Elastomers – Tensile Strength
D 2240-05 Rubber Property - Durometer Hardness
D 3574-05a Density – Lbs. per Cubic Foot
D 573-04 Heat Aged Properties

1853.03 DEFINITIONS

For the purpose of this specification, the following definition applies:

Flat Profile means not having more than 0.25 mm deviation lineally in 305 mm.

1853.04 DESIGN AND SUBMISSION REQUIREMENTS

1853.04.01 Design Requirements

The maximum thickness of any rubber adjustment unit shall not be greater than 75 mm, and stack height to be in accordance with manufacturer's recommendations.

Rubber adjustment units shall not be adversely affected by exposure to salt, gasoline, antifreeze, or motor oil when tested for resistance to chemical agents.

Thickness of the rubber adjustment units shall be within 3 mm of the manufacturer's stated dimension. All other dimensions shall be within 5 mm of manufacturer's stated dimensions.

1853.05 MATERIALS

1853.05.01 Rubber

Rubber adjustment units shall be made of recycled or virgin rubber - most preferably Styrene-Butadiene Rubber (SBR).

1853.07 PRODUCTION

1853.07.01 Requirements

Adjustment units shall be manufactured using production compression moulding, tooling, and manufacturing practices to be consistent with current technology used for that type of material.

Manufactured rings shall be compressed to a minimum of 300 psi / 20.68 bar.

Adjustment units to be supplied in round, square, and rectangular shapes, and in flat and tapered profiles up to a maximum of 75 mm (3") per ring. Stacking height per manufacturer's recommendation.

1853.07.02 Quality Control

The manufacturing process shall be such that individual units will be consistent in quality and appearance. All rough edges shall be trimmed of excess flash, each ring to be checked for thickness, and flatness.

1853.07.02.01 General

Testing shall be conducted on production run rubber adjustment units not less than 24 hours old and not more than 60 Days old. The temperature of the test specimens shall be maintained at 23 °C ± 2 °C for at least 12 hours prior to and during the test period.

1853.07.02.02 Hardness

The moulded surface and interior hardness measurements of the adjustment unit material shall not vary more than 15 points Shore A for any single unit when measured according to ASTM D 2240. The readings shall be taken within 1 second after the presser foot is in firm contact with the specimen, unless the durometer has a maximum indicator, in which case the maximum indicated reading shall be recorded within 1 second of the cessation of the indenter travel.

1853.07.02.02.01 Moulded Surface Hardness

A minimum of 6 measurements for hardness shall be taken on each moulded surface of the adjustment unit. Each measurement shall be at different positions evenly spaced along the adjustment unit surfaces and shall be at least 12 mm from any edge of the adjustment unit.

1853.07.02.02.02 Interior Hardness

The adjustment units selected for testing shall be cut into a minimum of 3 equal size pieces providing a minimum of 6 cut surfaces. A total of 15 evenly spaced interior hardness measurements shall be taken of each cut surface. Each measurement shall be at least 6 mm apart and shall be at least 12 mm from any edge of the specimen.

1853.07.02.03 Tensile Strength

A minimum of 3 test specimens shall be cut from each adjustment unit selected for testing. The tensile strength of each specimen shall be a minimum of 1 MPa when tested according to ASTM D 412, Test Method A, using straight specimens.

1853.07.02.04 Compression Deformation and Compression Set

1853.07.02.04.01 Specimens

A minimum of 3 test specimens shall be cut from each adjustment unit selected for testing. The same samples shall be used for the compression deformation and compression set testing. Each specimen shall have a minimum thickness of 25 mm and a minimum top and bottom surface area of 2,500 mm². The top and bottom surfaces shall not be larger than the plates of the compression equipment.

1853.07.02.04.02 Testing Procedure

Each specimen shall be tested for initial compression deformation, final compression deformation, and compression set.

1853.07.02.04.03 Initial Compression Deformation

The initial compression deformation for each specimen shall be 6% ± 2% when tested in the following manner:

- a) The dimensions of each specimen shall be recorded to the nearest 0.02 mm prior to being subjected to any testing.
- b) Place the specimen in the compression equipment, using extreme care to place it exactly in the centre between the plates to avoid tilting. Apply an initial constant load to achieve 0.05 MPa stress to the specimen. Immediately determine the thickness of the specimen by measuring the distance between the top and bottom plates. This value will represent the initial thickness of the specimen prior to compression.
- c) Over a period of 30 seconds or less, apply and maintain a constant load to achieve 1 MPa stress to the specimen.
- d) Immediately after the required load has been achieved, determine the initial compression deformation thickness of the specimen by measuring the distance between the top and bottom plates and calculate the percentage of compression as follows:

$$C_{d1} = [(D_1 - D_2) / D_1] \times 100$$

where:

- C_{d1} = initial compression deformation as a percentage of the initial thickness
- D_1 = initial thickness
- D_2 = initial compression deformation thickness

1853.07.02.04.04 Final Compression Deformation

The final compression deformation for each specimen shall be 6% ± 2% when tested in the following manner:

- a) Maintain the load required to achieve the 1 MPa stress for a period of 30 minutes.
- b) At the end of the 30-minute period, determine the final compression deformation thickness of the specimen by measuring the distance between the top and bottom plates and calculate the percentage of compression as follows:

$$C_{d2} = [(D_1 - D_3) / D_1] \times 100$$

where:

- C_{d2} = final compression deformation as a percentage of the initial thickness
- D_1 = initial thickness, as derived during the initial compression deformation testing
- D_3 = final compression deformation thickness

1853.07.02.04.05 Compression Set

The maximum compression set for each specimen shall be 4% when tested in the following manner:

- a) Remove the load on the specimen and allow it to rest undisturbed for a period of 30 minutes.
- b) At the end of the 30-minute period, apply a constant load to achieve 0.05 MPa stress to the specimen. Immediately determine the compression set thickness of the specimen by measuring the distance between the top and bottom plates and calculate the percentage of compression set as follows:

$$C_s = [(D_1 - D_4) / D_1] \times 100$$

where:

- C_s = compression set as a percentage of the initial thickness
- D_1 = initial thickness
- D_4 = compression set thickness

1853.07.03 Tolerances

The thickness of the adjustment unit shall be within 3 mm of manufacturer's stated dimensions. All other dimensions shall be within 5 mm.

Except for shim or wedge units, the deviation from a plane parallel to theoretical surface shall not be greater than 1 in 500.

1853.07.04**Minimum Physical Requirements**

TEST / STANDARD	PROPERTIES
Hardness - ASTM D 2240	Maximum 15 Shore A variance
Tensile Strength - ASTM D 412	220 psi. 1.5 Mpa 1 Mpa minimum (145 PSI)
Compression Deformation - OPSS 1853	6% ± 2%
Compression Set - OPSS 1853	4% maximum
Density - ASTM D3574-05 Test A	64.214 Lbs./Cu. Ft. ± 3%
Heat Aged Properties -ASTM D573	3Hrs. @ 148• C (300• F)
Tensile, Hardness, Compression Deformation	100% Retained
Low Temperature Brittleness - 24 Hrs. @ -40	No signs of cracks, ruptures, or degradation

1853.07.05**Markings**

Each adjustment unit shall be clearly marked on the inside or top surface with the following information:

- a) Manufacturer's name.
- b) Product trade name/catalogue number, if applicable.
- c) Origin of manufacture.
- d) Dimensions of the adjustment unit including:
 - i. thickness,
 - ii. inside dimensions, and
 - iii. outside dimensions.

1853.08**QUALITY ASSURANCE****1853.08.01 Certificate**

Supplier shall provide a certificate upon request to indicate that the product was produced and tested in accordance with this specification.

1853.08.02**Inspection and Testing**

The Owner may make inspections and tests at such times as necessary to ensure that the material supplied is according to this specification.

1853.09**OWNER PURCHASE OF MATERIAL**

For measurement purposes, a count shall be made of the rubber adjustment units supplied and delivered as noted on the purchasing order.

Payment at the price specified in the purchasing order shall be for the supply of the rubber adjustment units delivered to the destination on the date and time specified.

**Appendix 1853-A, November 2018
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 ensure that the General Conditions of Contract and the 100 Series General Specifications are included in the Contract Documents.

Related Ontario Provincial Standard Drawings

OPSD 704.013