OPSS COMMON to PROV ADMIN CONVERSIONS

Reference Type/Code	Existing Version	New Version	Implemented In CPS	New, Revised (Rev), Cancelled (Can), Reissued/Reinstated (Rei)	Initiator
Ontario Provincial Standard Specifications (OPSSs)					
102	October 1992	April 2025	TBD	Rev: General Specification for Weighing of Materials is implemented. The specification has been converted from the October 1992 COMMON to a PROV with no technical content changes. Applicable content from SSP 101S18 has been incorporated into OPSS 102.	Mike Pearsall
353	September 1996	April 2025	TBD	Rev: Construction Specification for Concrete Curb and Gutter System is implemented. The specification has been converted from the September 1996 COMMON to a PROV with no technical content changes. Applicable content from SSP 101S18 has been incorporated into OPSS 353.	Mike Pearsall
415	February 1990	April 2025	TBD	Rev: Construction Specification for Tunnelling is implemented. The specification has been converted from the February 1990 COMMON to a PROV with no technical content changes. Applicable content from SSP 415S01 has been incorporated into OPSS 415.	Mike Pearsall
416	February 1990	April 2025	TBD	Rev: Construction Specification for Jacking and Boring is implemented. The specification has been converted from the February 1990 COMMON to a PROV with no technical content changes. Applicable content from SSP 416S01 has been incorporated into OPSS 416.	Mike Pearsall
760	November 2014	April 2025	TBD	Rev: Construction Specification for Noise Barrier Systems is implemented. The specification has been converted from the November 2014 COMMON to a PROV with no technical content changes. Applicable content from SSP 760F01 has been incorporated into OPSS 760.	Mike Pearsall
802	November 2010	April 2025	TBD	Rev: Construction Specification for Topsoil is implemented. The specification has been converted from the November 2010 COMMON to a PROV with no technical content changes.	Mike Pearsall

Reference Type/Code	Existing Version	New Version	Implemented In CPS	New, Revised (Rev), Cancelled (Can), Reissued/Reinstated (Rei)	Initiator
1204	November 2003	April 2025	TBD	Rev: Material Specification for Polyvinyl Chloride Waterstops is implemented. The specification has been converted from the November 2003 COMMON to a PROV with no technical content changes.	Mike Pearsall
1308	November 2003	April 2025	TBD	Rev: Material Specification for Joint Filler in Concrete is implemented. The specification has been converted from the November 2003 COMMON to a PROV with no technical content changes.	Mike Pearsall
1315	September 1996	April 2025	TBD	Rev: Material Specification for White Pigmented Curing Compounds for Concrete is implemented. The specification has been converted from the September 1996 COMMON to a PROV with no technical content changes.	Mike Pearsall
1351	November 2004	April 2025	TBD	Rev: Material Specification for Precast Reinforced Concrete Components for Maintenance Holes, Catch Basin, Ditch Inlets, and Valve Chambers is implemented. The specification has been converted from the November 2004 COMMON to a PROV with no technical content changes.	Mike Pearsall
1352	November 1989	April 2025	TBD	Rev: Material Specification for Precast Concrete Barriers is implemented. The specification has been converted from the November 1989 COMMON to a PROV with no technical content changes. Legacy Section 10 removed.	Mike Pearsall
1442	November 1989	April 2025	TBD	Rev: Material Specification for Epoxy Coated Steel Reinforcement for Concrete is implemented. The specification has been converted from the May 1994 COMMON to a PROV with no technical content changes. Legacy Section 10 removed.	Mike Pearsall
1443	November 1989	April 2025	TBD	Rev: Material Specification for Organic Coatings for Steel Reinforcement is implemented. The specification has been converted from the May 1994 COMMON to a PROV with no technical content changes. Legacy Section 10 removed.	Mike Pearsall

Reference Type/Code	Existing Version	New Version	Implemented In CPS	New, Revised (Rev), Cancelled (Can), Reissued/Reinstated (Rei)	Initiator
Standard Special Provisions (SSPs)					
101S18	April 1994	April 2025	TBD	Can: SSP Amendment to General Specification for Weighing of Materials is cancelled. Applicable content has been incorporated into OPSS 102.	Mike Pearsall
113S09	February 2013	April 2025	TBD	Can: SSP Amendment to Material Specification for Precast Concrete Barriers is cancelled. Applicable content has been incorporated into OPSS 1352.	Mike Pearsall
353S02	July 2007	April 2025	TBD	Can: SSP Amendment to Construction Specification for Concrete Curb and Gutter System is cancelled. Applicable content has been incorporated into OPSS 353.	Mike Pearsall
415S01	March 2012	April 2025	TBD	Can: SSP Amendment to Construction Specification for Tunnelling is cancelled. Applicable content has been incorporated into OPSS 415.	Mike Pearsall
416S01	March 2012	April 2025	TBD	Can: SSP Amendment to Construction Specification for Jacking and Boring is cancelled. Applicable content has been incorporated into OPSS 416.	Mike Pearsall
760F01	March 2018	April 2025	TBD	Rev: SSP Amendment to Construction Specification for Noise Barrier Systems is administratively revised. Applicable standard content has been incorporated into OPSS 760.	Mike Pearsall

COMPAREs and FINAL PROVs

OPSS.PROV 102 - Apr 2025

COMMON to PROV conversion with SSP 101S18 rolled-in and canceled.

Ontario Provincial Standard Specifications (OPSSs)					
102	October 1992	April 2025	TBD	Rev: General Specification for Weighing of Materials is implemented. The specification has been converted from the October 1992 COMMON to a PROV with no technical content changes. Applicable content from SSP 101S18 has been incorporated into OPSS 102.	Mike Pearsall
Standard Special Provisions (SSPs)					
101S18	April 1994	April 2025	TBD	Can: SSP Amendment to General Specification for Weighing of Materials is cancelled. Applicable content has been incorporated into OPSS 102.	Mike Pearsall

ONTARIO
PROVINCIAL
STANDARD
SPECIFICATION

~~METRIC~~
OPSS.PROV 102
~~OCTOBER 1992~~APRIL 2025

Note: The 102 implemented in April 2025 replaces 102, October 1992 with no technical content changes.

GENERAL SPECIFICATION FOR WEIGHING OF MATERIALS

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~~102.10.01 Weighing~~

102.01 SCOPE

This specification covers the requirements for the weighing of materials where payment is based on mass.

102.02 REFERENCES

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

American National Standard for Materials Handling - Bar Code Symbols on Unit Loads and Transport Packages (ANSI MH10.8M-1983)

Government of Canada Weights and Measures Act 1985.

Government of Canada Weights and Measures Regulations, 1990

~~American National Standard for Materials Handling - Bar Code Symbols on Unit Loads and Transport Packages (ANSI MH10.8M-1983)~~

102.03 DEFINITIONS

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

Limits of Error~~:~~ means the In Service Limits of Error contained in the Government of Canada Weights & Measures Act.

Weigh Scales, ~~**weigh machines:**~~ **Weigh Machines** means any device that measures mass and has a moving or movable part that has or can have an effect on the accuracy of the device.

102.04 DESIGN AND SUBMISSION ~~AND DESIGN~~ REQUIREMENTS - Testing and Certification of Scales

102.04.01 Testing Procedures

The Contractor shall give the Contract Administrator a minimum of 48 h notice in advance of any test to be carried out on the weigh scales. The Contract Administrator will be present throughout the duration of the test. Failure to comply may result in a re-test being required.

102.04.02 Portable Scales

Portable scales shall be tested and certified conforming to the Government of Canada Weights and Measures Act and Government of Canada Weights and Measures Regulations.

A completed copy of the "Heavy Duty Scale Inspection Report", form CCA-1409 of the Consumer and Corporate Affairs Department, the Federal Government of Canada shall be sent to the nearest office of the District Inspector of the Weights and Measures Division in each of the following circumstances:

a.) After the initial installation on a contract and before use on that contract.

b.) When the scale is moved to a new location.

c.) When the scale has undergone adjustments, alterations or repairs to the weighing mechanism.

d.) When weighing is resumed after winter suspension.

e.) When digital heads are changed or added.

A duplicate copy of the above report shall be on view in the scale house or trailer before weighing operations commence and at all times thereafter.

102.04.03 Permanently Installed Scales

Permanently installed scales shall show a Government of Canada certificate of inspection.

Where a rejection tag is on display and the Government of Canada certificate of inspection is shown as not currently in effect, but subsequent alterations, adjustments or repair have been carried out, verification of this work is required by the Contract Administrator and should either be on display or located on file in the scale house or trailer. Verification shall be documented on a form CCA-1409 including the following minimum requirements:

a.) Date work carried out.

b.) Items required, altered or adjusted.

c.) Name and signature of person performing the work and name of firm or organization responsible for the work.

102.04.04 Conveyor Scales

Conveyor scales shall be certified by an Inspector of the Government of Canada, Weights and Measures.

a.) After the initial installation on a contract and before use on that contract.

b.) After every relocation on that contract.

102.06 EQUIPMENT

102.06.01 General

Where the contract includes items that require measurement for payment by weighing, weigh scales shall be provided which meet the requirements of the Government of Canada Weights and Measures Act and Regulations for the purposes for which they are to be used.

102.06.02 Platform Scales

Platform scales shall be of sufficient capacity and dimension so as to fully contain the loaded vehicle or coupled vehicle combination in one setting and so as to permit weighing of the entire load in one operation. Weighing of various axle combinations in more than one operation will not be permitted. Scale foundations shall be adequate to support the largest gross load without any settlement occurring during the weighing operation. Scale pits shall be properly drained. Substantial retaining walls, which may be concrete, shall be built at each end of the scale platform to support the entrance and exit ramps. These retaining walls shall be of sufficient strength and so placed as to support the ramp material without binding on the ends of the platform.

In order to minimize the effect of impact loads on the scale adjustment and to reduce the effect of vehicle braking and kickback on the scale platform and scale adjustments, the approach ramp shall be constructed conforming to the weights and measures requirements on a straight and level grade at the same elevation as the scale platform. Vehicles shall enter and leave the platform at a maximum speed of 8.0 km/h.

The scale platform and mechanism shall at all times be maintained clean and free from encumbrances such as gravel, asphalt, snow and ice. The mass indicator mechanism shall be enclosed in the scale house or trailer.

The platform scale shall be equipped with a direct cable connection to the computer for the purpose of sending mass measurements.

A printing device connected by direct cable connection to the computer shall be capable of electronically producing, in black print only, tickets conforming to the requirements specified in this special provision.

102.06.03 Conveyor Scales

In order to ensure that the required operating temperature has been reached, electric power for conveyor scales shall be applied to the weighing system at least 30 min before the commencement of weighing.

Each conveyor scale shall be provided with a calibration chain certified by the testing agency of the Government of Canada and readily available at all times.

The mass recording device shall clearly indicate the mass so that weigh tickets can be conveniently completed by the weigher.

The mass recording device shall be enclosed in the scale house or trailer.

Span calibration controls shall be sealed during the period of operation and accessible only to the testing personnel.

102.06.04 Scale Houses or Trailers

Each scale house or trailer shall be properly ventilated and shall be clean, dry and weathertight, with a minimum floor space of 4.5 m^2 and minimum head room of 2.1 m. They shall be equipped with windows which can be opened and closed from within and from which the weigher, while seated at the scale or console, has an unobstructed view of the vehicle to be weighed, the scale platform or conveyor and the approach ramp.

Each scale house or trailer shall also have the following:

~~1.~~a) A free sliding window or other approved means for passing out weigh tickets.

~~2.~~b) Screens for doors and windows.

~~3~~c) A door located remotely from the scale platform suitable for the occupant's unobstructed exit in case of fire.

~~4.~~d) Theft and vandal-proof locking devices for doors and windows.

~~5.~~e) Door key for the weigher.

~~6.~~f) Table, chair and bench, so that the weigher can be seated during weighing operations in front of the scale or console.

~~7.~~g) Heating equipment sufficient to maintain the temperature in the scale house at 20°C.

~~8.~~h) Adequate lighting to facilitate office work.

~~9.~~i) Fuel, for heating and lighting.

~~10.~~j) Sanitary facilities within 100 m of the scale house or trailer.

102.07 CONSTRUCTION - Weighing

102.07.01 Mass Measurements

The Contractor shall provide personnel to conduct the mass measurements. ~~-~~The mass measurements shall be sent to the printing device using a print command on the computer.~~-~~ Any form of override of the printing process, except total transaction rejection, will not be allowed.

The system shall be capable of detecting vehicle overloads, and of automatically signalling overload occurrence to the system operator.

Tickets shall be supplied by the Contractor. ~~-~~Bar codes shall be printed directly onto the weigh ticket or onto labels.~~-~~ Bar coded labels shall be affixed to the Owner's copy of the ticket before it leaves the weigh scale building.

The following information shall be displayed as bar code groups printed in a column or left to right configuration:

~~1)~~ a) Truck Number
~~2)~~
b) Tare Weight
~~3)~~
c) Net Weight
~~4)~~
d) Ticket Number

The words "Truck", "Tare", "Net", and "Ticket" must appear beneath each appropriate bar code group.

Conventional alphanumerics shall be used elsewhere on the ticket to express the exact information contained in the bar codes.

Automated reading failure rates greater than one reading failure in twenty tickets scanned and attributable to the density or configuration of the bar codes are not acceptable. ~~-~~Where such rates of reading failure occur, the Contractor must take corrective action to enhance the bar code symbology to an acceptable level immediately following notification of the problem.

The bar code symbols shall conform to the American National Standard for Materials Handling ~~-~~Bar Code Symbols on Unit Loads and Transport Packages (ANSI~~-~~ MH10.8M~~--~~1983) for 3 of 9 bar code (Code 39).

The minimum bar code height shall be 6.4 mm or 15 percent of the bar code length, whichever is greater.

In addition to the bar code group information, each weigh ticket shall contain the following:

a) licence plate number of unit(s)

b) time and date of transaction

c) Truck Owner

d) contract number

e) type of material

f) source of material

g) gross weight

h) overload notation

i) running total of each material

j) a place for the checker to sign

For each contract, the following reports shall be produced daily:

a) truck register, including allowable gross weight for all vehicles;

b) truck tare report for all vehicles, including old and new tares, and time recorded;

c) summaries for each type of material;

d) summaries for all cancelled loads.

The above reports shall be available for Owner pick-up at the end of daily operations or before start-up the following day.

A sample weigh ticket from each source must be supplied to the Owner two weeks prior to delivery of the material.

102.07.02 Scale Location

Scales for weighing hot mixed asphaltic concrete shall be located at the mixing plant. Scales for weighing other materials shall be installed at locations selected by the Contractor.

Where material is from a commercial source, the tickets issued at the source are acceptable providing the weighing operation conforms to this specification.

When, in the opinion of the Contract Administrator, waste or loss of material between the above scale location and the material's intended destination on the contract occurs, the hauling operation may be terminated until a scale has been provided on a site which is approved by the Contract Administrator and which is close enough to the intended destination to preclude the possibility of waste or loss.

102.07.03 Vehicle Tares

102.07.03.01 General

Vehicles shall be tared for all weighing operations with the normal hauling complement of driver, accessories and fuel.

The same scale shall be used for truck taring and establishing gross vehicle mass and the mass of the material to be delivered, with the exception of commercial sources, where separate tare scales are permitted in the same pit or quarry providing the electronics are interfaced from one scale to the other.

Each truck and each coupled vehicle combination shall have a distinguishing number prominently displayed where it will be readily visible to the weigher.

102.07.03.02 Weighing Non-Liquid Materials

When a platform scale is being used on the contract, the tares of the hauling vehicles will be determined randomly at least once daily, and more frequently if required by the Owner.

102.07.03.03 Weighing Liquid Materials

Weighing of liquid materials shall be carried out on permanently installed scales with automatic printing devices.

102.07.03.04 Volumetric Measurement

Where specified in the Contract as an alternative to weighing, a metering device, conforming to the Government of Canada Weights and Measures Act and Regulations thereto, shall be used in the conversion of liquid volume, to an equivalent mass in tonnes, using the factor specified in the Contract.

102.07.04 Checking of Weigh Scales by Enforcement Officers

During normal contract working hours weigh scales shall be at the disposal of Provincial Police Officers and enforcement officers of the Owner for the purpose of checking the mass of the loads of vehicles employed on this contract.

Scale houses or trailers shall be accessible during normal contract working hours so that weighing records may be examined.

102.08 QUALITY ASSURANCE

102.08.01 Scale Accuracy

The Owner reserves the right to check the accuracy or test the Contractor's scales at any time.

Where a device is found to be in error, in excess of the Limits of Error but less than three times the Limits of Error, the Owner will accept material measured for payment by the device for a period of 48 hours from the time the Contractor is notified in writing that the error exceeds the Limits of Error.

When a device is found to be in error, in excess of three times the Limits of Error, the Owner will immediately cease to accept material measured for payment by the device.

102.08.01.01 Conveyor Scales

A conveyor scale test shall be conducted a minimum of twice weekly or as required by the Owner. A minimum ten-minute run is required for this test.

The material shall be collected in truck boxes and the total mass for each truck recorded. The material shall be reweighed on a recently verified platform scale, arranged for by the Contractor, and the material mass compared. The maximum allowable variation between the truck scale mass and the conveyor scale mass shall not exceed 0.5%. The test results are to be recorded and available at all times.

The Contractor shall be responsible for arranging the use of the platform scale.

102.10 BASIS OF PAYMENT

102.10.01 Weighing

Payment for the weighing of material shall be included in the contract price of the item(s) for the materials to be placed or the work to be done and shall be deemed to include full compensation for all labour, equipment and material required to carry out the weighing operation including any delay or inconvenience due to any checking or testing carried out by the Owner.

Note: The 102 implemented in April 2025 replaces 102, October 1992 with no technical content changes.

GENERAL SPECIFICATION FOR WEIGHING OF MATERIALS

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102.09 MEASUREMENT FOR PAYMENT - Not Used

102.10 BASIS OF PAYMENT

102.01 SCOPE

This specification covers the requirements for the weighing of materials where payment is based on mass.

102.02 REFERENCES

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

American National Standard for Materials Handling - Bar Code Symbols on Unit Loads and Transport Packages (ANSI MH10.8M-1983)

Government of Canada Weights and Measures Act 1985.

Government of Canada Weights and Measures Regulations, 1990

102.03 DEFINITIONS

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

Limits of Error means the In Service Limits of Error contained in the Government of Canada Weights & Measures Act.

Weigh Scales, Weigh Machines means any device that measures mass and has a moving or movable part that has or can have an effect on the accuracy of the device.

102.04 DESIGN AND SUBMISSION REQUIREMENTS - Testing and Certification of Scales

102.04.01 Testing Procedures

The Contractor shall give the Contract Administrator a minimum of 48 h notice in advance of any test to be carried out on the weigh scales. The Contract Administrator will be present throughout the duration of the test. Failure to comply may result in a re-test being required.

102.04.02 Portable Scales

Portable scales shall be tested and certified conforming to the Government of Canada Weights and Measures Act and Government of Canada Weights and Measures Regulations.

A completed copy of the "Heavy Duty Scale Inspection Report", form CCA-1409 of the Consumer and Corporate Affairs Department, the Federal Government of Canada shall be sent to the nearest office of the District Inspector of the Weights and Measures Division in each of the following circumstances:

a) After the initial installation on a contract and before use on that contract.

b) When the scale is moved to a new location.

c) When the scale has undergone adjustments, alterations or repairs to the weighing mechanism.

d) When weighing is resumed after winter suspension.

e) When digital heads are changed or added.

A duplicate copy of the above report shall be on view in the scale house or trailer before weighing operations commence and at all times thereafter.

102.04.03 Permanently Installed Scales

Permanently installed scales shall show a Government of Canada certificate of inspection.

Where a rejection tag is on display and the Government of Canada certificate of inspection is shown as not currently in effect, but subsequent alterations, adjustments or repair have been carried out, verification of this work is required by the Contract Administrator and should either be on display or located on file in the scale house or trailer. Verification shall be documented on a form CCA-1409 including the following minimum requirements:

a) Date work carried out.

b) Items required, altered or adjusted.

c) Name and signature of person performing the work and name of firm or organization responsible for the work.

102.04.04 Conveyor Scales

Conveyor scales shall be certified by an Inspector of the Government of Canada, Weights and Measures.

a) After the initial installation on a contract and before use on that contract.

b) After every relocation on that contract.

102.06 EQUIPMENT

102.06.01 General

Where the contract includes items that require measurement for payment by weighing, weigh scales shall be provided which meet the requirements of the Government of Canada Weights and Measures Act and Regulations for the purposes for which they are to be used.

102.06.02 Platform Scales

Platform scales shall be of sufficient capacity and dimension so as to fully contain the loaded vehicle or coupled vehicle combination in one setting and so as to permit weighing of the entire load in one operation. Weighing of various axle combinations in more than one operation will not be permitted. Scale foundations shall be adequate to support the largest gross load without any settlement occurring during the weighing operation. Scale pits shall be properly drained. Substantial retaining walls, which may be concrete, shall be built at each end of the scale platform to support the entrance and exit ramps. These retaining walls shall be of sufficient strength and so placed as to support the ramp material without binding on the ends of the platform.

In order to minimize the effect of impact loads on the scale adjustment and to reduce the effect of vehicle braking and kickback on the scale platform and scale adjustments, the approach ramp shall be constructed conforming to the weights and measures requirements on a straight and level grade at the same elevation as the scale platform. Vehicles shall enter and leave the platform at a maximum speed of 8.0 km/h.

The scale platform and mechanism shall at all times be maintained clean and free from encumbrances such as gravel, asphalt, snow and ice. The mass indicator mechanism shall be enclosed in the scale house or trailer.

The platform scale shall be equipped with a direct cable connection to the computer for the purpose of sending mass measurements.

A printing device connected by direct cable connection to the computer shall be capable of electronically producing, in black print only, tickets conforming to the requirements specified in this special provision.

102.06.03 Conveyor Scales

In order to ensure that the required operating temperature has been reached, electric power for conveyor scales shall be applied to the weighing system at least 30 min before the commencement of weighing.

Each conveyor scale shall be provided with a calibration chain certified by the testing agency of the Government of Canada and readily available at all times.

The mass recording device shall clearly indicate the mass so that weigh tickets can be conveniently completed by the weigher.

The mass recording device shall be enclosed in the scale house or trailer.

Span calibration controls shall be sealed during the period of operation and accessible only to the testing personnel.

102.06.04 Scale Houses or Trailers

Each scale house or trailer shall be properly ventilated and shall be clean, dry and weathertight, with a minimum floor space of 4.5 m^2 and minimum head room of 2.1 m. They shall be equipped with windows which can be opened and closed from within and from which the weigher, while seated at the scale or console, has an unobstructed view of the vehicle to be weighed, the scale platform or conveyor and the approach ramp.

Each scale house or trailer shall also have the following:

a) A free sliding window or other approved means for passing out weigh tickets.

b) Screens for doors and windows.

c) A door located remotely from the scale platform suitable for the occupant's unobstructed exit in case of fire.

d) Theft and vandal-proof locking devices for doors and windows.

e) Door key for the weigher.

f) Table, chair and bench, so that the weigher can be seated during weighing operations in front of the scale or console.

g) Heating equipment sufficient to maintain the temperature in the scale house at 20°C.

h) Adequate lighting to facilitate office work.

i) Fuel, for heating and lighting.

j) Sanitary facilities within 100 m of the scale house or trailer.

102.07 CONSTRUCTION - Weighing

102.07.01 Mass Measurements

The Contractor shall provide personnel to conduct the mass measurements. The mass measurements shall be sent to the printing device using a print command on the computer. Any form of override of the printing process, except total transaction rejection, will not be allowed.

The system shall be capable of detecting vehicle overloads, and of automatically signalling overload occurrence to the system operator.

Tickets shall be supplied by the Contractor. Bar codes shall be printed directly onto the weigh ticket or onto labels. Bar coded labels shall be affixed to the Owner's copy of the ticket before it leaves the weigh scale building.

The following information shall be displayed as bar code groups printed in a column or left to right configuration:

a) Truck Number

b) Tare Weight

c) Net Weight

d) Ticket Number

The words "Truck", "Tare", "Net", and "Ticket" must appear beneath each appropriate bar code group.

Conventional alphanumerics shall be used elsewhere on the ticket to express the exact information contained in the bar codes.

Automated reading failure rates greater than one reading failure in twenty tickets scanned and attributable to the density or configuration of the bar codes are not acceptable. Where such rates of reading failure occur, the Contractor must take corrective action to enhance the bar code symbology to an acceptable level immediately following notification of the problem.

The bar code symbols shall conform to the American National Standard for Materials Handling -Bar Code Symbols on Unit Loads and Transport Packages (ANSI MH10.8M-1983) for 3 of 9 bar code (Code 39).

The minimum bar code height shall be 6.4 mm or 15 percent of the bar code length, whichever is greater.

In addition to the bar code group information, each weigh ticket shall contain the following:

a) licence plate number of unit(s)

b) time and date of transaction

c) Truck Owner

d) contract number

e) type of material

f) source of material

g) gross weight

h) overload notation

i) running total of each material

j) a place for the checker to sign

For each contract, the following reports shall be produced daily:

a) truck register, including allowable gross weight for all vehicles;

b) truck tare report for all vehicles, including old and new tares, and time recorded;

c) summaries for each type of material;

d) summaries for all cancelled loads.

The above reports shall be available for Owner pick-up at the end of daily operations or before start-up the following day.

A sample weigh ticket from each source must be supplied to the Owner two weeks prior to delivery of the material.

102.07.02 Scale Location

Scales for weighing hot mixed asphaltic concrete shall be located at the mixing plant. Scales for weighing other materials shall be installed at locations selected by the Contractor.

Where material is from a commercial source, the tickets issued at the source are acceptable providing the weighing operation conforms to this specification.

When, in the opinion of the Contract Administrator, waste or loss of material between the above scale location and the material's intended destination on the contract occurs, the hauling operation may be terminated until a scale has been provided on a site which is approved by the Contract Administrator and which is close enough to the intended destination to preclude the possibility of waste or loss.

102.07.03 Vehicle Tares

102.07.03.01 General

Vehicles shall be tared for all weighing operations with the normal hauling complement of driver, accessories and fuel.

The same scale shall be used for truck taring and establishing gross vehicle mass and the mass of the material to be delivered, with the exception of commercial sources, where separate tare scales are permitted in the same pit or quarry providing the electronics are interfaced from one scale to the other.

Each truck and each coupled vehicle combination shall have a distinguishing number prominently displayed where it will be readily visible to the weigher.

102.07.03.02 Weighing Non-Liquid Materials

When a platform scale is being used on the contract, the tares of the hauling vehicles will be determined randomly at least once daily, and more frequently if required by the Owner.

102.07.03.03 Weighing Liquid Materials

Weighing of liquid materials shall be carried out on permanently installed scales with automatic printing devices.

102.07.03.04 Volumetric Measurement

Where specified in the Contract as an alternative to weighing, a metering device, conforming to the Government of Canada Weights and Measures Act and Regulations thereto, shall be used in the conversion of liquid volume, to an equivalent mass in tonnes, using the factor specified in the Contract.

102.07.04 Checking of Weigh Scales by Enforcement Officers

During normal contract working hours weigh scales shall be at the disposal of Provincial Police Officers and enforcement officers of the Owner for the purpose of checking the mass of the loads of vehicles employed on this contract.

Scale houses or trailers shall be accessible during normal contract working hours so that weighing records may be examined.

102.08 QUALITY ASSURANCE

102.08.01 Scale Accuracy

The Owner reserves the right to check the accuracy or test the Contractor's scales at any time.

Where a device is found to be in error, in excess of the Limits of Error but less than three times the Limits of Error, the Owner will accept material measured for payment by the device for a period of 48 hours from the time the Contractor is notified in writing that the error exceeds the Limits of Error.

When a device is found to be in error, in excess of three times the Limits of Error, the Owner will immediately cease to accept material measured for payment by the device.

102.08.01.01 Conveyor Scales

A conveyor scale test shall be conducted a minimum of twice weekly or as required by the Owner. A minimum ten-minute run is required for this test.

The material shall be collected in truck boxes and the total mass for each truck recorded. The material shall be reweighed on a recently verified platform scale, arranged for by the Contractor, and the material mass compared. The maximum allowable variation between the truck scale mass and the conveyor scale mass shall not exceed 0.5%. The test results are to be recorded and available at all times.

The Contractor shall be responsible for arranging the use of the platform scale.

102.10 BASIS OF PAYMENT

102.10.01 Weighing

Payment for the weighing of material shall be included in the contract price of the item(s) for the materials to be placed or the work to be done and shall be deemed to include full compensation for all labour, equipment and material required to carry out the weighing operation including any delay or inconvenience due to any checking or testing carried out by the Owner.

OPSS.PROV 353 - Apr 2025

COMMON to PROV conversion with SSP 353S02 rolled-in and canceled.

Ontario Provincial Standard Specifications (OPSSs)					
353	September 1996	April 2025	TBD	Rev: Construction Specification for Concrete Curb and Gutter System is implemented. The specification has been converted from the September 1996 COMMON to a PROV with no technical content changes. Applicable content from SSP 101S18 has been incorporated into OPSS 353.	Mike Pearsall
Standard Special Provisions (SSPs)					
353S02	July 2007	April 2025	TBD	Can: SSP Amendment to Construction Specification for Concrete Curb and Gutter System is cancelled. Applicable content has been incorporated into OPSS 353.	Mike Pearsall

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~~SEPTEMBER 1996~~APRIL 2025

Note: The 353 implemented in April 2025 replaces 353, September 1996 with no technical content changes.

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353.01 SCOPE

This specification covers the requirements for the construction of concrete curb and gutter, set backs, gutter outlets and bullnoses together with the installation of catchbasin frames and grates which lie within the flow lines of the curb and gutter system.

353.02 REFERENCES

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

Ontario Provincial Standard Specifications, Construction:

OPSS 206	Grading
OPSS 314	Untreated Granular Subbase, Base, Surface, Shoulder and Stockpiling
OPSS 350	Concrete Pavement, Concrete Base and Lean Concrete Base
OPSS 407	Construction of Manholes, Catch Basins, Ditch Inlets and Valve Chambers
OPSS 501	Compacting
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OPSS 904	Concrete Structures
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Ontario Provincial Standard Specifications, Material:

OPSS 1212	Hot Poured Rubberized Asphalt Joint Sealing Compounds
OPSS 1308	Joint Filler (Concrete)
OPSS 1315	White Pigmented Membrane Curing Compounds for Concrete
OPSS 1350	Concrete (Materials and Production)
OPSS 1440	Steel Reinforcement for Concrete
OPSS 1850	Frames, Grates, Covers and Gratings

353.03 DEFINITIONS

For the purpose of this specification the following definitions apply:

Curb and Gutter: means curb, gutter or combinations of curb and gutter.

Curb and Gutter Systems: means curb and gutter, set backs, gutter outlets, concrete spillways, bullnoses or any combination of them.

Concrete Pavement: means concrete pavement or concrete base.

353.05 MATERIALS

353.05.01 Concrete

Concrete shall be according to OPSS 1350 and the following:

Minimum specified 28-Day compressive strength:	30 MPa,
Coarse aggregate:	19 mm nominal maximum size.

353.05.02 Catchbasin Frames and Grates

Frames and grates shall conform to OPSS 1850.

353.05.03 Joint Materials

Expansion joint fillers shall conform to OPSS 1308 for types A or C except that granulated cork fillers will not be accepted.

Hot rubberized asphalt joint sealing compound shall conform to OPSS 1212.

353.05.04 Curing Compound

Curing compound shall conform to OPSS 1315.

353.05.05 Forms

Forms shall conform to OPSS 919.

353.05.06 Reinforcing Steel

Reinforcing steel shall conform to OPSS 1440.

353.07 CONSTRUCTION

353.07.01 General

The following construction sub-sections 353.07.02 to 353.07.12 apply equally to concrete curb and gutter, concrete spillways and concrete gutter outlets.

353.07.02 Foundation and Backfill

Excavation and embankment construction shall conform to OPSS 206.

Granular base and granular backfill construction shall conform to OPSS 314.

353.07.03 Compaction

Compaction shall conform to OPSS 501.

353.07.04 Reinforcing Steel

Placement of reinforcing steel shall conform to OPSS 905.

353.07.05 Formwork

Forms shall conform to OPSS 919 and shall be set true to the lines and grades specified in the contract and in direct contact with the subgrade or granular course.

353.07.06 Joints

When concrete curb and gutter is constructed adjacent to concrete pavement, the transverse joint spacing of the curb and gutter shall coincide with that of the concrete pavement. When concrete curb and gutter is constructed adjacent to asphalt pavement, transverse joints shall have a uniform spacing not exceeding 6 m. In addition to the foregoing, joints shall be constructed between the curb structure including catchbasin frames, set backs and gutter outlets.

Joints, including those between curb and gutter systems and any abutting sidewalk, catchbasin frames, setbacks, gutter outlets, or any structure, shall be formed with 12 mm thick panels of joint filler except as follows:

a) Contraction joints in extruded curb and gutter and in formed curb and gutter may be saw cut or formed by the use of a "guillotine" knife.

b) Longitudinal joints, as shown in the contract, shall be sawn between a curb and gutter system and concrete pavement and shall conform to OPSS 350 when the curb and gutter system is placed adjacent to the concrete pavement. The joint shall be sealed with liquid joint sealer and shall conform to OPSS 350.

Joint filler panels shall be set in a vertical position and if for transverse joints, shall be set normal to the inside edge of the structure.

Panels shall be precut from a single piece of joint filler to the shape of the curb and gutter cross section as shown on the standard drawings but so as to provide a 6 mm recess on the exposed surfaces. Cutting and tolerances shall conform to OPSS 1308.

Expansion joint material shall be set in place before concrete placement begins and shall be supported by removable forms.

The Contractor has the option of either providing a 6mm deep, 12 mm wide cap strip, to be removed after the concrete has hardened and not edging the joints, or carefully removing all concrete immediately above the filler material to form a 6 mm deep, 12 mm wide recess then finishing both edges of each joint to 6 mm radius with a suitable short edging tool. However, should the Contractor choose the latter method and should he construct joints which do not conform to the requirements, the Engineer may, without prejudicing any other provisions of the contract, require that all remaining work be carried out using cap strips.

Contraction joints shall be formed within a sufficient time of placing of the curb and gutter to prevent uncontrolled cracking. The width of the joint shall be 3mm to 5 mm and the depth 65 mm minimum.

353.07.07 Hook Bolt Dowels

Where the plans require a concrete pavement to be anchored to the curb and gutter system with hook bolt dowels, the installation of the hook bolt dowels shall be considered as part of the work of constructing the concrete pavement.

353.07.08 Concrete

353.07.08.01 Placement of Concrete

Concrete shall not be placed until the base course on which the concrete is to be placed, and the forms, have been inspected by the Authority.

Before placing concrete, the Contractor shall wet down the subgrade immediately ahead of the concrete placing by means of a uniform spray of water sufficient to wet the subgrade thoroughly without leaving standing water.

The concrete shall be placed and compacted in a manner such that segregation of the aggregate does not occur.

Concrete shall be placed continuously and contact with partially set concrete shall be avoided. When placement of concrete is interrupted, it shall be at a vertical form. A 5 mm bituminous fibre joint filler shall be placed before recommencing placement of concrete.

The concrete shall be thoroughly consolidated against all formwork and all entrapped air shall be eliminated.

353.07.08.02 Concrete Finishing

The concrete on the upper surfaces shall be floated to a smooth uniform finish of the required cross section, free of open texturing, plucked aggregate and local projections. Only hardwood or magnesium trowels shall be used for hand finishing.

Care shall be taken to avoid over finishing or working more mortar to the surface than is actually required. Unless otherwise provided, back edges shall be rounded by use of a 6 mm radius edging tool. Neat cement shall not be used as a drier to facilitate finishing.

Any honeycombed areas occurring along the formed surfaces shall be filled with mortar composed of one part Portland cement, and two parts sand with 12% of entrained air.

353.07.08.03 Concrete Curing

Formed and slipformed concrete shall be cured according to OPSS 904. The use of white pigmented curing compound is permitted except that curing with curing compound shall not be used on any construction joint or when cold weather concreting is in effect.

353.07.08.04 Concrete Tolerances

The exposed surfaces of the finished concrete shall be such that when tested with a 3 m long straight edge placed anywhere along the surface parallel to the edge, there shall be no deviation greater than 3 mm between the bottom of the straight edge and the surface of the concrete nor shall there be any deviation from alignment in excess of 3 mm.

353.07.09 Extrusion Methods

The provisions of this specification may be modified by the Authority at the Contractor's request to suit construction by extrusion methods if the Contractor can demonstrate to the Authority's satisfaction that by such methods a quality will be achieved at least equal to that produced by standard methods. Notwithstanding approval of such modification, the Authority may, at any time, require the Contractor to revert to standard methods if, in the Authority's opinion, the required results are not being obtained.

353.07.10 Cold Weather Concreting

Protection shall conform to OPSS 904. The components of the Curb and Gutter System shall be considered as slabs on the ground.

353.07.11 Catchbasin and Maintenance Hole Frames and Grates

Catchbasin and maintenance hole frames and grates which lie within the flow lines of the curb and gutter system shall be installed as part of the construction of the various components making up the curb and gutter system. Frames shall be set to their final elevations on full beds of mortar and shall conform to OPSS 407. The exposed surfaces of the mortar bed shall be left in a smooth condition, free of depressions and sharp protuberances. All remaining formwork shall be removed.

353.07.12 Identification Stamp

At the request of the Authority, the Contractor shall clearly and legibly mark with an approved stamp each end of the work, every 20 m and all other places directed by the Authority. The mark shall be located in the centre of an exposed face of the curb and gutter systems. The mark shall bear the Contractor's name and the year of construction.

353.07.13 Field Sampling and Testing of Concrete

Field sampling and testing of concrete shall be according to OPSS 1350.

353.09 MEASUREMENT FOR PAYMENT

353.09.01 Actual Measurement

353.09.01.01 Concrete Curb and Gutter

Measurement of concrete curb and gutter will be made in metres along the flow lines of the gutter whether straight or circular, without separation into types. Measurement will include the space occupied by setbacks, gutter outlets and frames and grates.

353.09.01.02 Concrete Spillways

Measurement of concrete spillways will be made in metres from the end of the gutter outlet to the spillway termination.

353.09.01.03 Concrete Gutter Outlets

Measurement will be by the number of setbacks and gutter outlets installed without separation into types.

353.09.02 Plan Quantity Measurement

353.09.02.01 Concrete Curb and Gutter

Measurement of concrete curb and gutter is by Plan Quantity, as may be revised by Adjusted Plan Quantity, of the horizontal length in metres along the flow lines of the gutter whether straight or circular, without separation into types. Measurement will include the space occupied by setbacks, gutter outlets and frames and grates.

353.09.02.02 Concrete Spillways

Measurement of concrete spillways is by Plan Quantity, as may be revised by Adjusted Plan Quantity, of the contour length in metres from the end of the gutter outlet to the spillway termination.

353.09.02.03 Concrete Gutter Outlets

Measurement of the number of concrete gutter outlets and setbacks is by Plan Quantity, as may be revised by Adjusted Plan Quantity, without separation into types.

353.09.03 Bullnose Fillets

353.09.03.01 Concrete

There will be no measurement of concrete used for fillets in bullnoses.

353.09.03.02 Hot Mix

Hot mix designated for fillets in bullnoses will be measured in tonnes conforming to OPSS 502.

353.09.04 Granular

Measurement for payment for granular material shall conform to OPSS 314. When roadbed granular material is measured in square metres, no measurement will be made for the material directly below or behind the concrete curb and gutter system.

353.09.05 Excavation

Measurement for excavation that overlaps that required for concrete curb and gutter systems shall conform to the specification for such other work as though no excavation were required for curb and gutter systems construction.

353.09.06 Reinforcing Steel

There will be no measurement of reinforcing steel used in concrete curb and gutter systems.

353.10 BASIS OF PAYMENT

353.10.01 Concrete Curb and Gutter - Item
Concrete Spillways - Item
Concrete Gutter Outlets - Item

Payment at the contract price for the above item(s) shall be full compensation for all labour, equipment and material required to do the work.

When roadbed granular material is measured in square metres, the contract price for the above item(s) shall include full compensation for all labour, equipment and material for the material directly below or behind the concrete curb and gutter system.

353.10.02 Hot Mix

Hot mix designated for constructing bullnose fillets shall be paid for at the contract price for the appropriate Hot Mix item.

353.10.03 Granular

Payment for granular material shall conform to OPSS 314.

353.10.04 Excavation

Payment for excavation that overlaps that required for concrete curb and gutter systems shall be made conforming to the specification for such other work as though no excavation were required for curb and gutter construction.

353.10.05 Reinforcing Steel

Costs for supplying and placing reinforcing steel are deemed to be included in the items comprising concrete curb and gutter systems.

Note: The 353 implemented in April 2025 replaces 353, September 1996 with no technical content changes.

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353.01 SCOPE

This specification covers the requirements for the construction of concrete curb and gutter, set backs, gutter outlets and bullnoses together with the installation of catchbasin frames and grates which lie within the flow lines of the curb and gutter system.

353.02 REFERENCES

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

Ontario Provincial Standard Specifications, Construction:

OPSS 206	Grading
OPSS 314	Untreated Granular Subbase, Base, Surface, Shoulder and Stockpiling
OPSS 350	Concrete Pavement, Concrete Base and Lean Concrete Base
OPSS 407	Construction of Manholes, Catch Basins, Ditch Inlets and Valve Chambers
OPSS 501	Compacting
OPSS 502	Weighing of Materials

OPSS 904 Concrete Structures
OPSS 905 Steel Reinforcement for Concrete
OPSS 919 Formwork and Falsework

Ontario Provincial Standard Specifications, Material:

OPSS 1212 Hot Poured Rubberized Asphalt Joint Sealing Compounds
OPSS 1308 Joint Filler (Concrete)
OPSS 1315 White Pigmented Membrane Curing Compounds for Concrete
OPSS 1350 Concrete (Materials and Production)
OPSS 1440 Steel Reinforcement for Concrete
OPSS 1850 Frames, Grates, Covers and Gratings

353.03 DEFINITIONS

For the purpose of this specification the following definitions apply:

Curb and Gutter: means curb, gutter or combinations of curb and gutter.

Curb and Gutter Systems: means curb and gutter, set backs, gutter outlets, concrete spillways, bullnoses or any combination of them.

Concrete Pavement: means concrete pavement or concrete base.

353.05 MATERIALS

353.05.01 Concrete

Concrete shall be according to OPSS 1350 and the following:

Minimum specified 28-Day compressive strength:	30 MPa,
Coarse aggregate:	19 mm nominal maximum size.

353.05.02 Catchbasin Frames and Grates

Frames and grates shall conform to OPSS 1850.

353.05.03 Joint Materials

Expansion joint fillers shall conform to OPSS 1308 for types A or C except that granulated cork fillers will not be accepted.

Hot rubberized asphalt joint sealing compound shall conform to OPSS 1212.

353.05.04 Curing Compound

Curing compound shall conform to OPSS 1315.

353.05.05 Forms

Forms shall conform to OPSS 919.

353.05.06 Reinforcing Steel

Reinforcing steel shall conform to OPSS 1440.

353.07 CONSTRUCTION

353.07.01 General

The following construction sub-sections 353.07.02 to 353.07.12 apply equally to concrete curb and gutter, concrete spillways and concrete gutter outlets.

353.07.02 Foundation and Backfill

Excavation and embankment construction shall conform to OPSS 206.

Granular base and granular backfill construction shall conform to OPSS 314.

353.07.03 Compaction

Compaction shall conform to OPSS 501.

353.07.04 Reinforcing Steel

Placement of reinforcing steel shall conform to OPSS 905.

353.07.05 Formwork

Forms shall conform to OPSS 919 and shall be set true to the lines and grades specified in the contract and in direct contact with the subgrade or granular course.

353.07.06 Joints

When concrete curb and gutter is constructed adjacent to concrete pavement, the transverse joint spacing of the curb and gutter shall coincide with that of the concrete pavement. When concrete curb and gutter is constructed adjacent to asphalt pavement, transverse joints shall have a uniform spacing not exceeding 6 m. In addition to the foregoing, joints shall be constructed between the curb structure including catchbasin frames, set backs and gutter outlets.

Joints, including those between curb and gutter systems and any abutting sidewalk, catchbasin frames, setbacks, gutter outlets, or any structure, shall be formed with 12 mm thick panels of joint filler except as follows:

a) Contraction joints in extruded curb and gutter and in formed curb and gutter may be saw cut or formed by the use of a "guillotine" knife.

b) Longitudinal joints, as shown in the contract, shall be sawn between a curb and gutter system and concrete pavement and shall conform to OPSS 350 when the curb and gutter system is placed adjacent to the concrete pavement. The joint shall be sealed with liquid joint sealer and shall conform to OPSS 350.

Joint filler panels shall be set in a vertical position and if for transverse joints, shall be set normal to the inside edge of the structure.

Panels shall be precut from a single piece of joint filler to the shape of the curb and gutter cross section as shown on the standard drawings but so as to provide a 6 mm recess on the exposed surfaces. Cutting and tolerances shall conform to OPSS 1308.

Expansion joint material shall be set in place before concrete placement begins and shall be supported by removable forms.

The Contractor has the option of either providing a 6mm deep, 12 mm wide cap strip, to be removed after the concrete has hardened and not edging the joints, or carefully removing all concrete immediately above the filler material to form a 6 mm deep, 12 mm wide recess then finishing both edges of each joint to 6 mm radius with a suitable short edging tool. However, should the Contractor choose the latter method and should he construct joints which do not conform to the requirements, the Engineer may, without prejudicing any other provisions of the contract, require that all remaining work be carried out using cap strips.

Contraction joints shall be formed within a sufficient time of placing of the curb and gutter to prevent uncontrolled cracking. The width of the joint shall be 3mm to 5 mm and the depth 65 mm minimum.

353.07.07 Hook Bolt Dowels

Where the plans require a concrete pavement to be anchored to the curb and gutter system with hook bolt dowels, the installation of the hook bolt dowels shall be considered as part of the work of constructing the concrete pavement.

353.07.08 Concrete

353.07.08.01 Placement of Concrete

Concrete shall not be placed until the base course on which the concrete is to be placed, and the forms, have been inspected by the Authority.

Before placing concrete, the Contractor shall wet down the subgrade immediately ahead of the concrete placing by means of a uniform spray of water sufficient to wet the subgrade thoroughly without leaving standing water.

The concrete shall be placed and compacted in a manner such that segregation of the aggregate does not occur.

Concrete shall be placed continuously and contact with partially set concrete shall be avoided. When placement of concrete is interrupted, it shall be at a vertical form. A 5 mm bituminous fibre joint filler shall be placed before recommencing placement of concrete.

The concrete shall be thoroughly consolidated against all formwork and all entrapped air shall be eliminated.

353.07.08.02 Concrete Finishing

The concrete on the upper surfaces shall be floated to a smooth uniform finish of the required cross section, free of open texturing, plucked aggregate and local projections. Only hardwood or magnesium trowels shall be used for hand finishing.

Care shall be taken to avoid over finishing or working more mortar to the surface than is actually required. Unless otherwise provided, back edges shall be rounded by use of a 6 mm radius edging tool. Neat cement shall not be used as a drier to facilitate finishing.

Any honeycombed areas occurring along the formed surfaces shall be filled with mortar composed of one part Portland cement, and two parts sand with 12% of entrained air.

353.07.08.03 Concrete Curing

Formed and slipformed concrete shall be cured according to OPSS 904. The use of white pigmented curing compound is permitted except that curing with curing compound shall not be used on any construction joint or when cold weather concreting is in effect.

353.07.08.04 Concrete Tolerances

The exposed surfaces of the finished concrete shall be such that when tested with a 3 m long straight edge placed anywhere along the surface parallel to the edge, there shall be no deviation greater than 3 mm between the bottom of the straight edge and the surface of the concrete nor shall there be any deviation from alignment in excess of 3 mm.

353.07.09 Extrusion Methods

The provisions of this specification may be modified by the Authority at the Contractor's request to suit construction by extrusion methods if the Contractor can demonstrate to the Authority's satisfaction that by such methods a quality will be achieved at least equal to that produced by standard methods. Notwithstanding approval of such modification, the Authority may, at any time, require the Contractor to revert to standard methods if, in the Authority's opinion, the required results are not being obtained.

353.07.10 Cold Weather Concreting

Protection shall conform to OPSS 904. The components of the Curb and Gutter System shall be considered as slabs on the ground.

353.07.11 Catchbasin and Maintenance Hole Frames and Grates

Catchbasin and maintenance hole frames and grates which lie within the flow lines of the curb and gutter system shall be installed as part of the construction of the various components making up the curb and gutter system. Frames shall be set to their final elevations on full beds of mortar and shall conform to OPSS 407. The exposed surfaces of the mortar bed shall be left in a smooth condition, free of depressions and sharp protuberances. All remaining formwork shall be removed.

353.07.12 Identification Stamp

At the request of the Authority, the Contractor shall clearly and legibly mark with an approved stamp each end of the work, every 20 m and all other places directed by the Authority. The mark shall be located in the centre of an exposed face of the curb and gutter systems. The mark shall bear the Contractor's name and the year of construction.

353.07.13 Field Sampling and Testing of Concrete

Field sampling and testing of concrete shall be according to OPSS 1350.

353.09 MEASUREMENT FOR PAYMENT

353.09.01 Actual Measurement

353.09.01.01 Concrete Curb and Gutter

Measurement of concrete curb and gutter will be made in metres along the flow lines of the gutter whether straight or circular, without separation into types. Measurement will include the space occupied by setbacks, gutter outlets and frames and grates.

353.09.01.02 Concrete Spillways

Measurement of concrete spillways will be made in metres from the end of the gutter outlet to the spillway termination.

353.09.01.03 Concrete Gutter Outlets

Measurement will be by the number of setbacks and gutter outlets installed without separation into types.

353.09.02 Plan Quantity Measurement

353.09.02.01 Concrete Curb and Gutter

Measurement of concrete curb and gutter is by Plan Quantity, as may be revised by Adjusted Plan Quantity, of the horizontal length in metres along the flow lines of the gutter whether straight or circular, without separation into types. Measurement will include the space occupied by setbacks, gutter outlets and frames and grates.

353.09.02.02 Concrete Spillways

Measurement of concrete spillways is by Plan Quantity, as may be revised by Adjusted Plan Quantity, of the contour length in metres from the end of the gutter outlet to the spillway termination.

353.09.02.03 Concrete Gutter Outlets

Measurement of the number of concrete gutter outlets and setbacks is by Plan Quantity, as may be revised by Adjusted Plan Quantity, without separation into types.

353.09.03 Bullnose Fillets

353.09.03.01 Concrete

There will be no measurement of concrete used for fillets in bullnoses.

353.09.03.02 Hot Mix

Hot mix designated for fillets in bullnoses will be measured in tonnes conforming to OPSS 502.

353.09.04 Granular

Measurement for payment for granular material shall conform to OPSS 314. When roadbed granular material is measured in square metres, no measurement will be made for the material directly below or behind the concrete curb and gutter system.

353.09.05 Excavation

Measurement for excavation that overlaps that required for concrete curb and gutter systems shall conform to the specification for such other work as though no excavation were required for curb and gutter systems construction.

353.09.06 Reinforcing Steel

There will be no measurement of reinforcing steel used in concrete curb and gutter systems.

353.10 BASIS OF PAYMENT

353.10.01 Concrete Curb and Gutter - Item
Concrete Spillways - Item
Concrete Gutter Outlets - Item

Payment at the contract price for the above item(s) shall be full compensation for all labour, equipment and material required to do the work.

When roadbed granular material is measured in square metres, the contract price for the above item(s) shall include full compensation for all labour, equipment and material for the material directly below or behind the concrete curb and gutter system.

353.10.02 Hot Mix

Hot mix designated for constructing bullnose fillets shall be paid for at the contract price for the appropriate Hot Mix item.

353.10.03 Granular

Payment for granular material shall conform to OPSS 314.

353.10.04 Excavation

Payment for excavation that overlaps that required for concrete curb and gutter systems shall be made conforming to the specification for such other work as though no excavation were required for curb and gutter construction.

353.10.05 Reinforcing Steel

Costs for supplying and placing reinforcing steel are deemed to be included in the items comprising concrete curb and gutter systems.

OPSS.PROV 415 - Apr 2025

COMMON to PROV conversion with SSP 415S01 rolled-in and canceled.

Ontario Provincial Standard Specifications (OPSSs)					
415	February 1990	April 2025	TBD	Rev: Construction Specification for Tunnelling is implemented. The specification has been converted from the February 1990 COMMON to a PROV with no technical content changes. Applicable content from SSP 415S01 has been incorporated into OPSS 415.	Mike Pearsall
Standard Special Provisions (SSPs)					
415S01	March 2012	April 2025	TBD	Can: SSP Amendment to Construction Specification for Tunnelling is cancelled. Applicable content has been incorporated into OPSS 415.	Mike Pearsall

ONTARIO
PROVINCIAL
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SPECIFICATION

~~METRIC~~
OPSS.PROV 415
~~FEBRUARY 1990~~APRIL 2025

Note: The 415 implemented in April 2025 replaces 415, February 1990 with no technical content changes.

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415.10 BASIS OF PAYMENT

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415.01 SCOPE

This specification covers the requirements for tunnel construction.

415.02 REFERENCES

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

Ontario Provincial Standard Specifications, Construction:

OPSS 517 Dewatering

Ontario Provincial Standard Specifications, Material:

OPSS 1004 Aggregates - Miscellaneous
OPSS 1350 Concrete ~~(~~ - Materials and Production~~)~~
OPSS 1440 Steel Reinforcement for Concrete

Canadian Standards Association:

CAN/CSA-A5-M88 - Portland Cement

415.03 DEFINITIONS

For the purpose of this specification the following definition applies.

Rock~~:~~ means natural beds or massive fragments, of the hard, stable, cemented part of the earth's crust, igneous, metamorphic, of sedimentary in origin, which may or may not be weathered.

415.04 DESIGN AND SUBMISSION ~~AND DESIGN~~ REQUIREMENTS

The Contractor shall submit primary liner design details to the Engineer for review at least two weeks prior to commencing work where the primary liner design is not specified in the contract.

A written agreement regarding the disposal site setting out the terms, conditions and ultimate responsibility for the materials as placed, shall be obtained from the property owner and submitted to the Engineer.

415.05 MATERIALS

415.05.01 Concrete

Concrete shall conform to OPSS 1350 and the minimum compressive strength shall be 25 MPa.

415.05.02 Concrete Reinforcement

Steel reinforcing for concrete work shall conform to OPSS 1440.

415.05.03 Timber

Timber shall be sound, straight, free from cracks, shakes and large or loose knots.

415.05.04 Cement Grout

Grout shall consist of a mixture of one part Portland cement conforming to the requirements of CAN/CSA-A5-M and two parts mortar sand conforming to OPSS 1004 wetted with only sufficient water to make the mixture plastic.

415.05.05 Primary Liner

The primary liner shall be as specified in the Contract.

415.05.06 Rock Bolts

Rock bolts and nuts shall be manufactured from steel having a minimum tensile strength of 700 MPa. ~~-~~Rock bolts shall have a minimum diameter of 15 mm and a length adequate for the conditions encountered, shall have clean, well lubricated threads and shall be supplied with a nut, hardened round washer, expansion shell and a steel bolt plate not less than 100 mm x 100 mm by 6 mm in size.

415.06 EQUIPMENT

415.06.01 General

The Contractor shall ensure that all hoisting and compressed air equipment as required is installed and ready for operation before commencing tunnelling operations.

Shafts and tunnels are to be provided with electric lights of a sufficient number to ensure proper work and inspection.

415.06.02 Use of Compressed Air

Complete compressing equipment and air locks shall be provided as required to supply and control air pressure in tunnels.

Electrically driven compressors with stand-by diesel or gas driven equipment shall be provided.

Stand-by equipment for low pressure air shall be arranged so that equipment will start automatically in case of failure of the electric power supply.

Compressing equipment shall be installed in a weatherproof building insulated against sound transmission.

Compressors shall be provided that are equipped with silencers and receivers on the intake and exhaust lines.

415.07 CONSTRUCTION

415.07.01 General

The location of tunnels shall be established by the Contractor from the lines and elevations as indicated on the contract drawings.

Labour, instruments and materials shall be provided for setting out all reference points necessary to construct the tunnel and appurtenances.

The Engineer shall be provided with assistance and access necessary to check the layout of the tunnel and associated appurtenances.

415.07.02 Alignment Holes

Alignment holes shall be in place near each bend with at least one hole in a straight section between bends and at any other locations specified.

Alignment holes shall be located at the time of construction.

Alignment holes may be used for other purpose after their primary purpose is fulfilled.

A 250 mm diameter steel casing shall be place in a drilled hole over the centreline of the tunnel and used for alignment.

Casings shall be set vertically and provided with a removable steel cover plate.

After the tunnel section is completed, the casings shall be removed to the depth specified and any opening in the tunnel wall filled with concrete. -The remainder of the casing and the hole shall be filled as specified in the contract.

Provision shall be made by the contractor for controlling alignment in the case of tunnels constructed under compressed air.

415.07.03 Construction Shafts

Construction shafts shall be provided at locations specified or as approved by the Engineer.

Shafts shall be maintained in a drained condition.

A 3.5 m high close boarded fence shall be installed around the perimeter of the working area with gates and truck entrances at the shafts and the fence shall be removed on completion of the work.

415.07.04 Stability of Excavation

The Contractor shall employ such construction methods, plant, procedures and precautions that will ensure that excavations are stable, free from disturbance and maintained in a drained condition.

Such construction methods may include, but are not limited to tight timber and/or steel primary liner; ground water control systems employing well points, deep wells, educators, or compressed air; free water control systems employing drains, pipes and pumps, and soil stabilization methods employing cement grouting, chemical grouting or chemical freezing.

The Contractor shall employ such construction methods, plant and materials that will prevent the migration of soil material into tunnels or shafts from adjacent ground.

415.07.05 Tunnelling

The method of tunnelling selected by the Contractor shall be reviewed with the Engineer prior to commencement of the work.

A competent superintendent, experienced in the construction of tunnels, shall supervise the work at all times.

The tunnelling method shall be modified as needed due to changing conditions which may be encountered during the progress of the work.

The tunnel is to be kept sufficiently dry at all times to permit work to be performed in a safe and satisfactory manner.

415.07.06 Dewatering

Dewatering shall conform to OPSS 517.

415.07.07 Excavated Materials

Satisfactory re-usable excavated material shall be separated from unsuitable excavated material.

415.07.08 Disposal of Materials

Unsuitable or surplus material shall be disposed off site.

Excavated material which cannot be incorporated into the work shall be disposed as specified. If the Authority cannot make use of the unwanted excavated material, arrangements for disposal sites shall be made by the Contractor.

The disposal site shall be kept stable and materials shall be dumped in a manner not to cause nuisance, injury or inconvenience until the property owner assumes responsibility under the terms of the agreement referred to in Section 415.04.

415.07.09 Primary Lining

The primary lining shall be designed to support all soil and hydrostatic pressures an to withstand any additional loads caused by grouting or jacking thrusts.

The primary liner shall be installed so that the exterior is as tight as possible to the excavated surface of the tunnel and allows the placement of the full design thickness of the secondary lining.

All voids between the primary lining and the surface of the excavation shall be filled with grout as the primary lining is placed. If a continuous liner is used, the space outside the liner plates shall be grouted at least daily.

Tunnels excavated in sound rock shall be supported in a manner that prevents scaling and unravelling of the rock and also protects from weathering or deterioration.

Where a tunnel is excavated in unstable rock the Contractor shall supply and install rock bolts or equivalent acceptable to the Engineer. The rock bolts shall be of such length and spacing that they safely sustain the tunnel crown and walls to the satisfaction of the Engineer. Rock bolts complete with hardened round washers and bolt plates shall be installed as soon as possible after the surface to be supported has been exposed and the rock has been scaled down.

415.07.10 Secondary Lining

A secondary lining of air-entrained concrete to the strength and dimensions specified shall be provided.

415.07.11 Mixing Grout

Grout shall be mixed in a mechanical mixer capable of maintaining a continuous supply of grout.

Grout shall not be left in the mixer for more than 30 minutes.

415.07.12 Placing Grout

The space outside the finished secondary liner shall be pressure grouted. Pumps for grouting shall be capable of supplying grout at a pressure of 1 MPa.

Grout holes shall be provided in the locations and at the spacings specified.

Grouting shall be done through pipes a minimum of 40 mm in diameter or through holes drilled in the finished secondary liner. The pipes shall be set at the time of placement of the concrete for the secondary liner.

Grout shall not be placed until the lining has achieved 85% of its specified strength. Grouting shall be limited to such operating pressures, sequences and programs as are necessary to avoid damaging any part of the works or any other structure or property.

415.07.13 Wiring

Separate circuits shall be installed for each lighting and power purpose.

All wires shall be installed and securely supported in shafts in waterproof conduits.

All wiring and conduits in shafts and tunnels shall be removed as directed by the Engineer.

415.07.14 Approaching Closure

Caution shall be exercised when approaching a closure while operating under compressed air.

Air pressure shall be reduced to a safe limit when closure is approached.

415.09 MEASUREMENT FOR PAYMENT

415.09.01 Actual Measurement

415.09.01.01 Tunnel

Measurement will be in metres along the centre line of the tunnel from centre to centre of manholes or chambers or from the end of the tunnel where no manhole or chamber is installed.

415.09.01.02 Rock Excavation in Tunnelling

Measurement will be in cubic metres based on the neat lines of the tunnel as shown in the Contract.

415.09.02 Plan Quantity Measurement

415.09.02.01 Tunnel

Measurement is by Plan Quantity, as may be revised by Adjusted Plan Quantity, of the length in metres along the centre line of the tunnel from centre to centre of manholes or chambers or from the end of the tunnel where no manhole or chamber is installed.

415.09.02.02 Rock Excavation in Tunnelling

Measurement is by Plan Quantity, as may be revised by Adjusted Plan Quantity of the volume in cubic metres.

415.10 BASIS OF PAYMENT

415.10.01 Tunnel - Item
Rock Excavation in Tunnelling - Item

Payment at the contract price for the above item(s) shall be full compensation for all labour, equipment and material required to do the work.

The removal of boulders having a volume in excess of 0.5 cubic metres will be paid for as extra work.

Payment for connecting intercepted drains and service connections into the tunnel shall be made on the following basis:

a) Where such drains and service connections are shown on the Contract Drawings the cost of connections shall be included in the Contractor's bid price for the tender item "Tunnel".

b) Where such drains and service connections are not shown on the Contract Drawings the cost of connections will be considered as a Change in the Work.

ONTARIO PROVINCIAL STANDARD SPECIFICATION

OPSS.PROV 415
APRIL 2025

Note: The 415 implemented in April 2025 replaces 415, February 1990 with no technical content changes.

CONSTRUCTION SPECIFICATION FOR TUNNELLING

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415.01 SCOPE

This specification covers the requirements for tunnel construction.

415.02 REFERENCES

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

Ontario Provincial Standard Specifications, Construction:

OPSS 517 Dewatering

Ontario Provincial Standard Specifications, Material:

OPSS 1004 Aggregates - Miscellaneous
OPSS 1350 Concrete - Materials and Production
OPSS 1440 Steel Reinforcement for Concrete

Canadian Standards Association:

CAN/CSA-A5-M88 - Portland Cement

415.03 DEFINITIONS

For the purpose of this specification the following definition applies.

Rock means natural beds or massive fragments, of the hard, stable, cemented part of the earth's crust, igneous, metamorphic, of sedimentary in origin, which may or may not be weathered.

415.04 DESIGN AND SUBMISSION REQUIREMENTS

The Contractor shall submit primary liner design details to the Engineer for review at least two weeks prior to commencing work where the primary liner design is not specified in the contract.

A written agreement regarding the disposal site setting out the terms, conditions and ultimate responsibility for the materials as placed, shall be obtained from the property owner and submitted to the Engineer.

415.05 MATERIALS

415.05.01 Concrete

Concrete shall conform to OPSS 1350 and the minimum compressive strength shall be 25 MPa.

415.05.02 Concrete Reinforcement

Steel reinforcing for concrete work shall conform to OPSS 1440.

415.05.03 Timber

Timber shall be sound, straight, free from cracks, shakes and large or loose knots.

415.05.04 Cement Grout

Grout shall consist of a mixture of one part Portland cement conforming to the requirements of CAN/CSA-A5-M and two parts mortar sand conforming to OPSS 1004 wetted with only sufficient water to make the mixture plastic.

415.05.05 Primary Liner

The primary liner shall be as specified in the Contract.

415.05.06 Rock Bolts

Rock bolts and nuts shall be manufactured from steel having a minimum tensile strength of 700 MPa. Rock bolts shall have a minimum diameter of 15 mm and a length adequate for the conditions encountered, shall have clean, well lubricated threads and shall be supplied with a nut, hardened round washer, expansion shell and a steel bolt plate not less than 100 mm x 100 mm by 6 mm in size.

415.06 EQUIPMENT

415.06.01 General

The Contractor shall ensure that all hoisting and compressed air equipment as required is installed and ready for operation before commencing tunnelling operations.

Shafts and tunnels are to be provided with electric lights of a sufficient number to ensure proper work and inspection.

415.06.02 Use of Compressed Air

Complete compressing equipment and air locks shall be provided as required to supply and control air pressure in tunnels.

Electrically driven compressors with stand-by diesel or gas driven equipment shall be provided.

Stand-by equipment for low pressure air shall be arranged so that equipment will start automatically in case of failure of the electric power supply.

Compressing equipment shall be installed in a weatherproof building insulated against sound transmission.

Compressors shall be provided that are equipped with silencers and receivers on the intake and exhaust lines.

415.07 CONSTRUCTION

415.07.01 General

The location of tunnels shall be established by the Contractor from the lines and elevations as indicated on the contract drawings.

Labour, instruments and materials shall be provided for setting out all reference points necessary to construct the tunnel and appurtenances.

The Engineer shall be provided with assistance and access necessary to check the layout of the tunnel and associated appurtenances.

415.07.02 Alignment Holes

Alignment holes shall be in place near each bend with at least one hole in a straight section between bends and at any other locations specified.

Alignment holes shall be located at the time of construction.

Alignment holes may be used for other purpose after their primary purpose is fulfilled.

A 250 mm diameter steel casing shall be place in a drilled hole over the centreline of the tunnel and used for alignment.

Casings shall be set vertically and provided with a removable steel cover plate.

After the tunnel section is completed, the casings shall be removed to the depth specified and any opening in the tunnel wall filled with concrete. The remainder of the casing and the hole shall be filled as specified in the contract.

Provision shall be made by the contractor for controlling alignment in the case of tunnels constructed under compressed air.

415.07.03 Construction Shafts

Construction shafts shall be provided at locations specified or as approved by the Engineer.

Shafts shall be maintained in a drained condition.

A 3.5 m high close boarded fence shall be installed around the perimeter of the working area with gates and truck entrances at the shafts and the fence shall be removed on completion of the work.

415.07.04 Stability of Excavation

The Contractor shall employ such construction methods, plant, procedures and precautions that will ensure that excavations are stable, free from disturbance and maintained in a drained condition.

Such construction methods may include, but are not limited to tight timber and/or steel primary liner; ground water control systems employing well points, deep wells, educators, or compressed air; free water control systems employing drains, pipes and pumps, and soil stabilization methods employing cement grouting, chemical grouting or chemical freezing.

The Contractor shall employ such construction methods, plant and materials that will prevent the migration of soil material into tunnels or shafts from adjacent ground.

415.07.05 Tunnelling

The method of tunnelling selected by the Contractor shall be reviewed with the Engineer prior to commencement of the work.

A competent superintendent, experienced in the construction of tunnels, shall supervise the work at all times.

The tunnelling method shall be modified as needed due to changing conditions which may be encountered during the progress of the work.

The tunnel is to be kept sufficiently dry at all times to permit work to be performed in a safe and satisfactory manner.

415.07.06 Dewatering

Dewatering shall conform to OPSS 517.

415.07.07 Excavated Materials

Satisfactory re-usable excavated material shall be separated from unsuitable excavated material.

415.07.08 Disposal of Materials

Unsuitable or surplus material shall be disposed off site.

Excavated material which cannot be incorporated into the work shall be disposed as specified. If the Authority cannot make use of the unwanted excavated material, arrangements for disposal sites shall be made by the Contractor.

The disposal site shall be kept stable and materials shall be dumped in a manner not to cause nuisance, injury or inconvenience until the property owner assumes responsibility under the terms of the agreement referred to in Section 415.04.

415.07.09 Primary Lining

The primary lining shall be designed to support all soil and hydrostatic pressures an to withstand any additional loads caused by grouting or jacking thrusts.

The primary liner shall be installed so that the exterior is as tight as possible to the excavated surface of the tunnel and allows the placement of the full design thickness of the secondary lining.

All voids between the primary lining and the surface of the excavation shall be filled with grout as the primary lining is placed. If a continuous liner is used, the space outside the liner plates shall be grouted at least daily.

Tunnels excavated in sound rock shall be supported in a manner that prevents scaling and unravelling of the rock and also protects from weathering or deterioration.

Where a tunnel is excavated in unstable rock the Contractor shall supply and install rock bolts or equivalent acceptable to the Engineer. The rock bolts shall be of such length and spacing that they safely sustain the tunnel crown and walls to the satisfaction of the Engineer. Rock bolts complete with hardened round washers and bolt plates shall be installed as soon as possible after the surface to be supported has been exposed and the rock has been scaled down.

415.07.10 Secondary Lining

A secondary lining of air-entrained concrete to the strength and dimensions specified shall be provided.

415.07.11 Mixing Grout

Grout shall be mixed in a mechanical mixer capable of maintaining a continuous supply of grout.

Grout shall not be left in the mixer for more than 30 minutes.

415.07.12 Placing Grout

The space outside the finished secondary liner shall be pressure grouted. Pumps for grouting shall be capable of supplying grout at a pressure of 1 MPa.

Grout holes shall be provided in the locations and at the spacings specified.

Grouting shall be done through pipes a minimum of 40 mm in diameter or through holes drilled in the finished secondary liner. The pipes shall be set at the time of placement of the concrete for the secondary liner.

Grout shall not be placed until the lining has achieved 85% of its specified strength. Grouting shall be limited to such operating pressures, sequences and programs as are necessary to avoid damaging any part of the works or any other structure or property.

415.07.13 Wiring

Separate circuits shall be installed for each lighting and power purpose.

All wires shall be installed and securely supported in shafts in waterproof conduits.

All wiring and conduits in shafts and tunnels shall be removed as directed by the Engineer.

415.07.14 Approaching Closure

Caution shall be exercised when approaching a closure while operating under compressed air.

Air pressure shall be reduced to a safe limit when closure is approached.

415.09 MEASUREMENT FOR PAYMENT

415.09.01 Actual Measurement

415.09.01.01 Tunnel

Measurement will be in metres along the centre line of the tunnel from centre to centre of manholes or chambers or from the end of the tunnel where no manhole or chamber is installed.

415.09.01.02 Rock Excavation in Tunnelling

Measurement will be in cubic metres based on the neat lines of the tunnel as shown in the Contract.

415.09.02 Plan Quantity Measurement

415.09.02.01 Tunnel

Measurement is by Plan Quantity, as may be revised by Adjusted Plan Quantity, of the length in metres along the centre line of the tunnel from centre to centre of manholes or chambers or from the end of the tunnel where no manhole or chamber is installed.

415.09.02.02 Rock Excavation in Tunnelling

Measurement is by Plan Quantity, as may be revised by Adjusted Plan Quantity of the volume in cubic metres.

415.10 BASIS OF PAYMENT

415.10.01 Tunnel - Item
Rock Excavation in Tunnelling - Item

Payment at the contract price for the above item(s) shall be full compensation for all labour, equipment and material required to do the work.

The removal of boulders having a volume in excess of 0.5 cubic metres will be paid for as extra work.

Payment for connecting intercepted drains and service connections into the tunnel shall be made on the following basis:

a) Where such drains and service connections are shown on the Contract Drawings the cost of connections shall be included in the Contractor's bid price for the tender item "Tunnel".

b) Where such drains and service connections are not shown on the Contract Drawings the cost of connections will be considered as a Change in the Work.

OPSS.PROV 416 - Apr 2025

COMMON to PROV conversion with SSP 416S01 rolled-in and canceled.

Ontario Provincial Standard Specifications (OPSSs)					
416	February 1990	April 2025	TBD	Rev: Construction Specification for Jacking and Boring is implemented. The specification has been converted from the February 1990 COMMON to a PROV with no technical content changes. Applicable content from SSP 416S01 has been incorporated into OPSS 416.	Mike Pearsall
Standard Special Provisions (SSPs)					
416S01	March 2012	April 2025	TBD	Can: SSP Amendment to Construction Specification for Jacking and Boring is cancelled. Applicable content has been incorporated into OPSS 416.	Mike Pearsall

ONTARIO
PROVINCIAL
STANDARD
SPECIFICATION

~~METRIC~~
OPSS.PROV 416
~~FEBRUARY 1990~~APRIL 2025

Note: The 416 implemented in April 2025 replaces 416, February 1990 with no technical content changes.

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416415.10 BASIS OF PAYMENT

~~416.10.01 Jacking and Boring – Item~~

416.01 SCOPE

This specification covers the requirements for the installation of pipes by jacking and boring methods.

416.02 REFERENCES

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

Ontario Provincial Standard Specifications, Construction:

OPSS 517 Dewatering

Ontario Provincial Standard Specifications, Material:

OPSS 1004 Aggregates - Miscellaneous
OPSS 1820 Concrete Pipe

American Water Works Association:

AWWA C200-80 Steel Water Pipe 6 Inches and Larger
AWWA C206-82 Field Welding of Steel Water Pipe

Canadian Standards Association:

CAN/CSA-A5-M88 Portland Cement

416.04 DESIGN AND SUBMISSION ~~AND DESIGN~~ REQUIREMENTS

Plans shall be submitted showing proposed locations of shafts, pits or approach tunnels, and details of the proposed method, materials and equipment to be used, at least two weeks prior to commencement of the work.

Design assumptions and material data shall be submitted for review by the Engineer, when materials other than those specified are proposed for use.

A written agreement regarding the disposal site setting out the terms, conditions and ultimate responsibility for the materials as placed, shall be obtained from the property owner and submitted to the Engineer.

416.05 MATERIALS

416.05.01 Pipe Materials

Concrete pipe shall conform to OPSS 1820.

Steel pipe shall conform to AWWA C200 with welded joints.

416.05.02 Cement Grout

Grout shall consist of a mixture of one part Portland cement conforming to CAN/CSA-A5-M88 and two parts mortar sand conforming to OPSS 1004 wetted with only sufficient water to make the mixture plastic.

416.07 CONSTRUCTION

416.07.01 Method of Installation

Method of installation to be used by the Contractor shall be reviewed with the Engineer prior to commencing the work and shall be subject to the following limitations.

a.) Only smooth walled steel or concrete pipe shall be used.

b.) Hydraulically operated jacks in adequate number and capacity shall be provided to ensure smooth and uniform advancement without overstressing of the pipe.

c.) A jacking head shall be provided to transfer and distribute jacking pressure uniformly over the entire end bearing area of the pipe. In the case of concrete pipe, the jacking head shall be suitably padded.

d.) Two or more lubricated guide rails or sills shall be provided of sufficient length to fully support the pipe at the specified line and grade in the jacking pit.

416.07.02 Construction Shafts

Construction shafts shall be provided at the downstream end at the locations specified.

Shafts shall be maintained in a drained condition.

A 3.5 m high close boarded fence shall be installed around the perimeter of the working area with gates and truck entrances at the shafts and the fence shall be removed on completion of the work.

416.07.03 Dewatering

Dewatering shall conform to OPSS 517.

416.07.04 Pipe Installation

Pipe shall be installed to the line and grade specified.

Long delays shall be avoided between jacking operations.

Butt welding of pipe joints shall conform to AWWA C 206 when steel pipe is used.

The space between concrete pipe and the wall of the excavation shall be kept filled with a bentonite slurry.

Joints shall be protected from crushing by placing 15 mm thick plywood on spigot shoulder. The plywood shall be cut to form a ring with the outer surface conforming to the outer circumference of the pipe.

416.07.05 Grouting

All voids remaining between the pipe and the excavation wall shall be grouted as soon as the pipe is jacked.

416.07.06 Excavated Materials

Satisfactory re-usable excavated material required for backfill shall be separated from unsuitable excavated material.

416.07.07 Disposal of Materials

Unsuitable or surplus material shall be disposed off site.

Excavated material which cannot be incorporated into the work shall be disposed as specified. If the Authority cannot make use of the unwanted excavated material, arrangements for disposal sites shall be made by the Contractor.

The disposal site shall be kept stable and materials shall be dumped in a manner not to cause nuisance, injury or inconvenience until the property owner assumes responsibility under the terms of the agreement referred to in Section 416.04.

416.09 MEASUREMENT FOR PAYMENT

416.09.01 Actual Measurement

416.09.01.01 Jacking and Boring

Measurement will be in metres along the centre line of the pipe from centre to centre of manholes or chambers or from the end of the pipe where no manhole or chamber is installed.

416.09.02 Plan Quantity Measurement

416.09.02.01 Jacking and Boring

Measurement is by Plan Quantity, as may be revised by Adjusted Plan Quantity, of the length in metres along the centre line of the pipe from centre to centre of manholes or chambers or from the end of the pipe where no manhole or chamber is installed.

416.10 BASIS OF PAYMENT

416.10.01 Jacking and Boring - Item

Payment at the contract price for the above item shall be full compensation for all labour, equipment and material required to do the work.

The removal of boulders having a volume in excess of 0.5 cubic metres will be paid for as extra work.

Payment for connecting intercepted drains and service connections into the jacked and bored pipe shall be made on the following basis:

a) Where such drains and service connections are shown on the Contract Drawings the cost of connections shall be included in the Contractor's bid price for the Jacking and Boring tender item.

b) Where such drains and service connections are not shown on the Contract Drawings the cost of connections will be considered as a Change in the Work.

Note: The 416 implemented in April 2025 replaces 416, February 1990 with no technical content changes.

CONSTRUCTION SPECIFICATION FOR JACKING AND BORING

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416.05 MATERIALS

416.06 EQUIPMENT - Not Used

416.07 CONSTRUCTION

415.08 QUALITY ASSURANCE - Not Used

415.09 MEASUREMENT FOR PAYMENT

415.10 BASIS OF PAYMENT

416.01 SCOPE

This specification covers the requirements for the installation of pipes by jacking and boring methods.

416.02 REFERENCES

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

Ontario Provincial Standard Specifications, Construction:

OPSS 517 Dewatering

Ontario Provincial Standard Specifications, Material:

OPSS 1004 Aggregates - Miscellaneous
OPSS 1820 Concrete Pipe

American Water Works Association:

AWWA C200-80 Steel Water Pipe 6 Inches and Larger
AWWA C206-82 Field Welding of Steel Water Pipe

Canadian Standards Association:

CAN/CSA-A5-M88 Portland Cement

416.04 DESIGN AND SUBMISSION REQUIREMENTS

Plans shall be submitted showing proposed locations of shafts, pits or approach tunnels, and details of the proposed method, materials and equipment to be used, at least two weeks prior to commencement of the work.

Design assumptions and material data shall be submitted for review by the Engineer, when materials other than those specified are proposed for use.

A written agreement regarding the disposal site setting out the terms, conditions and ultimate responsibility for the materials as placed, shall be obtained from the property owner and submitted to the Engineer.

416.05 MATERIALS

416.05.01 Pipe Materials

Concrete pipe shall conform to OPSS 1820.

Steel pipe shall conform to AWWA C200 with welded joints.

416.05.02 Cement Grout

Grout shall consist of a mixture of one part Portland cement conforming to CAN/CSA-A5-M88 and two parts mortar sand conforming to OPSS 1004 wetted with only sufficient water to make the mixture plastic.

416.07 CONSTRUCTION

416.07.01 Method of Installation

Method of installation to be used by the Contractor shall be reviewed with the Engineer prior to commencing the work and shall be subject to the following limitations.

a) Only smooth walled steel or concrete pipe shall be used.

b) Hydraulically operated jacks in adequate number and capacity shall be provided to ensure smooth and uniform advancement without overstressing of the pipe.

c) A jacking head shall be provided to transfer and distribute jacking pressure uniformly over the entire end bearing area of the pipe. In the case of concrete pipe, the jacking head shall be suitably padded.

d) Two or more lubricated guide rails or sills shall be provided of sufficient length to fully support the pipe at the specified line and grade in the jacking pit.

416.07.02 Construction Shafts

Construction shafts shall be provided at the downstream end at the locations specified.

Shafts shall be maintained in a drained condition.

A 3.5 m high close boarded fence shall be installed around the perimeter of the working area with gates and truck entrances at the shafts and the fence shall be removed on completion of the work.

416.07.03 Dewatering

Dewatering shall conform to OPSS 517.

416.07.04 Pipe Installation

Pipe shall be installed to the line and grade specified.

Long delays shall be avoided between jacking operations.

Butt welding of pipe joints shall conform to AWWA C 206 when steel pipe is used.

The space between concrete pipe and the wall of the excavation shall be kept filled with a bentonite slurry.

Joints shall be protected from crushing by placing 15 mm thick plywood on spigot shoulder. The plywood shall be cut to form a ring with the outer surface conforming to the outer circumference of the pipe.

416.07.05 Grouting

All voids remaining between the pipe and the excavation wall shall be grouted as soon as the pipe is jacked.

416.07.06 Excavated Materials

Satisfactory re-usable excavated material required for backfill shall be separated from unsuitable excavated material.

416.07.07 Disposal of Materials

Unsuitable or surplus material shall be disposed off site.

Excavated material which cannot be incorporated into the work shall be disposed as specified. If the Authority cannot make use of the unwanted excavated material, arrangements for disposal sites shall be made by the Contractor.

The disposal site shall be kept stable and materials shall be dumped in a manner not to cause nuisance, injury or inconvenience until the property owner assumes responsibility under the terms of the agreement referred to in Section 416.04.

416.09 MEASUREMENT FOR PAYMENT

416.09.01 Actual Measurement

416.09.01.01 Jacking and Boring

Measurement will be in metres along the centre line of the pipe from centre to centre of manholes or chambers or from the end of the pipe where no manhole or chamber is installed.

416.09.02 Plan Quantity Measurement

416.09.02.01 Jacking and Boring

Measurement is by Plan Quantity, as may be revised by Adjusted Plan Quantity, of the length in metres along the centre line of the pipe from centre to centre of manholes or chambers or from the end of the pipe where no manhole or chamber is installed.

416.10 BASIS OF PAYMENT

416.10.01 Jacking and Boring - Item

Payment at the contract price for the above item shall be full compensation for all labour, equipment and material required to do the work.

The removal of boulders having a volume in excess of 0.5 cubic metres will be paid for as extra work.

Payment for connecting intercepted drains and service connections into the jacked and bored pipe shall be made on the following basis:

a) Where such drains and service connections are shown on the Contract Drawings the cost of connections shall be included in the Contractor's bid price for the Jacking and Boring tender item.

b) Where such drains and service connections are not shown on the Contract Drawings the cost of connections will be considered as a Change in the Work.

OPSS.PROV 760 - Apr 2025

COMMON to PROV conversion
Engineer Definition Removed – Defined in MTO GCs
SSP 760F01 standard information rolled-in. Leftover fill-in SSP updated to reflect new PROV version.

Ontario Provincial Standard Specifications (OPSSs)					
760	November 2014	April 2025	TBD	Rev: Construction Specification for Noise Barrier Systems is implemented. The specification has been converted from the November 2014 COMMON to a PROV with no technical content changes. Applicable content from SSP 760F01 has been incorporated into OPSS 760.	Mike Pearsall
Standard Special Provisions (SSPs)					
760F01	March 2018	April 2025	TBD	Rev: SSP Amendment to Construction Specification for Noise Barrier Systems is administratively revised. Applicable standard content has been incorporated into OPSS 760.	Mike Pearsall

Note: The 760 implemented in April 2025 replaces 760, November 2014 with no technical content changes.

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~~760-A Commentary~~

760.01 SCOPE

This specification covers the requirements for the installation of noise barrier systems.

~~760.01.01 Specification Significance and Use~~

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

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

~~**760.01.02 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.~~

760.02 REFERENCES

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

~~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, Construction

OPSS 206	Grading
OPSS 501	Compacting
OPSS 510	Removal
OPSS 609	Grounding
OPSS 904	Concrete Structures
OPSS 906	Structural Steel for Bridges

Ontario Provincial Standard Specifications, Material

OPSS 1350	Concrete - Materials and Production
OPSS 1440	Steel Reinforcement for Concrete

MTO Forms:

PH-CC-701	Request to Proceed
PH-CC-702	Notice to Proceed

CSA Standards

S6-06 Canadian Highway Bridge Design Code

ASTM International

~~A 123/A 123M~~A123/A123M-13 Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
~~A 780/ A 780M~~A780/A780M-09 Repair of Damaged and Uncoated Areas of Hot Dip Galvanized Coatings
~~B 209~~B209-10 Aluminum and Aluminum-Alloy Sheet and Plate

760.03 DEFINITIONS

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

~~**Engineer** means a professional engineer licensed by the Professional Engineers Ontario to practice in the Province of Ontario.~~

Manufacturer means the party that supplies and/or specifies the design, materials, and components for the proprietary noise barrier system selected by the Contractor.

760.04 DESIGN AND SUBMISSION REQUIREMENTS

760.04.01 Design Requirements

Noise barrier system design shall be as specified in the Contract Documents and according to the manufacturer's specifications.

760.04.01.01 Footings

760.04.01.01.01 General

Depth of footings shall be according to CAN/CSA S6 and based on the soil design parameters and wind load as specified in the Contract Documents.

760.04.01.01.02 Footings in Earth

When footings are to be installed on or within 1 m from a downward slope of 3H:1V or steeper, the Working Drawings shall reflect this and shall note an increase in embedment depth of a minimum of 0.5 m greater than the requirements specified in CAN/CSA S6.

760.04.01.01.03 Footing in Rock

When rock is encountered within the specified excavation depth for footings in earth, the footing shall be designed and constructed according to the Footings in Earth clause based on soil properties and wind load as specified in the Contract Documents. ~~-~~Alternatively, the design depth into rock shall be designed based on rock properties provided by the Owner. ~~-~~The minimum design depth below final grade shall not be less than 1.5 m or to the frost depth, whichever is the greater.

760.04.02 Submission Requirements

760.04.02.01 Working Drawings

The Contractor shall submit 6 copies of Working Drawings for the noise barrier system to the Contract Administrator at least 4 weeks prior to the commencement of construction. The Working Drawings shall show full details of noise barrier related items, erection procedures and, if applicable, connections to structures. An Engineer's seal and signature shall be affixed on the Working Drawings verifying that the drawings are consistent with the Contract Documents.

760.05 MATERIALS

760.05.01 General

All components for noise barrier systems shall be according to the manufacturer's specifications and as specified in the Contract Documents.

760.05.02 Granular Materials

Granular material shall be as specified in the Contract Documents.

760.05.03 Footings

Cast-in-place concrete in footings shall be according to OPSS 1350 with a nominal minimum 28-Day compressive strength of 30 MPa.

760.05.04 Steel Reinforcement

Steel reinforcement for the footings shall be according to OPSS 1440.

760.07 CONSTRUCTION

760.07.01 General

Noise barrier systems shall be installed according to manufacturer's specifications at locations specified in the Contract Documents.

760.07.02 Site Grading and Preparation

Grading and berm construction associated with the barrier installation shall be completed to within 25 mm below the bottom of the barrier prior to constructing the barrier footings. Grading up to 300 mm shall be part of installation of noise barrier system.

All grading shall be according to OPSS 206.

Earth and granular materials shall be compacted according to OPSS 501.

There shall be no visible gaps between any barrier panels or beneath the bottom panels after completion of the barrier.

Tree pruning and removal shall be kept to a minimum and shall be subject to the approval of the Contract Administrator prior to the commencement of any pruning and removal.

760.07.03 Footings

Concrete shall be according to OPSS 904.

Concrete for drilled footings shall be cast entirely against undisturbed soil.

For other footings, the footing shall be formed and the excavation shall be backfilled with granular materials and compacted to at least 95% standard Proctor maximum dry density.

When required, the top of all footings shall be shaped to provide for full horizontal seating of panels and the remaining surface area shall be sloped away from the post to shed water. Stepped footings shall be constructed to suit grade changes.

Concrete in the footings shall be cured to meet design strength as specified by the Engineer prior to the installation of noise barrier panels.

All excavations into rock shall be backfilled entirely with concrete. Excavation above the top of rock shall be formed to the required dimensions and the remainder of the excavation backfilled with granular material.

760.07.04 Posts

Structural steel posts shall be according to OPSS 906.

Steel posts and components shall be hot dip galvanized after fabrication according to ASTM A123. Galvanized surfaces that are abraded shall be cleaned and painted with a zinc-rich paint according to ASTM A780.

The top of footing and underside of post base plate shall be filled with non-shrink grout according to the manufacturer's specifications.

Tolerance for post plumb shall be according to the manufacturer's specifications.

760.07.05 Panels

Panels shall be installed horizontally and stepped when necessary to match the elevation profile specified on the Working Drawings. Changes in horizontal direction shall be made using special arrangements of the posts according to the manufacturer's specifications.

All panels shall be cleaned of any oils, dirt, and debris.

760.07.06 Noise Barriers on Structures

Noise barrier system shall be attached to the structure as specified in the Contract Documents.

Flashing shall be installed and sealed in a manner so that water will not pond on the structure according to the manufacturer's specifications.

760.07.07 Precast Noise and Traffic Barriers

Precast noise or traffic barrier units or both shall be constructed to the line and grades as specified in the Contract Documents with a tolerance of ±10 mm.

When changes in horizontal alignment are greater than 2° or when changes in vertical alignment are greater than 2% between adjacent units occur, the ends of the units shall be manufactured with the appropriate skewed end detail. Units required to match ground profiles with grades in excess of 2% shall be manufactured with skewed ends to match the vertical post detail. The space between each unit on the traffic side surface shall not exceed 25 mm at the base of the traffic barrier. The difference in elevation between adjacent units shall not exceed 25 mm. Any levelling or plumbing of units shall be done according to the manufacturer's specifications.

Granular base for the precast noise or traffic barrier units or both shall be placed in a manner to ensure that there are no voids between the bottom surface of units and the granular material and that the units are set to the correct line and grades.

Precast noise or traffic barrier units or both shall be set according to the manufacturer's specifications. Top of footings shall be clear of foreign material, ice, snow, or water.

Precast noise or traffic barrier units or both shall be positioned to have complete contact with the post flange along the traffic side of the units.

Top of the noise or traffic barrier units or both shall be cleared of any foreign or loose material, ice, snow, or water prior to installing the noise barrier panels.

The point of contact between the top of the precast noise or traffic unit or both and the bottom of the noise barrier panels shall be sealed according to manufacturer's specifications.

760.07.08 Noise Barrier Access Openings

Openings, frames, doors, and hardware for noise barrier access shall be supplied and installed in accordance with the manufacturer's Working Drawings and installation instructions at the locations and of the types specified in the Contract Documents.

Openings shall be cut a minimum distance of 1,000 mm from the centerline of the noise barrier post to the centerline of the opening.

The centre of fire hose access openings shall be located within the range of 1,300 to 1,500 mm measured from the finished ground surface.

Standard opening sizes for fire hose access and person door access are shown in Table 1. Dimensions and details for all other access opening types including, but not limited to electrical access, vehicle access, and hydraulic access are as specified in the Contract Documents. The openings shall meet the specified dimensions and shall be centred between adjacent posts.

Each noise barrier access opening shall be fitted with a hinged door that opens away from the roadway to a minimum opening angle of 110º.

When doors are in the closed position, there shall be no impact to the acoustical characteristics of the noise barrier system. All gaps between openings and frames shall be sealed to ensure that there are no gaps.

760.07.09 Connection to Existing Fence

When sections of an existing parallel or cross fence are to be removed or replaced or both with a noise barrier system, the Contractor shall ensure that a sufficient length of existing fence is maintained in good condition to adequately allow for connection to a new post at locations shown in the Contract Documents.

Removal of any fence shall be according to OPSS 510.

760.07.10 Underground Utility and Drainage Crossings

Reduced post spacing shall be allowed according to the manufacturer's specifications to avoid placing posts on top of utilities and drainage facilities.

760.07.11 Existing Overhead High Voltage Lines

When the potential of arcing exists due to the close proximity of existing overhead high voltage lines, steel noise barrier panels and posts shall be grounded according to OPSS 609.

760.07.12 Marking

Identification plates, provided by the manufacturer, shall be attached to the completed noise barrier system at the following intervals:

a) At the start and end of noise barrier system.

b) At a maximum interval of 300 m.

The identification plate shall be located within 300 mm of a terminal post with the top of the plate located approximately 1.2 m above the ground. The maximum dimensions of the plate shall be 200 by 200 mm. The plate shall be made from 0.81 mm thick anodized aluminum sheet according to ASTM B 209 series 1100 or 5005-H34.

Each plate shall be engraved with the following information:

a) Contract number.

b) Name of manufacturer of noise barrier system.

c) Name of Subcontractor that installed the noise barrier system.

d) Date of completed installation (i.e., yyyy-mm).

The height of the letters and numerals shall be within the range of 6 to 32 mm.

760.07.13 Quality Control

760.07.13.01 Inspection before Installation of Noise Barrier Panels

A Request to Proceed shall be submitted to the Contract Administrator after the construction of the noise barrier footings and posts and prior to the installation of the noise barrier panels.

The installation of the noise barrier panels shall not proceed until a Notice to Proceed has been received from the Contract Administrator.

760.07.13.02 Inspection after Installation of Noise Barrier System

A Certificate of Conformance shall be submitted to the Contract Administrator upon completion of the installation of the noise barrier system.

760.07.14 Site Restoration

After noise barrier system installation, the site shall be cleaned and trimmed and the ground restored to a neat condition.

760.07.15 Management of Excess Material

Management of excess material shall be according to the Contract Documents.

760.08 QUALITY ASSURANCE

760.08.01 Construction

Noise barrier components damaged in transit or during placement shall be replaced by the Contractor at no cost to the Owner.

The Contractor shall install noise barrier materials that are visually uniform in appearance in terms of colour, pattern, and texture. Uniformity of appearance is subject to approval of the Contract Administrator. Noise barrier panels shall visually match adjacent panels. Inspection shall occur at a distance of approximately 15 metres from the noise barrier system.

Final inspection of the complete noise barrier system shall not be made until it has been installed.

760.09 MEASUREMENT FOR PAYMENT

760.09.01 Actual Measurement

760.09.01.01 Noise Barrier System
Noise Barrier System Including Precast Noise/Traffic Barrier
Noise Barrier System on Structures

Measurement of noise barrier system shall be along the horizontal length in metres of the specified height. Transitions between barrier heights shall form part of the higher barrier and terminations shall form part of the adjoining barrier.

At the discretion of the Contract Administrator, if unidentified difficult soil conditions (i.e., rock, shale, or unstable earth) are encountered above the design footing depths, work necessary to complete the design requirements such as caissons, dewatering, additional concrete, or different augering equipment, shall be paid for as Additional Work.

760.09.01.02 Noise Barrier Access

For measurement purposes, a count shall be made of the number of accesses installed.

760.09.02 Plan Quantity Measurement

When measurement is by Plan Quantity, such measurement shall be based on the units shown in the clauses under Actual Measurement.

760.10 BASIS OF PAYMENT

760.10.01 *"height"* Noise Barrier System - Item
***"height"* Noise Barrier System Including Precast Noise/Traffic Barrier - Item**
***"height"* Noise Barrier System on Structures - Item**
Noise Barrier Access - Item

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

Grading up to 300 mm shall be included as part of the noise barrier system item. For earth grading requirements greater than 300 mm, the full grading is provided under the earth excavation item.

760.10.02 Removals and Replacements

Cost associated with any required removals and replacements of defective workmanship or materials shall be the Contractor's responsibility at no cost to the Owner.

TABLE 1
Noise Barrier Access Standard Opening Sizes

Type of Door / Opening	Opening Size (W mm x H mm)
Fire Hose Access	254 x 254
Person Door Access	915 x 2438

Appendix 760-A, November 2014
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:

- Noise barrier system design requirements should include the following: (760.04.01)

a) Acoustics

The noise barrier system shall be designed for one of the following acoustical characteristic:

i. Either sound absorptive or reflective
ii. Sound absorptive on the highway side
iii. Sound absorptive on the residential side
iv. Sound absorptive on both sides.

If more than one acoustical characteristic apply to this Contract for various sections, then each section shall be designed accordingly with clearly defined limits.

b) Height

The designer shall select an appropriate height according to the acoustical requirements, which shall not be more than 5 metres.

c) Aesthetics

The designer shall plan the number of colours and textures for the Contract. The designer shall also specify the patterns and proportions in which each is required. The exact colour, texture, and pattern for the noise barrier system shall be specified following the award of the Contract, but will be within the following parameters:

The number of colours adjacent to highway is _____;

in the proportion of: _____ _____ _____ _____

The number of textures is _____;

in the proportion of: _____ _____ _____ _____

The number of colours adjacent to residential property is _____;

in the proportion of: _____ _____ _____ _____

The number of textures is: _____;

in the proportion of: _____ _____ _____ _____

Appendix 760-A

Final colour selections shall be determined by the Contract Administrator at the point of manufacture from samples prepared by the manufacturer.

If only one colour and texture are to be used, the noise barrier shall be constructed using only one colour and texture, which shall be specified by the Contract Administrator following the award of the Contract. Final colour selection shall be determined at the point of manufacture from samples prepared by the manufacturer.

d) Noise Barrier Access

The designer should provide station and offset (Lt. or Rt.) locations for all required barrier access points and indicate the type of access opening required at each location. Opening sizes for fire hose access and person access are standard. Opening sizes for other types of access including, but not limited to electrical access, vehicle access, and hydraulic access are site specific and should be specified by location and opening size.

- Soil design parameters and wind loads for footings should include the following: (760.04.01.01.01)

a) Footings

The designer shall design the noise barrier system footings according to CAN/CSA S6 with the assistance of soil design parameters. The designer shall also provide the soil design parameters as per the example below.

Station to Station	Soil Design Parameter
East Bound Lane 17+320 to 17+790 (shoulder)	Ø = 28º
West Bound Lanes 17+100 to 17+600 (ROW) 17+600 to 17+720 (ROW) 17+700 to 18+050 (shoulder)	Ø = 28º Cu = 12 Kpa Ø = 28º

b) Wind Pressure

The wind pressure information shall be used from CAN/CSA S6 for the city where the project is located (e.g., 415 Pa for Hamilton area).

- Noise barrier system material requirements. (760.05.01)

- Granular material to be used. (760.05.02)

- Noise barrier system locations. (760.07.01)

- Attachment requirements for noise barrier system to structure. (760.07.06)

- Line and grade specifications for precast noise/traffic barrier units. (760.07.07)

- Noise barrier access opening requirements. (760.07.08)

Appendix 760-A

- Locations where noise barrier system connects to existing fence.

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.

***"height"* NOISE BARRIER SYSTEM - Item No.**
***"height"* NOISE BARRIER SYSTEM INCLUDING PRECAST NOISE/TRAFFIC BARRIER - Item No.**
***"height"* NOISE BARRIER SYSTEM ON STRUCTURES - Item No.**
NOISE BARRIER ACCESS - Item No.

Special Provision No. 760F01 ~~March 2018~~April 2025

Amendment to OPSS 760, ~~November 2014~~April 2025

~~**760.03 DEFINITIONS**~~

~~Section 760.03 of OPSS 760 is amended by the deletion of the definitions for **Certificate of Conformance** and **Quality Verification Engineer**.~~

760.04 DESIGN AND SUBMISSION REQUIREMENTS

760.04.01 Design Requirements

760.04.01.01 Footings

760.04.01.01.01 General

Clause 760.04.01.01.01 of OPSS 760 is amended by the addition of the following paragraph:

The soil design parameters for the design of footings shall be as specified in Table A: ~~[* Designer Fill-In for Table A, See Notes to Designer].~~

Table A
Soil Design Parameters

Location	Soil Design Parameter
*	*
*	*

[* Designer Fill-In for Table A, See Notes to Designer].

Subsection 760.04.01 of OPSS 760 is amended by the addition of the following clauses:

760.04.01.02 Wind Load

The wind load applied for the design of structure shall be:

[** Designer Fill-In, See Notes to Designer].

760.04.01.03 Acoustics

The minimum acoustical characteristic of the noise barrier system shall be such that the noise barrier is:

[*** Designer Fill-In, See Notes to Designer].

760.04.01.04 Aesthetics

The colour and texture for the noise barrier system shall be within the following parameters:

Number of colours adjacent to highway: [**** Designer Fill-in – See Notes to Designer]

in the proportion of _____ _____ _____ _____

Number of textures _____

in the proportion of _____ _____ _____ _____

Number of colours adjacent to residential property: [**** Designer Fill-In, See Notes to Designer].

in the proportion of _____ _____ _____ _____

Number of textures _____

in the proportion of _____ _____ _____ _____

Final colour selections shall be determined by the Contract Administrator at the point of manufacture from samples prepared by the manufacturer.

If only one colour and texture are specified, the noise barrier shall be constructed using the colour and texture specified by the Contract Administrator following the award of the Contract. Final colour selection shall be determined at the point of manufacture from samples prepared by the manufacturer.

~~**760.07 CONSTRUCTION**~~

~~**760.07.13 Quality Control**~~

~~**760.07.13.01 Interim Inspection of Footings and Posts**~~

~~Clause 760.07.13.01 of OPSS 760 is deleted in its entirety and replaced with the following:~~

~~**760.07.13.01 Inspection before Installation of Noise Barrier Panels**~~

~~A Request to Proceed shall be submitted to the Contract Administrator after the construction of the noise barrier footings and posts and prior to the installation of the noise barrier panels~~

~~The installation of the noise barrier panels shall not proceed until a Notice to Proceed has been received from the Contract Administrator.~~

~~**760.07.13.02 Certificate of Conformance**~~

~~Clause 760.07.13.02 of OPSS 760 is deleted in its entirety and replaced by the following:~~

~~**760.07.13.02 Inspection after Installation of Noise Barrier System**~~

~~A Certificate of Conformance shall be submitted to the Contract Administrator upon completion of the installation of the noise barrier system.~~

NOTES TO DESIGNER:

* Insert station to station limits and soil design parameters in Table A as per the example below:

Example

Location	Soil Design Parameter
East Bound Lane 17+320 to 17+790 (shoulder)	Ø = 28º
West Bound Lanes 17+100 to 17+600 (ROW) 17+600 to 17+720 (ROW) 17+700 to 18+050 (shoulder)	Ø = 28º Cu = 12 Kpa Ø = 28º

** Insert the reference wind load along with its respective area or city (e.g., 415 Pa for Hamilton area).

*** Insert one of the following acoustical characteristics:

- Either sound absorptive or reflective
- Sound absorptive on the highway side
- Sound absorptive on the residential side
- Sound absorptive on both sides.

If more than one acoustical characteristic applies to this Contract, each section shall be designed accordingly with clearly defined limits.

**** Insert the number of colours planned for this contract, the proportions in which each are required, the number of textures if applicable and their proportions of the total noise barrier area in the locations specified.

WARRANT: Always with these tender items.

Note: The 760 implemented in April 2025 replaces 760, November 2014 with no technical content changes.

CONSTRUCTION SPECIFICATION FOR NOISE BARRIER SYSTEMS

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760.09 MEASUREMENT FOR PAYMENT

760.10 BASIS OF PAYMENT

760.01 SCOPE

This specification covers the requirements for the installation of noise barrier systems.

760.02 REFERENCES

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

Ontario Provincial Standard Specifications, Construction

OPSS 206 Grading
OPSS 501 Compacting
OPSS 510 Removal
OPSS 609 Grounding
OPSS 904 Concrete Structures
OPSS 906 Structural Steel for Bridges

Ontario Provincial Standard Specifications, Material

OPSS 1350 Concrete - Materials and Production
OPSS 1440 Steel Reinforcement for Concrete

MTO Forms:
PH-CC-701 Request to Proceed
PH-CC-702 Notice to Proceed

CSA Standards

S6-06 Canadian Highway Bridge Design Code

ASTM International

A123/A123M-13 Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
A780/A780M-09 Repair of Damaged and Uncoated Areas of Hot Dip Galvanized Coatings
B209-10 Aluminum and Aluminum-Alloy Sheet and Plate

760.03 DEFINITIONS

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

Manufacturer means the party that supplies and/or specifies the design, materials, and components for the proprietary noise barrier system selected by the Contractor.

760.04 DESIGN AND SUBMISSION REQUIREMENTS

760.04.01 Design Requirements

Noise barrier system design shall be as specified in the Contract Documents and according to the manufacturer's specifications.

760.04.01.01 Footings

760.04.01.01.01 General

Depth of footings shall be according to CAN/CSA S6 and based on the soil design parameters and wind load as specified in the Contract Documents.

760.04.01.01.02 Footings in Earth

When footings are to be installed on or within 1 m from a downward slope of 3H:1V or steeper, the Working Drawings shall reflect this and shall note an increase in embedment depth of a minimum of 0.5 m greater than the requirements specified in CAN/CSA S6.

760.04.01.01.03 Footing in Rock

When rock is encountered within the specified excavation depth for footings in earth, the footing shall be designed and constructed according to the Footings in Earth clause based on soil properties and wind load as specified in the Contract Documents. Alternatively, the design depth into rock shall be designed based on rock properties provided by the Owner. The minimum design depth below final grade shall not be less than 1.5 m or to the frost depth, whichever is the greater.

760.04.02 Submission Requirements

760.04.02.01 Working Drawings

The Contractor shall submit 6 copies of Working Drawings for the noise barrier system to the Contract Administrator at least 4 weeks prior to the commencement of construction. The Working Drawings shall show full details of noise barrier related items, erection procedures and, if applicable, connections to structures. An Engineer's seal and signature shall be affixed on the Working Drawings verifying that the drawings are consistent with the Contract Documents.

760.05 MATERIALS

760.05.01 General

All components for noise barrier systems shall be according to the manufacturer's specifications and as specified in the Contract Documents.

760.05.02 Granular Materials

Granular material shall be as specified in the Contract Documents.

760.05.03 Footings

Cast-in-place concrete in footings shall be according to OPSS 1350 with a nominal minimum 28-Day compressive strength of 30 MPa.

760.05.04 Steel Reinforcement

Steel reinforcement for the footings shall be according to OPSS 1440.

760.07 CONSTRUCTION

760.07.01 General

Noise barrier systems shall be installed according to manufacturer's specifications at locations specified in the Contract Documents.

760.07.02 Site Grading and Preparation

Grading and berm construction associated with the barrier installation shall be completed to within 25 mm below the bottom of the barrier prior to constructing the barrier footings. Grading up to 300 mm shall be part of installation of noise barrier system.

All grading shall be according to OPSS 206.

Earth and granular materials shall be compacted according to OPSS 501.

There shall be no visible gaps between any barrier panels or beneath the bottom panels after completion of the barrier.

Tree pruning and removal shall be kept to a minimum and shall be subject to the approval of the Contract Administrator prior to the commencement of any pruning and removal.

760.07.03 Footings

Concrete shall be according to OPSS 904.

Concrete for drilled footings shall be cast entirely against undisturbed soil.

For other footings, the footing shall be formed and the excavation shall be backfilled with granular materials and compacted to at least 95% standard Proctor maximum dry density.

When required, the top of all footings shall be shaped to provide for full horizontal seating of panels and the remaining surface area shall be sloped away from the post to shed water. Stepped footings shall be constructed to suit grade changes.

Concrete in the footings shall be cured to meet design strength as specified by the Engineer prior to the installation of noise barrier panels.

All excavations into rock shall be backfilled entirely with concrete. Excavation above the top of rock shall be formed to the required dimensions and the remainder of the excavation backfilled with granular material.

760.07.04 Posts

Structural steel posts shall be according to OPSS 906.

Steel posts and components shall be hot dip galvanized after fabrication according to ASTM A123. Galvanized surfaces that are abraded shall be cleaned and painted with a zinc-rich paint according to ASTM A780.

The top of footing and underside of post base plate shall be filled with non-shrink grout according to the manufacturer's specifications.

Tolerance for post plumb shall be according to the manufacturer's specifications.

760.07.05 Panels

Panels shall be installed horizontally and stepped when necessary to match the elevation profile specified on the Working Drawings. Changes in horizontal direction shall be made using special arrangements of the posts according to the manufacturer's specifications.

All panels shall be cleaned of any oils, dirt, and debris.

760.07.06 Noise Barriers on Structures

Noise barrier system shall be attached to the structure as specified in the Contract Documents.

Flashing shall be installed and sealed in a manner so that water will not pond on the structure according to the manufacturer's specifications.

760.07.07 Precast Noise and Traffic Barriers

Precast noise or traffic barrier units or both shall be constructed to the line and grades as specified in the Contract Documents with a tolerance of ±10 mm.

When changes in horizontal alignment are greater than 2° or when changes in vertical alignment are greater than 2% between adjacent units occur, the ends of the units shall be manufactured with the appropriate skewed end detail. Units required to match ground profiles with grades in excess of 2% shall be manufactured with skewed ends to match the vertical post detail. The space between each unit on the traffic side surface shall not exceed 25 mm at the base of the traffic barrier. The difference in elevation between adjacent units shall not exceed 25 mm. Any levelling or plumbing of units shall be done according to the manufacturer's specifications.

Granular base for the precast noise or traffic barrier units or both shall be placed in a manner to ensure that there are no voids between the bottom surface of units and the granular material and that the units are set to the correct line and grades.

Precast noise or traffic barrier units or both shall be set according to the manufacturer's specifications. Top of footings shall be clear of foreign material, ice, snow, or water.

Precast noise or traffic barrier units or both shall be positioned to have complete contact with the post flange along the traffic side of the units.

Top of the noise or traffic barrier units or both shall be cleared of any foreign or loose material, ice, snow, or water prior to installing the noise barrier panels.

The point of contact between the top of the precast noise or traffic unit or both and the bottom of the noise barrier panels shall be sealed according to manufacturer's specifications.

760.07.08 Noise Barrier Access Openings

Openings, frames, doors, and hardware for noise barrier access shall be supplied and installed in accordance with the manufacturer's Working Drawings and installation instructions at the locations and of the types specified in the Contract Documents.

Openings shall be cut a minimum distance of 1,000 mm from the centerline of the noise barrier post to the centerline of the opening.

The centre of fire hose access openings shall be located within the range of 1,300 to 1,500 mm measured from the finished ground surface.

Standard opening sizes for fire hose access and person door access are shown in Table 1. Dimensions and details for all other access opening types including, but not limited to electrical access, vehicle access, and hydraulic access are as specified in the Contract Documents. The openings shall meet the specified dimensions and shall be centred between adjacent posts.

Each noise barrier access opening shall be fitted with a hinged door that opens away from the roadway to a minimum opening angle of 110º.

When doors are in the closed position, there shall be no impact to the acoustical characteristics of the noise barrier system. All gaps between openings and frames shall be sealed to ensure that there are no gaps.

760.07.09 Connection to Existing Fence

When sections of an existing parallel or cross fence are to be removed or replaced or both with a noise barrier system, the Contractor shall ensure that a sufficient length of existing fence is maintained in good condition to adequately allow for connection to a new post at locations shown in the Contract Documents.

Removal of any fence shall be according to OPSS 510.

760.07.10 Underground Utility and Drainage Crossings

Reduced post spacing shall be allowed according to the manufacturer's specifications to avoid placing posts on top of utilities and drainage facilities.

760.07.11 Existing Overhead High Voltage Lines

When the potential of arcing exists due to the close proximity of existing overhead high voltage lines, steel noise barrier panels and posts shall be grounded according to OPSS 609.

760.07.12 Marking

Identification plates, provided by the manufacturer, shall be attached to the completed noise barrier system at the following intervals:

a) At the start and end of noise barrier system.

b) At a maximum interval of 300 m.

The identification plate shall be located within 300 mm of a terminal post with the top of the plate located approximately 1.2 m above the ground. The maximum dimensions of the plate shall be 200 by 200 mm. The plate shall be made from 0.81 mm thick anodized aluminum sheet according to ASTM B 209 series 1100 or 5005-H34.

Each plate shall be engraved with the following information:

a) Contract number.

b) Name of manufacturer of noise barrier system.

c) Name of Subcontractor that installed the noise barrier system.

d) Date of completed installation (i.e., yyyy-mm).

The height of the letters and numerals shall be within the range of 6 to 32 mm.

760.07.13 Quality Control

760.07.13.01 Inspection before Installation of Noise Barrier Panels

A Request to Proceed shall be submitted to the Contract Administrator after the construction of the noise barrier footings and posts and prior to the installation of the noise barrier panels.

The installation of the noise barrier panels shall not proceed until a Notice to Proceed has been received from the Contract Administrator.

760.07.13.02 Inspection after Installation of Noise Barrier System

A Certificate of Conformance shall be submitted to the Contract Administrator upon completion of the installation of the noise barrier system.

760.07.14 Site Restoration

After noise barrier system installation, the site shall be cleaned and trimmed and the ground restored to a neat condition.

760.07.15 Management of Excess Material

Management of excess material shall be according to the Contract Documents.

760.08 QUALITY ASSURANCE

760.08.01 Construction

Noise barrier components damaged in transit or during placement shall be replaced by the Contractor at no cost to the Owner.

The Contractor shall install noise barrier materials that are visually uniform in appearance in terms of colour, pattern, and texture. Uniformity of appearance is subject to approval of the Contract Administrator. Noise barrier panels shall visually match adjacent panels. Inspection shall occur at a distance of approximately 15 metres from the noise barrier system.

Final inspection of the complete noise barrier system shall not be made until it has been installed.

760.09 MEASUREMENT FOR PAYMENT

760.09.01 Actual Measurement

760.09.01.01 Noise Barrier System
Noise Barrier System Including Precast Noise/Traffic Barrier
Noise Barrier System on Structures

Measurement of noise barrier system shall be along the horizontal length in metres of the specified height. Transitions between barrier heights shall form part of the higher barrier and terminations shall form part of the adjoining barrier.

At the discretion of the Contract Administrator, if unidentified difficult soil conditions (i.e., rock, shale, or unstable earth) are encountered above the design footing depths, work necessary to complete the design requirements such as caissons, dewatering, additional concrete, or different augering equipment, shall be paid for as Additional Work.

760.09.01.02 Noise Barrier Access

For measurement purposes, a count shall be made of the number of accesses installed.

760.09.02 Plan Quantity Measurement

When measurement is by Plan Quantity, such measurement shall be based on the units shown in the clauses under Actual Measurement.

760.10 BASIS OF PAYMENT

760.10.01 *"height"* Noise Barrier System - Item
***"height"* Noise Barrier System Including Precast Noise/Traffic Barrier - Item**
***"height"* Noise Barrier System on Structures - Item**
Noise Barrier Access - Item

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

Grading up to 300 mm shall be included as part of the noise barrier system item. For earth grading requirements greater than 300 mm, the full grading is provided under the earth excavation item.

760.10.02 Removals and Replacements

Cost associated with any required removals and replacements of defective workmanship or materials shall be the Contractor's responsibility at no cost to the Owner.

TABLE 1
Noise Barrier Access Standard Opening Sizes

Type of Door / Opening	Opening Size (W mm x H mm)
Fire Hose Access	254 x 254
Person Door Access	915 x 2438

***"height"* NOISE BARRIER SYSTEM - Item No.**
***"height"* NOISE BARRIER SYSTEM INCLUDING PRECAST NOISE/TRAFFIC BARRIER - Item No.**
***"height"* NOISE BARRIER SYSTEM ON STRUCTURES - Item No.**
NOISE BARRIER ACCESS - Item No.

Special Provision No. 760F01 April 2025

Amendment to OPSS 760, April 2025

760.04 DESIGN AND SUBMISSION REQUIREMENTS

760.04.01 Design Requirements

760.04.01.01 Footings

760.04.01.01.01 General

Clause 760.04.01.01.01 of OPSS 760 is amended by the addition of the following paragraph:

The soil design parameters for the design of footings shall be as specified in Table A:

Table A
Soil Design Parameters

Location	Soil Design Parameter
*	*
*	*

[* Designer Fill-In for Table A, See Notes to Designer].

Subsection 760.04.01 of OPSS 760 is amended by the addition of the following clauses:

760.04.01.02 Wind Load

The wind load applied for the design of structure shall be:

[** Designer Fill-In, See Notes to Designer].

760.04.01.03 Acoustics

The minimum acoustical characteristic of the noise barrier system shall be such that the noise barrier is:

[*** Designer Fill-In, See Notes to Designer].

760.04.01.04 Aesthetics

The colour and texture for the noise barrier system shall be within the following parameters:

Number of colours adjacent to highway: [**** Designer Fill-in – See Notes to Designer]

in the proportion of _____ _____ _____ _____

Number of textures _____

in the proportion of _____ _____ _____ _____

Number of colours adjacent to residential property: [**** Designer Fill-In, See Notes to Designer].

in the proportion of _____ _____ _____ _____

Number of textures _____

in the proportion of _____ _____ _____ _____

Final colour selections shall be determined by the Contract Administrator at the point of manufacture from samples prepared by the manufacturer.

If only one colour and texture are specified, the noise barrier shall be constructed using the colour and texture specified by the Contract Administrator following the award of the Contract. Final colour selection shall be determined at the point of manufacture from samples prepared by the manufacturer.

NOTES TO DESIGNER:

* Insert station to station limits and soil design parameters in Table A as per the example below:

Example

Location	Soil Design Parameter
East Bound Lane 17+320 to 17+790 (shoulder)	Ø = 28º
West Bound Lanes 17+100 to 17+600 (ROW) 17+600 to 17+720 (ROW) 17+700 to 18+050 (shoulder)	Ø = 28º Cu = 12 Kpa Ø = 28º

** Insert the reference wind load along with its respective area or city (e.g., 415 Pa for Hamilton area).

*** Insert one of the following acoustical characteristics:

- Either sound absorptive or reflective
- Sound absorptive on the highway side
- Sound absorptive on the residential side
- Sound absorptive on both sides.

If more than one acoustical characteristic applies to this Contract, each section shall be designed accordingly with clearly defined limits.

**** Insert the number of colours planned for this contract, the proportions in which each are required, the number of textures if applicable and their proportions of the total noise barrier area in the locations specified.

WARRANT: Always with these tender items.

OPSS.PROV 802 - Apr 2025

COMMON to PROV conversion

Ontario Provincial Standard Specifications (OPSSs)					
802	November 2010	April 2025	TBD	Rev: Construction Specification for Topsoil is implemented. The specification has been converted from the November 2010 COMMON to a PROV with no technical content changes.	Mike Pearsall

Note: The 802 implemented in April 2025 replaces 802, November 2010 with no technical content changes.

CONSTRUCTION SPECIFICATION FOR TOPSOIL

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802.07 CONSTRUCTION

802.08 QUALITY ASSURANCE - Not Used

802.09 MEASUREMENT FOR PAYMENT

802.10 BASIS OF PAYMENT

~~APPENDICES~~

~~802-A Commentary~~

802.01 SCOPE

This specification covers the requirements for stockpiling, supplying, and placing topsoil.

~~802.01.01 Specification Significance and Use~~

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

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

~~802.01.02 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.~~

802.02 REFERENCES

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

~~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, Construction

OPSS 206 Grading

802.05 MATERIALS

802.05.01 Topsoil

Topsoil shall be a fertile loam material that is free of roots, vegetation, or other debris of a size and quantity that prevents proper placement of the topsoil. ~~-~~The topsoil shall not contain material greater than 25 mm in size, such as stones and clods.

Imported topsoil shall not have contaminants that adversely affect plant growth.

Soil from swamps or muskeg areas may be used in place of topsoil, when approved by the Contract Administrator.

802.07 CONSTRUCTION

802.07.01 Stockpiling Topsoil

Topsoil shall be removed, stockpiled, and managed according to the Contract Documents. Stockpiles shall be constructed neatly with uniform surfaces. When required, the top surface shall be dished.

802.07.02 Preparation for Topsoil

Areas where topsoil is to be placed shall be fine graded to a uniform surface according to OPSS 206. The surface shall be loosened to a depth of 25 mm. It shall be free of all vegetation, debris, and stones which would not be covered by the depth of topsoil specified in the Placement of Topsoil subsection.

These areas shall be maintained in the condition described above until the topsoil is placed.

802.07.03 Placement of Topsoil

Topsoil shall be placed to a uniform depth of 50 mm on areas specified in the Contract Documents and up to the subgrade elevation on the roadway front slope.

Soil from swamps or muskeg areas, when used in place of topsoil, shall be placed according to the Contract Documents to a uniform depth of 75 mm, with no woody material protruding more than 50 mm above the surface.

802.07.04 Management of Excess Material

Management of excess material shall be according to the Contract Documents.

802.09 MEASUREMENT FOR PAYMENT

802.09.01 Actual Measurement

802.09.01.01 Topsoil from Stockpiles

Measurement shall be by volume in cubic metres of topsoil placed from a stockpile.

802.09.01.02 Topsoil, Imported

Measurement shall be by volume in cubic metres of topsoil imported and placed.

802.10 BASIS OF PAYMENT

802.10.01 Preparation for Topsoil - Item

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

Payment for this item shall be on surfaces graded under a previous Contract that require preparation for topsoil.

There is no payment for this item on surfaces constructed on this Contract.

802.10.02 Topsoil from Stockpiles - Item

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

802.10.03 Topsoil, Imported - Item

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

Appendix 802-A, November 2010
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:

- Topsoil removal and stockpiling areas. (802.07.01)

- Topsoil placement areas. (802.07.03)

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.

Note: The 802 implemented in April 2025 replaces 802, November 2010 with no technical content changes.

CONSTRUCTION SPECIFICATION FOR TOPSOIL

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802.02 REFERENCES

802.03 DEFINITIONS - Not Used

802.04 DESIGN AND SUBMISSION REQUIREMENTS - Not Used

802.05 MATERIALS

802.06 EQUIPMENT - Not Used

802.07 CONSTRUCTION

802.08 QUALITY ASSURANCE - Not Used

802.09 MEASUREMENT FOR PAYMENT

802.10 BASIS OF PAYMENT

802.01 SCOPE

This specification covers the requirements for stockpiling, supplying, and placing topsoil.

802.02 REFERENCES

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

Ontario Provincial Standard Specifications, Construction

OPSS 206 Grading

802.05 MATERIALS

802.05.01 Topsoil

Topsoil shall be a fertile loam material that is free of roots, vegetation, or other debris of a size and quantity that prevents proper placement of the topsoil. The topsoil shall not contain material greater than 25 mm in size, such as stones and clods.

Imported topsoil shall not have contaminants that adversely affect plant growth.

Soil from swamps or muskeg areas may be used in place of topsoil, when approved by the Contract Administrator.

802.07 CONSTRUCTION

802.07.01 Stockpiling Topsoil

Topsoil shall be removed, stockpiled, and managed according to the Contract Documents. Stockpiles shall be constructed neatly with uniform surfaces. When required, the top surface shall be dished.

802.07.02 Preparation for Topsoil

Areas where topsoil is to be placed shall be fine graded to a uniform surface according to OPSS 206. The surface shall be loosened to a depth of 25 mm. It shall be free of all vegetation, debris, and stones which would not be covered by the depth of topsoil specified in the Placement of Topsoil subsection.

These areas shall be maintained in the condition described above until the topsoil is placed.

802.07.03 Placement of Topsoil

Topsoil shall be placed to a uniform depth of 50 mm on areas specified in the Contract Documents and up to the subgrade elevation on the roadway front slope.

Soil from swamps or muskeg areas, when used in place of topsoil, shall be placed according to the Contract Documents to a uniform depth of 75 mm, with no woody material protruding more than 50 mm above the surface.

802.07.04 Management of Excess Material

Management of excess material shall be according to the Contract Documents.

802.09 MEASUREMENT FOR PAYMENT

802.09.01 Actual Measurement

802.09.01.01 Topsoil from Stockpiles

Measurement shall be by volume in cubic metres of topsoil placed from a stockpile.

802.09.01.02 Topsoil, Imported

Measurement shall be by volume in cubic metres of topsoil imported and placed.

802.10 BASIS OF PAYMENT

802.10.01 Preparation for Topsoil - Item

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

Payment for this item shall be on surfaces graded under a previous Contract that require preparation for topsoil.

There is no payment for this item on surfaces constructed on this Contract.

802.10.02 Topsoil from Stockpiles - Item

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

802.10.03 Topsoil, Imported - Item

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

OPSS.PROV 1204 - Apr 2025

COMMON to PROV conversion

Ontario Provincial Standard Specifications (OPSSs)					
1204	November 2003	April 2025	TBD	Rev: Material Specification for Polyvinyl Chloride Waterstops is implemented. The specification has been converted from the November 2003 COMMON to a PROV with no technical content changes.	Mike Pearsall

Note: The 1204 implemented in April 2025 replaces 1204, November 2003 with no technical content changes.

MATERIAL SPECIFICATION FOR
POLYVINYL CHLORIDE WATERSTOPS

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1204.01 SCOPE

1204.02 REFERENCES

1204.03 DEFINITIONS - Not Used

1204.04 SUBMISSION AND DESIGN REQUIREMENTS - Not Used

1204.05 MATERIALS

1204.06 EQUIPMENT - Not Used

1204.07 PRODUCTION

1204.08 QUALITY ASSURANCE

1204.09 OWNER PURCHASE OF MATERIAL

~~**APPENDICES**~~

~~**1204-A Commentary**~~

1204.01 SCOPE

This specification covers the polyvinyl chloride waterstops for joints in concrete structures.

~~1204.01.01 Significance and use of Appendices~~

~~Appendices are not a mandatory part of this specification unless invoked by the Owner.~~

~~**Appendix 1204-A** is a commentary appendix to provide designers with information on the use of this specification in a Contract.~~

1204.02 REFERENCES

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

ASTM International

~~D 412~~D412-98a Standard Test Methods for Vulcanised Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers - Tension

~~D 624~~D624-98 Standard Test for Tear Strength of Conventional Vulcanised Rubber and Thermoplastic Elastomers

~~D 2240~~D2240-97el Standard Test Method for Rubber Property - Durometer Hardness

1204.05 MATERIALS

1204.05.01 General Requirements

The waterstops shall be extruded from a polyvinyl chloride compound to meet the performance requirements given in this specification. ~~-~~Reworked polyvinyl chloride may be used but reclaimed polyvinyl chloride will not be permitted.

1204.05.02 Physical Requirements

The waterstop shall meet the requirements specified in Table 1. ~~-~~All tests shall be made on specimens prepared from the extruded waterstops.

When required, the thickness of specimens shall be reduced to between 1.5 and 3.0 mm by buffing, or slicing.

The extruded material shall be dense, homogeneous, of smooth surface, and free from porosity and other imperfections.

1204.07 PRODUCTION

1204.07.01 General

The waterstops shall be of the shape and dimensions specified in the Contract Documents. ~~-~~The cross-section of the waterstop shall be uniform along its length and shall be symmetrical transversely so that the thickness at any given distance from either edge of the waterstop will be uniform.

All splices in the waterstop shall be watertight.

1204.07.02 Quality Control

1204.07.02.01 Testing Procedures

1204.07.02.01.01 General

Testing procedures shall be according to the relevant ASTM standards indicated in Table 1, except that modulus of elasticity, effect of alkali, accelerated extraction, cold bend, and low temperature impact resistance shall be determined according to the procedures described in the following clauses.

1204.07.02.01.02 Modulus of Elasticity

Conformance shall be determined on the average of the results from tests on 3 specimens. Testing shall be carried out according to the following:

a) Each specimen shall be 25 mm in length and of the full cross-section of the finished waterstop.

b) The specimen shall be clamped in the testing machine in such a manner as to form a cantilever beam with the 25 mm dimension as the beam width.

c) The specimen shall be held between the bulb and the nearest rib on either side of the bulb.

d) The load shall be applied at the rib farthest from the clamp, across the full width of the specimen by a rigid blade type loading head of 0.8 mm contact edge radius.

e) With the load value being that obtained for a deflection rate of 5 mm/min the modulus of elasticity of the material shall be calculated from the following formula.

$$E = \frac{4P\,x\,L^3}{\Delta\,x\,b\,x\,t^3}$$

Where:

E = modulus of elasticity, kilopascals
P = applied load, kilonewtons
L = span length, millimetre
Δ = deflection under applied load, millimetres
b = width of the specimen 25 mm
t = average thickness of the specimen, millimetres

1204.07.02.01.03 Effect of Alkali

Testing shall be carried out according to the following:

a) Three specimens shall be cut from the waterstop, each having a mass of 75 grams.

b) The specimens shall be washed in tap water, rinsed with distilled water, wiped with a clean cloth, and allowed to dry in laboratory air for approximately 1 hour.

c) The mass of each specimen shall be recorded to the nearest 0.001 gram.

d) Using a Shore durometer, Type A, a durometer reading shall be taken according to ASTM D 2240D2240.

e) The specimens shall be completely immersed in a freshly made solution containing 5.0 grams of chemically pure sodium hydroxide and 5.0 grams of chemically pure potassium hydroxide in one litre of distilled water kept at 21 to 24°C. The solution shall be replaced every 7 Days.

f) At the end of 7 Days and at the end of 28 Days the specimens shall be removed, rinsed with distilled water, the surfaces wiped with a clean cloth, and allowed to dry in laboratory air for approximately 1 hour.

g) The mass shall be measured and recorded at the end of 7 Days and at the end of 28 Days. The durometer hardness shall be measured and recorded at the end of 7 Days. Mass changes shall be recorded as a percentage of the original mass and the hardness change in durometer units.

1204.07.02.01.04 Accelerated Extraction

Testing shall be carried out according to the following:

a) Five tensile test specimens according to ASTM ~~D 412~~D412 Die C, each weighed to the nearest 0.001 gram, shall be placed in a one litre tall form beaker with spout.

b) The beaker shall be filled to within 50 mm of the top, with a solution made by dissolving 5.0 grams of chemically pure potassium hydroxide in one litre of distilled water. The specimens shall be completely immersed and the top of the beaker covered with a watch glass.

c) The beaker shall then be placed in a constant temperature bath and the temperature of the solution maintained between 60 and 65°C. The solution shall be changed every 24 hours, with the new solution being warmed to 65°C before replacing the old.

d) A 6 mm diameter glass tube shall be inserted in the spout of the beaker to within 12 mm of the bottom of the beaker. Air shall then be gently bubbled through the solution at the rate of about one bubble per second.

e) Once daily each of the five specimens shall be removed from the beaker, rinsed lightly with distilled water, and then superficially dried with a clean cloth. Ten minutes after the specimens have been thus dried, the group of five specimens shall be weighed and mass recorded.

f) The sequence of testing shall be carried out continuously for a period of not less than 14 Days.

g) After the 14 Day period, provided the specimens have reached constant mass, they shall be tested for tensile strength and elongation. Constant mass is assumed to have been achieved when the masses of the group of specimens on three successive weighings do not differ from each other by more than 0.05% of the original mass. Prior to being tested for tensile strength and elongation, the specimens shall be removed, rinsed, stored for 10 minutes and weighed. If the tests for tensile strength and elongation cannot be made within 1 hour after completion of the weighings indicating the achievement of constant mass, the specimens shall be stored immersed in a fresh alkali solution at room temperature. Tensile strength shall be calculated from the total load at failure, the nominal width, and the thickness as determined prior to the extraction test. The tensile strength and elongation shall be determined not more than 72 hours after the weighings which demonstrated that constant mass had been achieved.

h) If constant mass has not been achieved after 90 Days, the exposure shall be terminated, the specimen tested for tensile strength and elongation, and a note added to the report indicating the mass losses between the last successive weighings and the fact that constant mass, as here defined, was not achieved.

1204.07.02.01.05 Cold Bend

Three specimens, each between 1.5 and 3.0 mm thick, 25 mm wide, and 150 mm long shall be cooled to 10°C then immediately bent through 180 degrees around a 6 mm diameter mandrel. Any cracking shall constitute a failure.

1204.07.02.01.06 Low Temperature Impact Resistance

Testing shall be carried out according to the following:

a) Three specimens from a finished waterstop, each 100 to 150 mm long and of full cross-section, shall be rigidly clamped in a horizontal position in such a manner as to form a cantilever beam of length equal to the cross-sectional width. There shall be a minimum of 125 mm vertical clearance below the unsupported section of the beam.

b) The test assembly and specimens shall be cooled to a temperature of -35°C.

c) At that temperature the unsupported section shall be struck centrally with a 3.6 kg steel ball dropped freely through 1.5 m.

Any cracking or chipping of the specimen shall constitute failure

1204.07.03 Test Certificates

Two certified copies of the manufacturer's test results for the lot numbers shall be provided for all shipments to the Contract or storage depots. One copy shall be included with the shipment and a second copy shall be sent to the Contract Administrator.

1204.07.04 Acceptance or Rejection

All waterstops failing to meet any of the requirements of this specification shall be rejected. Rejected materials shall be expeditiously removed and replaced with acceptable materials at no additional expense to the Owner.

1204.07.05 Marking

All waterstops shall be identified as to the manufacturer by means of a colour. These colours shall be registered with the Owner and shall be used in all waterstops produced by the respective manufacturer.

The waterstop shall be marked with the lot number.

1204.07.06 Packaging

The waterstop shall be packaged as coils in containers so constructed as to ensure safe delivery. The inside diameter of the coil shall be at least 300 mm.

The waterstop in the coil shall be of continuous length.

The waterstop shall be clearly identified by affixing labels to the coils and containers. The labels shall indicate the following:

a) Manufacturer's name.

b) Trade name.

c) Lot number.

d) Coil number.

e) Length of the waterstop in the coil.

f) Size.

1204.08 QUALITY ASSURANCE

The Owner may perform such inspection, sampling, and testing at such times and locations deemed necessary to determine the acceptability of the waterstops.

1204.09 OWNER PURCHASE OF MATERIAL

1204.09.01 Measurement and Payment

Payment at the price specified in the purchasing order, in metres along the length of the waterstops for the type specified, shall be full compensation for all labour, Equipment, and Material to supply the waterstops to the destination at the time specified.

Where material is sampled by the Owner's representative after packaging, measurement shall be made of the original quantity as packed.

~~Table~~TABLE 1
Physical Requirements for Waterstops

Property	Physical Requirements	Test Procedure
Tensile Strength, Mpa	minimum 10 average of 5 specimens	ASTM ~~D 412~~D412 Die C
Ultimate Elongation, %	minimum 275 average of 5 specimens	ASTM ~~D 412~~D412 Die C
Tear Resistance, N/mm	minimum 44 average of 3 specimens	ASTM ~~D 624~~D624 Die B
Modulus of Elasticity, MPa	minimum 24	See Modulus of Elasticity clause
Effect of Alkali 7 Day - mass increase, % - mass decrease, % - hardness change, points 28 Day - mass increase, % - mass decrease, %	 maximum 0.25 maximum 0.10 $\pm$ 5 maximum 0.40 maximum 0.30	See Effect of Alkali clause.
Accelerated Extraction Tensile Strength, MPa Ultimate Elongation, %	 minimum 90 minimum 250	 See Accelerated Extraction clause
Cold Bend	Pass	See Cold Bend clause
Low Temperature Impact Resistance	Pass	See Low Temperature Impact Resistance clause

Appendix 1204-A, Commentary for OPSS 1204, November 2003

Note: This appendix does not form part of the standard specification. It is intended to provide information to the designer on the use of this specification in a Contract.

Designer Action/Considerations

The designer should specify the following in the Contract Documents:

- Waterstop shape and dimensions. (1204.07.01)

Related Ontario Provincial Standard Drawing

OPSD 4670.000 Construction and Expansion Joint In Concrete

Note: The 1204 implemented in April 2025 replaces 1204, November 2003 with no technical content changes.

MATERIAL SPECIFICATION FOR POLYVINYL CHLORIDE WATERSTOPS

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1204.01 SCOPE

1204.02 REFERENCES

1204.03 DEFINITIONS - Not Used

1204.04 SUBMISSION AND DESIGN REQUIREMENTS - Not Used

1204.05 MATERIALS

1204.06 EQUIPMENT - Not Used

1204.07 PRODUCTION

1204.08 QUALITY ASSURANCE

1204.09 OWNER PURCHASE OF MATERIAL

1204.01 SCOPE

This specification covers the polyvinyl chloride waterstops for joints in concrete structures.

1204.02 REFERENCES

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

ASTM International

D412-98a	Standard Test Methods for Vulcanised Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers - Tension
D624-98	Standard Test for Tear Strength of Conventional Vulcanised Rubber and Thermoplastic Elastomers
D2240-97el	Standard Test Method for Rubber Property - Durometer Hardness

1204.05 MATERIALS

1204.05.01 General Requirements

The waterstops shall be extruded from a polyvinyl chloride compound to meet the performance requirements given in this specification. Reworked polyvinyl chloride may be used but reclaimed polyvinyl chloride will not be permitted.

1204.05.02 Physical Requirements

The waterstop shall meet the requirements specified in Table 1. All tests shall be made on specimens prepared from the extruded waterstops.

When required, the thickness of specimens shall be reduced to between 1.5 and 3.0 mm by buffing, or slicing.

The extruded material shall be dense, homogeneous, of smooth surface, and free from porosity and other imperfections.

1204.07 PRODUCTION

1204.07.01 General

The waterstops shall be of the shape and dimensions specified in the Contract Documents. The cross-section of the waterstop shall be uniform along its length and shall be symmetrical transversely so that the thickness at any given distance from either edge of the waterstop will be uniform.

All splices in the waterstop shall be watertight.

1204.07.02 Quality Control

1204.07.02.01 Testing Procedures

1204.07.02.01.01 General

Testing procedures shall be according to the relevant ASTM standards indicated in Table 1, except that modulus of elasticity, effect of alkali, accelerated extraction, cold bend, and low temperature impact resistance shall be determined according to the procedures described in the following clauses.

1204.07.02.01.02 Modulus of Elasticity

Conformance shall be determined on the average of the results from tests on 3 specimens. Testing shall be carried out according to the following:

a) Each specimen shall be 25 mm in length and of the full cross-section of the finished waterstop.

b) The specimen shall be clamped in the testing machine in such a manner as to form a cantilever beam with the 25 mm dimension as the beam width.

c) The specimen shall be held between the bulb and the nearest rib on either side of the bulb.

d) The load shall be applied at the rib farthest from the clamp, across the full width of the specimen by a rigid blade type loading head of 0.8 mm contact edge radius.

e) With the load value being that obtained for a deflection rate of 5 mm/min the modulus of elasticity of the material shall be calculated from the following formula.

$$E = \frac{4P\,x\,L^3}{\Delta\,x\,b\,x\,t^3}$$

Where:

E = modulus of elasticity, kilopascals
P = applied load, kilonewtons
L = span length, millimetre
Δ = deflection under applied load, millimetres
b = width of the specimen 25 mm
t = average thickness of the specimen, millimetres

1204.07.02.01.03 Effect of Alkali

Testing shall be carried out according to the following:

a) Three specimens shall be cut from the waterstop, each having a mass of 75 grams.

b) The specimens shall be washed in tap water, rinsed with distilled water, wiped with a clean cloth, and allowed to dry in laboratory air for approximately 1 hour.

c) The mass of each specimen shall be recorded to the nearest 0.001 gram.

d) Using a Shore durometer, Type A, a durometer reading shall be taken according to ASTM D2240.

e) The specimens shall be completely immersed in a freshly made solution containing 5.0 grams of chemically pure sodium hydroxide and 5.0 grams of chemically pure potassium hydroxide in one litre of distilled water kept at 21 to 24°C. The solution shall be replaced every 7 Days.

f) At the end of 7 Days and at the end of 28 Days the specimens shall be removed, rinsed with distilled water, the surfaces wiped with a clean cloth, and allowed to dry in laboratory air for approximately 1 hour.

g) The mass shall be measured and recorded at the end of 7 Days and at the end of 28 Days. The durometer hardness shall be measured and recorded at the end of 7 Days. Mass changes shall be recorded as a percentage of the original mass and the hardness change in durometer units.

1204.07.02.01.04 Accelerated Extraction

Testing shall be carried out according to the following:

a) Five tensile test specimens according to ASTM D412 Die C, each weighed to the nearest 0.001 gram, shall be placed in a one litre tall form beaker with spout.

b) The beaker shall be filled to within 50 mm of the top, with a solution made by dissolving 5.0 grams of chemically pure potassium hydroxide in one litre of distilled water. The specimens shall be completely immersed and the top of the beaker covered with a watch glass.

c) The beaker shall then be placed in a constant temperature bath and the temperature of the solution maintained between 60 and 65°C. The solution shall be changed every 24 hours, with the new solution being warmed to 65°C before replacing the old.

d) A 6 mm diameter glass tube shall be inserted in the spout of the beaker to within 12 mm of the bottom of the beaker. Air shall then be gently bubbled through the solution at the rate of about one bubble per second.

e) Once daily each of the five specimens shall be removed from the beaker, rinsed lightly with distilled water, and then superficially dried with a clean cloth. Ten minutes after the specimens have been thus dried, the group of five specimens shall be weighed and mass recorded.

f) The sequence of testing shall be carried out continuously for a period of not less than 14 Days.

g) After the 14 Day period, provided the specimens have reached constant mass, they shall be tested for tensile strength and elongation. Constant mass is assumed to have been achieved when the masses of the group of specimens on three successive weighings do not differ from each other by more than 0.05% of the original mass. Prior to being tested for tensile strength and elongation, the specimens shall be removed, rinsed, stored for 10 minutes and weighed. If the tests for tensile strength and elongation cannot be made within 1 hour after completion of the weighings indicating the achievement of constant mass, the specimens shall be stored immersed in a fresh alkali solution at room temperature. Tensile strength shall be calculated from the total load at failure, the nominal width, and the thickness as determined prior to the extraction test. The tensile strength and elongation shall be determined not more than 72 hours after the weighings which demonstrated that constant mass had been achieved.

h) If constant mass has not been achieved after 90 Days, the exposure shall be terminated, the specimen tested for tensile strength and elongation, and a note added to the report indicating the mass losses between the last successive weighings and the fact that constant mass, as here defined, was not achieved.

1204.07.02.01.05 Cold Bend

Three specimens, each between 1.5 and 3.0 mm thick, 25 mm wide, and 150 mm long shall be cooled to 10°C then immediately bent through 180 degrees around a 6 mm diameter mandrel. Any cracking shall constitute a failure.

1204.07.02.01.06 Low Temperature Impact Resistance

Testing shall be carried out according to the following:

a) Three specimens from a finished waterstop, each 100 to 150 mm long and of full cross-section, shall be rigidly clamped in a horizontal position in such a manner as to form a cantilever beam of length equal to the cross-sectional width. There shall be a minimum of 125 mm vertical clearance below the unsupported section of the beam.

b) The test assembly and specimens shall be cooled to a temperature of -35°C.

c) At that temperature the unsupported section shall be struck centrally with a 3.6 kg steel ball dropped freely through 1.5 m.

Any cracking or chipping of the specimen shall constitute failure

1204.07.03 Test Certificates

Two certified copies of the manufacturer's test results for the lot numbers shall be provided for all shipments to the Contract or storage depots. One copy shall be included with the shipment and a second copy shall be sent to the Contract Administrator.

1204.07.04 Acceptance or Rejection

All waterstops failing to meet any of the requirements of this specification shall be rejected. Rejected materials shall be expeditiously removed and replaced with acceptable materials at no additional expense to the Owner.

1204.07.05 Marking

All waterstops shall be identified as to the manufacturer by means of a colour. These colours shall be registered with the Owner and shall be used in all waterstops produced by the respective manufacturer.

The waterstop shall be marked with the lot number.

1204.07.06 Packaging

The waterstop shall be packaged as coils in containers so constructed as to ensure safe delivery. The inside diameter of the coil shall be at least 300 mm.

The waterstop in the coil shall be of continuous length.

The waterstop shall be clearly identified by affixing labels to the coils and containers. The labels shall indicate the following:

a) Manufacturer's name.

b) Trade name.

c) Lot number.

d) Coil number.

e) Length of the waterstop in the coil.

f) Size.

1204.08 QUALITY ASSURANCE

The Owner may perform such inspection, sampling, and testing at such times and locations deemed necessary to determine the acceptability of the waterstops.

1204.09 OWNER PURCHASE OF MATERIAL

1204.09.01 Measurement and Payment

Payment at the price specified in the purchasing order, in metres along the length of the waterstops for the type specified, shall be full compensation for all labour, Equipment, and Material to supply the waterstops to the destination at the time specified.

Where material is sampled by the Owner's representative after packaging, measurement shall be made of the original quantity as packed.

TABLE 1
Physical Requirements for Waterstops

Property	Physical Requirements	Test Procedure
Tensile Strength, Mpa	minimum 10 average of 5 specimens	ASTM D412 Die C
Ultimate Elongation, %	minimum 275 average of 5 specimens	ASTM D412 Die C
Tear Resistance, N/mm	minimum 44 average of 3 specimens	ASTM D624 Die B
Modulus of Elasticity, MPa	minimum 24	See Modulus of Elasticity clause
Effect of Alkali 7 Day - mass increase, % - mass decrease, % - hardness change, points 28 Day - mass increase, % - mass decrease, %	 maximum 0.25 maximum 0.10 $\pm$ 5 maximum 0.40 maximum 0.30	See Effect of Alkali clause.
Accelerated Extraction Tensile Strength, MPa Ultimate Elongation, %	 minimum 90 minimum 250	 See Accelerated Extraction clause
Cold Bend	Pass	See Cold Bend clause
Low Temperature Impact Resistance	Pass	See Low Temperature Impact Resistance clause

OPSS.PROV 1308 - Apr 2025

COMMON to PROV conversion

Ontario Provincial Standard Specifications (OPSSs)					
1308	November 2003	April 2025	TBD	Rev: Material Specification for Joint Filler in Concrete is implemented. The specification has been converted from the November 2003 COMMON to a PROV with no technical content changes.	Mike Pearsall

Note: OPSS 1308 implemented in April 2025 replaces OPSS 1308, November 2003 with no technical content changes.

MATERIAL SPECIFICATION FOR

JOINT FILLER IN CONCRETE

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1308.05 MATERIALS

1308.06 EQUIPMENT - Not Used

1308.07 PRODUCTION

1308.08 QUALITY ASSURANCE

1308.09 OWNER PURCHASE OF MATERIAL

~~**APPENDICES**~~

~~**1308-A Commentary**~~

1308.01 SCOPE

This specification covers preformed expansion joint fillers for joints in concrete.

~~**1308.01.01 Significance and Use of Appendices**~~

~~Appendices are not a mandatory part of this specification unless invoked by the Owner.~~

~~**Appendix 1308-A** is a commentary appendix to provide designers with information on the use of this specification in a Contract.~~

1308.02 REFERENCES

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

ASTM International

~~D 1751(~~D1751-99~~)~~ Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)

~~D 1752~~D1752-84(1996)~~e1~~e1 Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction

1308.05 MATERIALS

1308.05.01 Joint Filler

The joint filler shall be according to ASTM ~~D 1751~~D1751 for Type A or ASTM ~~D 1752~~D1752 for Type B.

The type of material supplied shall be as specified in the Contract Documents.

1308.07 PRODUCTION

1308.07.01 Cutting and Tolerance

The joint filler shall be cut neatly, free from burrs to the sizes specified in the Contract Documents.

Holes for dowel bars in the joint filler shall be neatly punched in the exact position specified and shall be free from loose fibres.

Pieces of the joint filler shall be according to the dimensions in the Contract Documents with the following tolerances:

Thickness	0 to 1.5 mm
Depth	± 3 mm
Length	± 3 mm

1308.07.02 Packaging and Marking

Each shipment of joint filler shall be provided with an itemized statement of the number and dimensions of the pieces. ~~-~~The brand name and the thickness of the material shall be clearly stamped on the pieces or on a label attached securely to each bundle.

Each piece of self-expanding cork filler shall be individually wrapped in waterproof material and shall be sealed in a manner that will prevent the entrance of moisture.

The material shall be suitably packaged to permit shipping, handling, and storage without damage.

1308.08 QUALITY ASSURANCE

1308.08.01 Sampling and Testing

Samples of the material for quality assurance testing shall be available to the Owner from deliveries to the site for testing according to ASTM ~~D 1751~~D1751 and ~~D 1752~~D1752.

1308.09 OWNER PURCHASE OF MATERIAL

1308.09.01 Measurement and Payment

Payment at the price specified in the purchasing order, by either linear metres for strips, or by a count for other shapes, shall be full compensation for all labour, Equipment, and Material required for the supply and delivery of the joint filler to the destination and at the time specified.

The cost of the samples for testing and the cost of all testing except that performed by the Owner shall be included in the price.

Appendix 1308-A, Commentary for OPSS 1308, November 2003

Note: This appendix does not form part of the standard specification. It is intended to provide information to the designer on the use of this specification in a Contract.

Designer Action/Considerations

The following shall be specified in the Contract Documents:

- Type and size of material to be supplied.

Related Ontario Provincial Standard Drawings

OPSD 4670.000 Construction and Expansion Joint In Concrete

Note: OPSS 1308 implemented in April 2025 replaces OPSS 1308, November 2003 with no technical content changes.

MATERIAL SPECIFICATION FOR JOINT FILLER IN CONCRETE

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1308.04 SUBMISSION AND DESIGN REQUIREMENTS - Not Used

1308.05 MATERIALS

1308.06 EQUIPMENT - Not Used

1308.07 PRODUCTION

1308.08 QUALITY ASSURANCE

1308.09 OWNER PURCHASE OF MATERIAL

1308.01 SCOPE

This specification covers preformed expansion joint fillers for joints in concrete.

1308.02 REFERENCES

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

ASTM International

D1751-99	Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
D1752-84(1996)e1	Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction

1308.05 MATERIALS

1308.05.01 Joint Filler

The joint filler shall be according to ASTM D1751 for Type A or ASTM D1752 for Type B.

The type of material supplied shall be as specified in the Contract Documents.

1308.07 PRODUCTION

1308.07.01 Cutting and Tolerance

The joint filler shall be cut neatly, free from burrs to the sizes specified in the Contract Documents.

Holes for dowel bars in the joint filler shall be neatly punched in the exact position specified and shall be free from loose fibres.

Pieces of the joint filler shall be according to the dimensions in the Contract Documents with the following tolerances:

Thickness	0 to 1.5 mm
Depth	$\pm$ 3 mm
Length	$\pm$ 3 mm

1308.07.02 Packaging and Marking

Each shipment of joint filler shall be provided with an itemized statement of the number and dimensions of the pieces. The brand name and the thickness of the material shall be clearly stamped on the pieces or on a label attached securely to each bundle.

Each piece of self-expanding cork filler shall be individually wrapped in waterproof material and shall be sealed in a manner that will prevent the entrance of moisture.

The material shall be suitably packaged to permit shipping, handling, and storage without damage.

1308.08 QUALITY ASSURANCE

1308.08.01 Sampling and Testing

Samples of the material for quality assurance testing shall be available to the Owner from deliveries to the site for testing according to ASTM D1751 and D1752.

1308.09 OWNER PURCHASE OF MATERIAL

1308.09.01 Measurement and Payment

Payment at the price specified in the purchasing order, by either linear metres for strips, or by a count for other shapes, shall be full compensation for all labour, Equipment, and Material required for the supply and delivery of the joint filler to the destination and at the time specified.

The cost of the samples for testing and the cost of all testing except that performed by the Owner shall be included in the price.

OPSS.PROV 1315 - Apr 2025

COMMON to PROV conversion

Ontario Provincial Standard Specifications (OPSSs)					
1315	September 1996	April 2025	TBD	Rev: Material Specification for White Pigmented Curing Compounds for Concrete is implemented. The specification has been converted from the September 1996 COMMON to a PROV with no technical content changes.	Mike Pearsall

ONTARIO
PROVINCIAL
STANDARD
SPECIFICATION

~~METRIC~~
OPSS.PROV 1315
~~SEPTEMBER 1996~~APRIL 2025

Note: OPSS 1315 implemented in April 2025 replaces OPSS 1315, September 1996 with no technical content changes.

MATERIAL SPECIFICATION FOR WHITE PIGMENTED CURING COMPOUNDS FOR CONCRETE

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~~1315.04.01 Submissions~~

~~1315.04.01.01 Product Data~~
~~.02 Product Sample~~

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~~1315.05.01 Requirements~~

1315.06 EQUIPMENT - Not Used

1315.07 ~~Not Used~~PRODUCTION

1315.08 QUALITY ASSURANCE

~~1315.08.01 Sampling and Testing~~
~~.02 Physical Tests~~
~~.03 Acceptance or Rejection~~

1315.09 OWNER PURCHASE OF MATERIALS - Not Used

~~1315.10 Not Used~~

1315.01 SCOPE

This specification covers membrane forming compounds for curing concrete.

1315.02 REFERENCES

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

~~**American Society for Testing and Materials Standards:**~~

Ontario

~~ASTM C156-93 Water Retention of Concrete Curing Materials Test~~

~~ASTM C309-93 Specification for Liquid Membrane Forming Compound for Curing Concrete~~

~~ASTM D244-94 Test Methods for Emulsified Asphalts~~

~~**Other:**~~

Ministry of Transportation ~~Ontario~~ **Publications**

Laboratory ~~**Standards**~~Testing Manual:

~~L.S.~~ LS-413 Method of Test for Non-Volatile Content of Chemical Admixtures, Latex Admixtures and Curing Compounds

~~L.S.~~ LS-416 Method of Test ~~For~~for Settling Rates ~~-~~Curing Compounds

ASTM

International

C156-93 Test Method for Water Retention by Concrete Curing Materials
C309-93 Specification for Liquid Membrane-Forming Compounds for Curing Concrete
D244-94 Test Methods and Practices for Emulsified Asphalts

1315.04 SUBMISSION AND DESIGN REQUIREMENTS

1315.04.01 Submissions

1315.04.01.01 Product Data

The following product data shall be submitted to Owner.

a~~. the~~) The trade name of the compound.

b~~. the~~) The manufacturer's and supplier's name.

c~~. a~~) A test certificate, from an independent laboratory, containing test results for the tests performed on the designated compound required by this specification.

d~~. infrared~~) Infrared spectra of the curing compound.

e~~. a~~) A statement as to the type of solids, type of solvents, pigment content, total solids content, specific gravity and viscosity of the designated compound.

f~~. production~~) Production tolerances for solids content and specific gravity.

g~~.~~) Manufacturer's Safety Data Sheet.

1315.04.01.02 Product Sample

A 1 L sample shall be submitted when requested by the Owner.

1315.05 MATERIALS

1315.05.01 Requirements

The curing compound shall be white pigmented Type 2 Class B curing compound according to ASTM C309 and this specification.

When performing the water retention test according to ASTM C156 the curing compound shall restrict the loss of water present in the test specimen at the time of application of the compound to not more than 300 g/m2 of treated surface.

The curing compound shall not react deleteriously with concrete.

When tested according to LS 416, the compound shall have such a rate of settling that the uniformly white portion, as visible to the eye, is not less than 145 ml at 2 hours nor less than 125 ml at 24 hours after filling the cylinder.

The testing shall be done by an organization certified by the Standard Council of Canada or by an organization participating in the Cement and Concrete Reference Laboratory at the National Institute of Standards and Technology correlation and inspection program. When the laboratory is the manufacturer's laboratory, an Engineer employed by an independent certified organization shall witness the testing and affix their Engineer's stamp to the test report.

1315.08 QUALITY ASSURANCE

1315.08.01 Sampling and Testing

Quality assurance samples of the white pigmented curing compound will be taken by the Owner from deliveries to its work.

The frequency of sampling and testing will be at the discretion of the Owner.

1315.08.02 Physical Tests

Testing for the non-volatile content will be done according to ~~L.S.~~LS 413. Testing for relative density will be done according to ASTM D244. Test for settling rate will be done according to ~~L.S.~~LS 416.

1315.08.03 Acceptance or Rejection

The material properties shall conform to the product data information submitted to the Owner at the time of the initial evaluation.

The non-volatile content shall be within ± 2.5% of the approved curing compound. The relative density shall be within ± 0.01 of the approved curing compound. When tested for settlement the rate shall be according to the Materials Section.

~~ailure~~Failure of any quality assurance sample to comply with the requirements of this specification shall be sufficient cause to prohibit the use of the material represented by the sample.

Note: OPSS 1315 implemented in April 2025 replaces OPSS 1315, September 1996 with no technical content changes.

MATERIAL SPECIFICATION FOR WHITE PIGMENTED CURING COMPOUNDS FOR CONCRETE

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1315.04 DESIGN AND SUBMISSION REQUIREMENTS

1315.05 MATERIALS

1315.06 EQUIPMENT - Not Used

1315.07 PRODUCTION

1315.08 QUALITY ASSURANCE

1315.09 OWNER PURCHASE OF MATERIALS - Not Used

1315.01 SCOPE

This specification covers membrane forming compounds for curing concrete.

1315.02 REFERENCES

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

Ontario Ministry of Transportation Publications

Laboratory Testing Manual:
LS-413 Method of Test for Non-Volatile Content of Chemical Admixtures, Latex Admixtures and Curing Compounds
LS-416 Method of Test for Settling Rates-Curing Compounds

ASTM International

C156-93 Test Method for Water Retention by Concrete Curing Materials
C309-93 Specification for Liquid Membrane-Forming Compounds for Curing Concrete
D244-94 Test Methods and Practices for Emulsified Asphalts

1315.04 SUBMISSION AND DESIGN REQUIREMENTS

1315.04.01 Submissions

1315.04.01.01 Product Data

The following product data shall be submitted to Owner.

a) The trade name of the compound.

b) The manufacturer's and supplier's name.

c) A test certificate, from an independent laboratory, containing test results for the tests performed on the designated compound required by this specification.

d) Infrared spectra of the curing compound.

e) A statement as to the type of solids, type of solvents, pigment content, total solids content, specific gravity and viscosity of the designated compound.

f) Production tolerances for solids content and specific gravity.

g) Manufacturer's Safety Data Sheet.

1315.04.01.02 Product Sample

A 1 L sample shall be submitted when requested by the Owner.

1315.05 MATERIALS

1315.05.01 Requirements

The curing compound shall be white pigmented Type 2 Class B curing compound according to ASTM C309 and this specification.

When performing the water retention test according to ASTM C156 the curing compound shall restrict the loss of water present in the test specimen at the time of application of the compound to not more than 300 g/m2 of treated surface.

The curing compound shall not react deleteriously with concrete.

When tested according to LS 416, the compound shall have such a rate of settling that the uniformly white portion, as visible to the eye, is not less than 145 ml at 2 hours nor less than 125 ml at 24 hours after filling the cylinder.

The testing shall be done by an organization certified by the Standard Council of Canada or by an organization participating in the Cement and Concrete Reference Laboratory at the National Institute of Standards and Technology correlation and inspection program. When the laboratory is the manufacturer's laboratory, an Engineer employed by an independent certified organization shall witness the testing and affix their Engineer's stamp to the test report.

1315.08 QUALITY ASSURANCE

1315.08.01 Sampling and Testing

Quality assurance samples of the white pigmented curing compound will be taken by the Owner from deliveries to its work.

The frequency of sampling and testing will be at the discretion of the Owner.

1315.08.02 Physical Tests

Testing for the non-volatile content will be done according to LS 413. Testing for relative density will be done according to ASTM D244. Test for settling rate will be done according to LS 416.

1315.08.03 Acceptance or Rejection

The material properties shall conform to the product data information submitted to the Owner at the time of the initial evaluation.

The non-volatile content shall be within $\pm$ 2.5% of the approved curing compound. The relative density shall be within $\pm$ 0.01 of the approved curing compound. When tested for settlement the rate shall be according to the Materials Section.

Failure of any quality assurance sample to comply with the requirements of this specification shall be sufficient cause to prohibit the use of the material represented by the sample.

OPSS.PROV 1351 - Apr 2025

COMMON to PROV conversion

Ontario Provincial Standard Specifications (OPSSs)					
1351	November 2004	April 2025	TBD	Rev: Material Specification for Precast Reinforced Concrete Components for Maintenance Holes, Catch Basin, Ditch Inlets, and Valve Chambers is implemented. The specification has been converted from the November 2004 COMMON to a PROV with no technical content changes.	Mike Pearsall

Note: The 1351 implemented in April 2025 replaces 1351, November 2004 with no technical content changes.

MATERIAL SPECIFICATION FOR PRECAST REINFORCED CONCRETE COMPONENTS FOR MAINTENANCE HOLES, CATCH BASINS, DITCH INLETS, AND VALVE CHAMBERS

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~~**APPENDICES**~~

~~**1351-A Commentary**~~

1351.01 SCOPE

This specification covers the requirements for precast reinforced concrete components for the construction of maintenance holes, catch basins, ditch inlets, and valve chambers, maintenance hole steps, and aluminum safety platforms.

~~**1351.01.01 Significance and Use of Appendices**~~

~~Appendices are not a mandatory part of this specification unless invoked by the Owner.~~

~~**Appendix 1351-A** is a commentary appendix to provide designers with information on the use of the specification in a Contract.~~

1351.02 REFERENCES

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

Ontario Provincial Standard Specifications, ~~Materials~~Material:

OPSS 1002	Aggregates - Concrete
OPSS 1301	Cementing Materials
OPSS 1302	Water
OPSS 1303	Air Entraining and Chemical Admixtures for Concrete
OPSS 1315	White Pigmented Curing Compounds for Concrete
OPSS 1350	Concrete - Materials and Production
OPSS 1440	Steel Reinforcement for Concrete

Ministry of Transportation Publications

MTO Laboratory Testing Manual:
LS-412 Scaling Resistance of Concrete Surfaces Exposed to Deicing Chemicals

Structural Manual:
Division 1, Exceptions to the Canadian Highway Bridge Design Code

Canadian Standards Association

A23.1-00	Concrete Materials and Methods of Concrete Construction [Part of CAN/CSA-A23.1-00/A23.2-00, Concrete Materials and Methods of Concrete Construction/Method of Test for Concrete]
A257.3-03	Joints for Circular Concrete Sewer and Culvert Pipe, Manhole Sections, and Fittings using Rubber Gaskets [Part of A257 Series-03, Standards for Concrete Pipe and Manhole Sections]
A257.4-03	Precast Reinforced Circular Concrete Manhole Sections, Catch Basins, and Fittings [Part of A257 Series-03, Standards for Concrete Pipe and Manhole Sections]
A3000-03	Cementitious Materials Compendium
S6-00	Canadian Highway Bridge Design Code
S157-M83 (R2002)	Strength Design in Aluminum

ASTM International

~~B 221~~B221-96 Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes

Canadian Food and Drug Act and Regulations

Division 23

United States Federal Specifications

United States Code of Federal Regulations, Section 177.1520 (Olefin Polymers)

SS-S-210A Sealing Compound Preformed Plastic for Pipe Joints

Plant Prequalification Program Publication

Prequalification Requirements for Precast Concrete Drainage Products

1351.03 DEFINITIONS

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

Engineer means a professional engineer licensed by the Professional Engineers of Ontario to practice in the Province of Ontario.

Hoop Steel means a continuous ring of deformed steel wire reinforcement.

1351.04 SUBMISSION AND DESIGN REQUIREMENTS

1351.04.01 Submission Requirements

1351.04.01.01 Special Design Drawings

When the Contract Documents do not include Drawings for precast reinforced concrete components, 2 copies of detailed structural design drawings of the components shall be supplied to the Owner for review. Details of precast concrete adjustment units, maintenance hole steps, and the name of the step manufacturer shall also be included.

Detailed structural design drawings shall bear the seals and signatures of the design and checking Engineers.

1351.04.02 Design Requirements

1351.04.02.01 Circular Maintenance Holes, Catch Basins, Ditch Inlets, and Valve Chambers

Circular precast concrete components shall be designed according to CSA A257.4, CAN/CSA-S6, and the Structural Manual, Division 1.

1351.04.02.02 Square or Rectangular Maintenance Holes, Catch Basins, Ditch Inlets, and Valve Chambers

Square or rectangular precast maintenance holes, catch basins, ditch inlets, and valve chambers shall be designed according to CAN/CSA-S6 and the Structural Manual, Division 1.

1351.04.02.03 Precast Concrete Adjustment Units

Precast concrete adjustment units shall be designed according to CSA A257.4.

1351.04.02.04 Steps

Steps that are cast, mortared, or attached by mechanical means into the walls of risers or tapered top sections shall be designed according to CSA A257.4 except that:

a) The steps shall be evenly spaced at a distance of 300 mm centre to centre.

b) The steps shall be located a minimum of 150 mm from the ends of the sections.

c) The clearance between the wall face and the centre of the inside surface of the step shall not be less than 150 mm.

1351.04.02.05 Aluminum Safety Platforms

Aluminum safety platforms shall be designed according to CAN3-S157-M.

1351.04.02.06 Joints

Joints shall be designed as to be formed by a male end of a precast concrete section joining with a female end on the adjoining section.

All joints of precast concrete sanitary sewer maintenance holes and valve chambers shall be provided with a joint seal system which shall be the sole element depended upon to make the joint watertight.

Joints shall be of such a design that when joined they will withstand, without cracking and fracturing, the forces caused by the compression of the joint seal system, and any stresses resulting from the hydrostatic test specified in this specification.

1351.04.02.07 Precast Base Slabs and Monolithic Base Sections

Structural design, including minimum reinforcing steel requirements, shall be based on worst condition installation for standard precast maintenance hole bases. Live load, dead load, hydrostatic uplift, and other possible forces shall be considered for a burial depth of 10 m. Depth of bury is to be measured from grate elevation at the top of the precast maintenance hole to the top of its base. Where greater depth of bury is required, a specially designed base shall be used.

1351.04.02.08 Precast Transition Slabs

Structural design, including minimum reinforcing steel requirements, shall be based on worst condition installation for standard precast maintenance hole transition slabs. Live load, dead load, hydrostatic uplift, and other possible forces shall be considered for a burial depth of:

a) 10 m for tapered transition slabs and transition slabs 1500 mm to 2400 mm in diameter;

b) 8 m for transition slabs greater than 2400 mm in diameter.

Depth of bury is to be measured from grate elevation at the top of the precast maintenance hole to the top of its transition slab. Where greater depths of bury are required, a specially designed transition slab shall be used.

1351.05 MATERIALS

1351.05.01 Aggregates

Aggregates shall be according to OPSS 1002, except that the requirement for gradation need not apply.

1351.05.02 Cement

Cement shall be Portland cement Type GU or blended cements Type GUb, i.e., Portland blast-furnace slag cement and Portland fly ash cement. Ground granulated blast-furnace slag or fly ash may also be added separately to Type GU Portland cement. Whether added separately or in the form of blended cement, ground

granulated blast furnace slag shall constitute not more than 70 percent by mass of the total cementing material and fly ash shall constitute not more than 40 percent by mass of the total cementing materials.

Portland cement Type GU, blended cements Type GUb, ground granulated blast furnace slag, and fly ash shall be according to CAN/CSA A3000.

1351.05.03 Water

Water for concrete shall be according to OPSS 1302.

1351.05.04 Chemical and Air Entraining Admixtures

Chemical and air entraining admixtures shall be according to OPSS 1303.

1351.05.05 Steel Reinforcement

Steel reinforcement shall be according to OPSS 1440 and as specified in the Contract Documents.

Steel reinforcement for precast concrete components may be:

a) Reinforcing steel bars.

b) Welded steel wire fabric, 500 MPa minimum yield strength.

c) Welded deformed steel wire fabric, 500 MPa minimum yield strength.

Steel reinforcement for precast concrete adjustment units shall be according to CSA A257.4.

1351.05.06 Steps

Steps shall be made of plastic encased or unencased aluminum, stainless steel, or plastic encased steel. Aluminum steps shall be according to ASTM B 221, Alloy 6351, Temper T6. Stainless steel steps shall be made of stainless steel type 304.

For plastic encased steps, the casing shall be of a solid, low-density virgin polyethylene material which has been deemed nonobjectionable by the Health Protection Branch of Health and Welfare Canada based on the Canadian Food and Drug Act and Regulations, Division 23. In addition, the polyethylene material must be in compliance with Title 21 of the United States Code of Federal Regulations, Section 177.1520 (Olefin Polymers).

The minimum thickness of the polyethylene material shall not be less than 3 mm along the top wearing surface of the step, excluding anchor portion. The bottom part of the step and the entire anchor portion shall have a polyethylene coating not less than 2 mm in thickness.

1351.05.07 Concrete

Concrete for precast concrete components, including circular valve chambers and adjustment units shall be according to OPSS 1350 with a nominal 28-Day compressive strength of 30 MPa, except that the nominal 28-Day compressive strength for precast rectangular valve chambers shall be 40 MPa.

1351.05.08 Aluminum Safety Platforms

Aluminum safety platforms shall be according to ASTM B 221, Alloy 6351, Temper T6.

1351.05.09 Joint Seal System

Joint seal system for circular precast components for maintenance holes, catch basins, ditch inlets, and valve chambers shall comply with one of the following requirements:

a) Until May 1, 2006, either a dense homogeneous rubber according to CSA A257.3, Clause 8 and 9, or a flexible preformed gasket according to U.S. Federal Specifications SS-S-210A.

b) After May 1, 2006, a dense homogeneous rubber according to CSA A257.3, Clauses 8 and 9.

Joint seal system square or rectangular precast components for maintenance holes, catch basins, ditch inlets, and valve chambers shall comply with one of the following requirements:

a) A dense homogeneous rubber according to CSA A257.3, Clauses 8 and 9.

b) A flexible preformed gasket according to U.S. Federal Specifications SS-S-210-A.

1351.05.10 Membrane Curing Compound

Membrane curing compound shall be according to OPSS 1315.

1351.07 PRODUCTION

1351.07.01 General

A manufacturer producing precast reinforced concrete components for maintenance holes, catch basins, and ditch inlets must possess a current Prequalification Certificate, issued under the Plant Prequalification Program as outlined in the publication, Prequalification Requirements for Precast Concrete Drainage Products.

1351.07.02 Production Method

Production of all precast reinforced concrete components shall be according to CSA A257.4.

1351.07.03 Marking

Markings shall be according to CSA A257.4 and be permanently marked on all precast components in a position readily visible for inspection. The following information shall also be marked on maintenance hole, catch basin, and ditch inlet components:

a) The term *HOOP* on precast concrete riser sections utilizing hoop steel reinforcement.

b) The Prequalification Stamp as outlined in the publication, Prequalification Requirements for Precast Concrete Drainage Products.

1351.08 QUALITY ASSURANCE

1351.08.01 General

Acceptance of the precast reinforced concrete components will be based on the results of the step testing; concrete testing; hydrostatic testing, when specified in the Contract Documents; and salt scaling acceptance test for dry-cast concrete or air voids testing for wet-cast concrete.

Precast reinforced concrete components, equipment, other material, and labour used to perform the testing shall be supplied without charge to the Owner.

When specified in the Contract Documents, the Owner shall be notified in writing at least 72 hours before testing is carried out. In the event that the Owner is unable to be present during the test, the manufacturer shall provide an affidavit affirming the actual recorded test results.

1351.08.02 Step Testing

1351.08.02.01 Horizontal Load Testing

The horizontal load testing of steps shall be according to CSA A257.4, except that a load of 1.3 kN shall be applied on the tread over the width of 90 mm, next to the point the step turns into the wall to form the anchorage. If the step sustains a permanent set of 6 mm or less after application of the horizontal load, then the test is acceptable.

1351.08.02.02 Vertical Load Testing

The vertical load testing of steps shall be according to CSA A257.4. If the step sustains a permanent set of 10 mm or less after application of the vertical load, then the test is acceptable.

1351.08.02.03 Integrity of Plastic Encased Steps to be Installed in New Maintenance Holes and Valve Chambers

This test applies only to steps to be installed in new concrete, less than 1 hour old for dry cast and less than 12 hours old for wet cast. Three steps of the same type shall be tested for integrity of the plastic coating in the following manner:

a) The steps shall be maintained at -23°C ±2°C for 24 hours.

b) The steps shall then be left at 20°C ±2°C for 24 hours.

c) The steps shall then be cut in half, vertically, at the midpoint of the tread and the coating removed at the cut end of each half step to expose approximately 10 mm of metal.

d) A water solution shall be prepared containing sodium chloride, 3% by mass, and a wetting agent, e.g., liquid detergent, 0.25% by volume.

e) A wire shall be connected from an anode in the salt/detergent solution to an ohm meter.

f) Each half step shall then be tested separately for integrity of the plastic coating by connecting the exposed end to the ohm meter and placing the sample in the salt/detergent solution to within 50 mm of the exposed metal end for at least 5 minutes.

For acceptance of the steps, the following criteria shall apply:

a) There shall be no cracking, fracturing, or openings through the plastic encasement. An unacceptable casing will be indicated by a resistance of less than 1 megaohm after 5 minutes in the salt/detergent solution. An acceptable coating will be indicated by a near infinite resistance greater than 1 megaohm after 5 minutes in the salt/detergent solution.

b) If any single half step of the three complete steps tested proves to be unacceptable, then three new complete steps of the same type shall be tested in accordance with the above procedures. If any of these

three steps subsequently tested do not meet the requirements of this specification, then the product shall be deemed to be unacceptable.

1351.08.02.04 Integrity of Plastic Encased Steps to be Installed in Existing Maintenance Holes and Valve Chambers

This test applies only to steps to be installed in existing concrete, older than 1 hour for dry cast and older than 12 hours for wet cast. Three steps of the same type shall be tested for integrity of the plastic coating in the following manner.

a) The steps shall be maintained in a cold room at -23°C ±2°C for 24 hours.

b) Within 5 minutes of removing them from the cold room, the steps shall be driven into 25 mm diameter holes drilled in 30 MPa concrete using a standard 1.45 kg rubber mallet. The concrete shall have been cured at least 28 days.

c) Taking care to avoid damage to the casing, the concrete shall be chipped away from around the steps and the steps left at room temperature at 20°C ±2°C for 24 hours.

d) The steps shall be cut in half vertically at the midpoint of the tread and the coating removed at the cut end of each half step to expose approximately 10 mm of metal.

e) A water solution shall be prepared containing sodium chloride, 3% by mass, and a wetting agent, e.g., liquid detergent, 0.25% by volume.

f) A wire shall be placed from an anode in the salt/detergent solution to an ohm meter.

g) Each half step shall then be tested separately for integrity of the plastic coating by connecting the exposed end to the ohm meter and placing the sample in the salt/detergent solution to within 50 mm of the exposed metal end for at least 5 minutes.

For acceptance of the steps, the following criteria shall apply:

a) There shall be no cracking, fracturing, or openings through the plastic encasement. An unacceptable casing will be indicated by a resistance of less than 1 megaohm after 5 minutes in the salt/detergent solution. An acceptable coating will be indicated by a near infinite resistance, greater than 1 megaohm after 5 minutes in the salt/detergent solution.

b) If any single half step of the three complete steps tested proves to be unacceptable, then three new complete steps of the same type shall be tested in accordance with the above procedures. If any of these three steps subsequently tested do not meet the requirements of this specification, then the product shall be deemed to be unacceptable.

1351.08.03 Concrete Testing

1351.08.03.01 Concrete Compressive Strength

Concrete compressive strength shall be according to CSA A257.4 except cylinders shall be cast and tested monthly.

If the specified strength requirement of the concrete has not been reached after 28 days, two cores shall be taken from a component at locations approved by the Owner. Cores shall be moisture conditioned and tested according to CSA A23.1. Repairs to the core holes shall be to the satisfaction of the Owner.

1351.08.03.02 Salt Scaling Acceptance Test

The Salt Scaling Acceptance Test shall be according to LS-412 except as noted below.

Compliance with the test requirement is based upon a loss of mass of not more than 0.8 kg/m^2 from the surface after 50 cycles of freezing and thawing. If the specimens fail the salt scale resistance test, the manufacturer shall submit proposals of remedial action to the Owner for consideration.

Salt scale resistance testing shall be done at least once a year per mix design. If any mix design components or component suppliers change or component mix design proportions change by more than 10%, then the mix design shall be considered new.

Specimens, at least 300 x 300 mm in size, shall be selected from finished and cured product. Specimens shall be representative of the manufacturer's production. Test specimens supplied from the finished and cured product are considered fully cured and salt scale resistance testing can start immediately on these specimens. Specimens do not need to be saturated with moisture before testing.

A dyke may be made of any material that will adhere to the specimen and serve to maintain the salt solution on the surface of the specimen throughout the period of the test. The dyke must be applied during the dry period. The dyke must not affect the test results. If a dyke is a precast mortar dyke, an air entrained paste shall be applied to the edges around the perimeter of the test specimen and any excess paste shall be removed. After allowing the paste to harden for 24 hours, apply epoxy sealant to the inside, top, and outside of the dyke extending the outside surface epoxy treatment to 25 mm below the joint.

1351.08.03.03 Air Voids Testing

Air voids testing in hardened concrete shall be done at least once a year per mix design according to OPSS 1350.

1351.08.03.04 Hydrostatic Testing

When specified in the Contract Documents, hydrostatic tests are to be carried out on any of the sizes of precast sections or bases to be supplied for the Contract. Such tests shall be carried out by the precast maintenance hole supplier in the presence of the Owner's representative in accordance with the following requirements:

a) A minimum of two maintenance hole riser sections shall be assembled according to the manufacturer's instructions.

b) When testing is performed in such a manner that the joint is closed, the restraining force exerted on the joint shall not exceed the force represented by the weight of a precast maintenance hole 9 m in height of the size being tested.

c) The ends of the test sections shall be bulkheaded and the section filled with water.

d) The maintenance hole sections shall be subjected to an internal hydrostatic pressure of 60 kPa for a period of ten minutes.

e) All joints shall be tested. When only two maintenance hole riser sections are tested the bulkhead joints shall also be tested.

f) There shall be no leakage through the maintenance hole joints or walls. Damp spots and beads of moisture adhering to the walls of the sections shall not be considered as leakage.

g) As an option, the two test riser sections may be allowed to soak for a period of 24 hours before proceeding with the hydrostatic test.

h) Up to 1.0% of the number of each size included in the Contract shall be tested, but in no case shall less than 2 riser sections be tested for each maintenance hole size. Riser sections supplied for testing shall be sound, full-size sections.

1351.08.04 Inspection and Testing

The Owner's representative shall be permitted free access to all portions of the plant engaged in the production of the precast maintenance hole, catch basin, and ditch inlet components, steps, and adjustment units and shall be provided with all reasonable facilities to secure the required samples and be satisfied that the components supplied are in accordance with this specification.

1351.09 OWNER PURCHASE OF MATERIAL

1351.09.01 Measurement and Payment

For measurement purposes, a count will be made of the number of complete structures delivered and accepted.

For measurement purposes, a count will be made of the number of concrete adjustment units delivered and accepted.

Payment at the price specified in the purchasing order shall be for supply and delivery of the complete structure, individual components, steps, concrete adjustment units, or safety platforms to the destination at the time specified.

The cost of all testing, except those performed in the Owner's laboratory, shall be included in the price.

Appendix 1351-A, Commentary for OPSS 1351, November 2004

Note: This appendix does not form part of the standard specification. It is intended to provide information to the designer on the use of this specification in a Contract.

Designer Action/Considerations

The designer should specify the following in the Contract Documents:

- Precast reinforced concrete component drawings. (1351.04.01.01)

- If Owner wishes 72 hours notice prior to quality assurance testing being carried out. (1351.08.01)

- If the Owner requires hydrostatic testing. For deeper maintenance hole test sections, higher hydrostatic test pressures to 90 kPa may be requested. (1351.08.03.03)

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

Related Ontario Provincial Standard Drawings

OPSD 404.020 to 404.022	Aluminum Safety Platforms
OPSD 405.010 to 405.020	Maintenance Hole Steps
OPSD 701.010 to 701.015	Precast Concrete Maintenance Holes, 1200 to 3600mm Diameter
OPSD 701.030 to 701.081	Precast Concrete Maintenance Hole Components, 1200 to 3600mm Diameter
OPSD 702.040	Precast Concrete Ditch Inlet Maintenance Hole Type A, 1200 x 1200mm
OPSD 702.050	Precast Concrete Ditch Inlet Maintenance Hole Type B, 1200 x 1200mm
OPSD 703.011 to 703.015	Precast Concrete Single Inlet Flat Cap, 1500 to 3600mm Diameter
OPSD 703.021 to 703.024	Precast Concrete Twin Inlet Flat Cap, 1500 to 3600mm Diameter
OPSD 704.010	Precast Concrete Adjustment Units for Maintenance Holes and Catch Basins
OPSD 705.010	Precast Concrete Catch Basin, 600 x 600mm
OPSD 705.020	Precast Concrete Twin Inlet Catch Basin, 600 x 1450mm
OPSD 705.030	Precast Concrete Ditch Inlet, 600 x 600mm
OPSD 705.040	Precast Concrete Ditch Inlet, 600 x 1200mm
OPSD 706.010 to 706.041	Precast Concrete Ditch Inlets 600 x 1200mm with 1500 to 3000mm Diameter Flat Caps
OPSD 1101.010	Precast Valve Chamber, 1200mm and 1500mm Diameter
OPSD 1101.012 to 1101.015	Precast Concrete Valve Chamber with Poured-In-Place Thrust Blocks, 1800 x 2400mm
OPSD 1101.016 to 1101.019	Precast Concrete Valve Chamber with Poured-In-Place Thrust Blocks, 2400 x 3000mm

Note: The 1351 implemented in April 2025 replaces 1351, November 2004 with no technical content changes.

MATERIAL SPECIFICATION FOR PRECAST REINFORCED CONCRETE COMPONENTS FOR MAINTENANCE HOLES, CATCH BASINS, DITCH INLETS, AND VALVE CHAMBERS

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1351.09 OWNER PURCHASE OF MATERIAL

1351.01 SCOPE

This specification covers the requirements for precast reinforced concrete components for the construction of maintenance holes, catch basins, ditch inlets, and valve chambers, maintenance hole steps, and aluminum safety platforms.

1351.02 REFERENCES

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

Ontario Provincial Standard Specifications, Material:

OPSS 1002 Aggregates - Concrete
OPSS 1301 Cementing Materials
OPSS 1302 Water
OPSS 1303 Air Entraining and Chemical Admixtures for Concrete
OPSS 1315 White Pigmented Curing Compounds for Concrete

OPSS 1350 Concrete - Materials and Production
OPSS 1440 Steel Reinforcement for Concrete

Ministry of Transportation Publications

MTO Laboratory Testing Manual:
LS-412 Scaling Resistance of Concrete Surfaces Exposed to Deicing Chemicals

Structural Manual:
Division 1, Exceptions to the Canadian Highway Bridge Design Code

Canadian Standards Association

A23.1-00 Concrete Materials and Methods of Concrete Construction [Part of CAN/CSA-A23.1-00/A23.2-00, Concrete Materials and Methods of Concrete Construction/Method of Test for Concrete]
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A257.4-03 Precast Reinforced Circular Concrete Manhole Sections, Catch Basins, and Fittings [Part of A257 Series-03, Standards for Concrete Pipe and Manhole Sections]
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S6-00 Canadian Highway Bridge Design Code
S157-M83 (R2002) Strength Design in Aluminum

ASTM International

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1351.03 DEFINITIONS

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

Engineer means a professional engineer licensed by the Professional Engineers of Ontario to practice in the Province of Ontario.

Hoop Steel means a continuous ring of deformed steel wire reinforcement.

1351.04 SUBMISSION AND DESIGN REQUIREMENTS

1351.04.01 Submission Requirements

1351.04.01.01 Special Design Drawings

When the Contract Documents do not include Drawings for precast reinforced concrete components, 2 copies of detailed structural design drawings of the components shall be supplied to the Owner for review. Details of precast concrete adjustment units, maintenance hole steps, and the name of the step manufacturer shall also be included.

Detailed structural design drawings shall bear the seals and signatures of the design and checking Engineers.

1351.04.02 Design Requirements

1351.04.02.01 Circular Maintenance Holes, Catch Basins, Ditch Inlets, and Valve Chambers

Circular precast concrete components shall be designed according to CSA A257.4, CAN/CSA-S6, and the Structural Manual, Division 1.

1351.04.02.02 Square or Rectangular Maintenance Holes, Catch Basins, Ditch Inlets, and Valve Chambers

Square or rectangular precast maintenance holes, catch basins, ditch inlets, and valve chambers shall be designed according to CAN/CSA-S6 and the Structural Manual, Division 1.

1351.04.02.03 Precast Concrete Adjustment Units

Precast concrete adjustment units shall be designed according to CSA A257.4.

1351.04.02.04 Steps

Steps that are cast, mortared, or attached by mechanical means into the walls of risers or tapered top sections shall be designed according to CSA A257.4 except that:

a) The steps shall be evenly spaced at a distance of 300 mm centre to centre.

b) The steps shall be located a minimum of 150 mm from the ends of the sections.

c) The clearance between the wall face and the centre of the inside surface of the step shall not be less than 150 mm.

1351.04.02.05 Aluminum Safety Platforms

Aluminum safety platforms shall be designed according to CAN3-S157-M.

1351.04.02.06 Joints

Joints shall be designed as to be formed by a male end of a precast concrete section joining with a female end on the adjoining section.

All joints of precast concrete sanitary sewer maintenance holes and valve chambers shall be provided with a joint seal system which shall be the sole element depended upon to make the joint watertight.

Joints shall be of such a design that when joined they will withstand, without cracking and fracturing, the forces caused by the compression of the joint seal system, and any stresses resulting from the hydrostatic test specified in this specification.

1351.04.02.07 Precast Base Slabs and Monolithic Base Sections

Structural design, including minimum reinforcing steel requirements, shall be based on worst condition installation for standard precast maintenance hole bases. Live load, dead load, hydrostatic uplift, and other possible forces shall be considered for a burial depth of 10 m. Depth of bury is to be measured from grate elevation at the top of the precast maintenance hole to the top of its base. Where greater depth of bury is required, a specially designed base shall be used.

1351.04.02.08 Precast Transition Slabs

Structural design, including minimum reinforcing steel requirements, shall be based on worst condition installation for standard precast maintenance hole transition slabs. Live load, dead load, hydrostatic uplift, and other possible forces shall be considered for a burial depth of:

a) 10 m for tapered transition slabs and transition slabs 1500 mm to 2400 mm in diameter;

b) 8 m for transition slabs greater than 2400 mm in diameter.

Depth of bury is to be measured from grate elevation at the top of the precast maintenance hole to the top of its transition slab. Where greater depths of bury are required, a specially designed transition slab shall be used.

1351.05 MATERIALS

1351.05.01 Aggregates

Aggregates shall be according to OPSS 1002, except that the requirement for gradation need not apply.

1351.05.02 Cement

Cement shall be Portland cement Type GU or blended cements Type GUb, i.e., Portland blast-furnace slag cement and Portland fly ash cement. Ground granulated blast-furnace slag or fly ash may also be added separately to Type GU Portland cement. Whether added separately or in the form of blended cement, ground granulated blast furnace slag shall constitute not more than 70 percent by mass of the total cementing material and fly ash shall constitute not more than 40 percent by mass of the total cementing materials.

Portland cement Type GU, blended cements Type GUb, ground granulated blast furnace slag, and fly ash shall be according to CAN/CSA A3000.

1351.05.03 Water

Water for concrete shall be according to OPSS 1302.

1351.05.04 Chemical and Air Entraining Admixtures

Chemical and air entraining admixtures shall be according to OPSS 1303.

1351.05.05 Steel Reinforcement

Steel reinforcement shall be according to OPSS 1440 and as specified in the Contract Documents.

Steel reinforcement for precast concrete components may be:

a) Reinforcing steel bars.

b) Welded steel wire fabric, 500 MPa minimum yield strength.

c) Welded deformed steel wire fabric, 500 MPa minimum yield strength.

Steel reinforcement for precast concrete adjustment units shall be according to CSA A257.4.

1351.05.06 Steps

Steps shall be made of plastic encased or unencased aluminum, stainless steel, or plastic encased steel. Aluminum steps shall be according to ASTM B 221, Alloy 6351, Temper T6. Stainless steel steps shall be made of stainless steel type 304.

For plastic encased steps, the casing shall be of a solid, low-density virgin polyethylene material which has been deemed nonobjectionable by the Health Protection Branch of Health and Welfare Canada based on the Canadian Food and Drug Act and Regulations, Division 23. In addition, the polyethylene material must be in compliance with Title 21 of the United States Code of Federal Regulations, Section 177.1520 (Olefin Polymers).

The minimum thickness of the polyethylene material shall not be less than 3 mm along the top wearing surface of the step, excluding anchor portion. The bottom part of the step and the entire anchor portion shall have a polyethylene coating not less than 2 mm in thickness.

1351.05.07 Concrete

Concrete for precast concrete components, including circular valve chambers and adjustment units shall be according to OPSS 1350 with a nominal 28-Day compressive strength of 30 MPa, except that the nominal 28-Day compressive strength for precast rectangular valve chambers shall be 40 MPa.

1351.05.08 Aluminum Safety Platforms

Aluminum safety platforms shall be according to ASTM B 221, Alloy 6351, Temper T6.

1351.05.09 Joint Seal System

Joint seal system for circular precast components for maintenance holes, catch basins, ditch inlets, and valve chambers shall comply with one of the following requirements:

a) Until May 1, 2006, either a dense homogeneous rubber according to CSA A257.3, Clause 8 and 9, or a flexible preformed gasket according to U.S. Federal Specifications SS-S-210A.

b) After May 1, 2006, a dense homogeneous rubber according to CSA A257.3, Clauses 8 and 9.

Joint seal system square or rectangular precast components for maintenance holes, catch basins, ditch inlets, and valve chambers shall comply with one of the following requirements:

a) A dense homogeneous rubber according to CSA A257.3, Clauses 8 and 9.

b) A flexible preformed gasket according to U.S. Federal Specifications SS-S-210-A.

1351.05.10 Membrane Curing Compound

Membrane curing compound shall be according to OPSS 1315.

1351.07 PRODUCTION

1351.07.01 General

A manufacturer producing precast reinforced concrete components for maintenance holes, catch basins, and ditch inlets must possess a current Prequalification Certificate, issued under the Plant Prequalification Program as outlined in the publication, Prequalification Requirements for Precast Concrete Drainage Products.

1351.07.02 Production Method

Production of all precast reinforced concrete components shall be according to CSA A257.4.

1351.07.03 Marking

Markings shall be according to CSA A257.4 and be permanently marked on all precast components in a position readily visible for inspection. The following information shall also be marked on maintenance hole, catch basin, and ditch inlet components:

a) The term *HOOP* on precast concrete riser sections utilizing hoop steel reinforcement.

b) The Prequalification Stamp as outlined in the publication, Prequalification Requirements for Precast Concrete Drainage Products.

1351.08 QUALITY ASSURANCE

1351.08.01 General

Acceptance of the precast reinforced concrete components will be based on the results of the step testing; concrete testing; hydrostatic testing, when specified in the Contract Documents; and salt scaling acceptance test for dry-cast concrete or air voids testing for wet-cast concrete.

Precast reinforced concrete components, equipment, other material, and labour used to perform the testing shall be supplied without charge to the Owner.

When specified in the Contract Documents, the Owner shall be notified in writing at least 72 hours before testing is carried out. In the event that the Owner is unable to be present during the test, the manufacturer shall provide an affidavit affirming the actual recorded test results.

1351.08.02 Step Testing

1351.08.02.01 Horizontal Load Testing

The horizontal load testing of steps shall be according to CSA A257.4, except that a load of 1.3 kN shall be applied on the tread over the width of 90 mm, next to the point the step turns into the wall to form the anchorage. If the step sustains a permanent set of 6 mm or less after application of the horizontal load, then the test is acceptable.

1351.08.02.02 Vertical Load Testing

The vertical load testing of steps shall be according to CSA A257.4. If the step sustains a permanent set of 10 mm or less after application of the vertical load, then the test is acceptable.

1351.08.02.03 Integrity of Plastic Encased Steps to be Installed in New Maintenance Holes and Valve Chambers

This test applies only to steps to be installed in new concrete, less than 1 hour old for dry cast and less than 12 hours old for wet cast. Three steps of the same type shall be tested for integrity of the plastic coating in the following manner:

a) The steps shall be maintained at -23°C ±2°C for 24 hours.

b) The steps shall then be left at 20°C ±2°C for 24 hours.

c) The steps shall then be cut in half, vertically, at the midpoint of the tread and the coating removed at the cut end of each half step to expose approximately 10 mm of metal.

d) A water solution shall be prepared containing sodium chloride, 3% by mass, and a wetting agent, e.g., liquid detergent, 0.25% by volume.

e) A wire shall be connected from an anode in the salt/detergent solution to an ohm meter.

f) Each half step shall then be tested separately for integrity of the plastic coating by connecting the exposed end to the ohm meter and placing the sample in the salt/detergent solution to within 50 mm of the exposed metal end for at least 5 minutes.

For acceptance of the steps, the following criteria shall apply:

a) There shall be no cracking, fracturing, or openings through the plastic encasement. An unacceptable casing will be indicated by a resistance of less than 1 megaohm after 5 minutes in the salt/detergent solution. An acceptable coating will be indicated by a near infinite resistance greater than 1 megaohm after 5 minutes in the salt/detergent solution.

b) If any single half step of the three complete steps tested proves to be unacceptable, then three new complete steps of the same type shall be tested in accordance with the above procedures. If any of these three steps subsequently tested do not meet the requirements of this specification, then the product shall be deemed to be unacceptable.

1351.08.02.04 Integrity of Plastic Encased Steps to be Installed in Existing Maintenance Holes and Valve Chambers

This test applies only to steps to be installed in existing concrete, older than 1 hour for dry cast and older than 12 hours for wet cast. Three steps of the same type shall be tested for integrity of the plastic coating in the following manner.

a) The steps shall be maintained in a cold room at -23°C ±2°C for 24 hours.

b) Within 5 minutes of removing them from the cold room, the steps shall be driven into 25 mm diameter holes drilled in 30 MPa concrete using a standard 1.45 kg rubber mallet. The concrete shall have been cured at least 28 days.

c) Taking care to avoid damage to the casing, the concrete shall be chipped away from around the steps and the steps left at room temperature at 20°C ±2°C for 24 hours.

d) The steps shall be cut in half vertically at the midpoint of the tread and the coating removed at the cut end of each half step to expose approximately 10 mm of metal.

e) A water solution shall be prepared containing sodium chloride, 3% by mass, and a wetting agent, e.g., liquid detergent, 0.25% by volume.

f) A wire shall be placed from an anode in the salt/detergent solution to an ohm meter.

g) Each half step shall then be tested separately for integrity of the plastic coating by connecting the exposed end to the ohm meter and placing the sample in the salt/detergent solution to within 50 mm of the exposed metal end for at least 5 minutes.

For acceptance of the steps, the following criteria shall apply:

a) There shall be no cracking, fracturing, or openings through the plastic encasement. An unacceptable casing will be indicated by a resistance of less than 1 megaohm after 5 minutes in the salt/detergent solution. An acceptable coating will be indicated by a near infinite resistance, greater than 1 megaohm after 5 minutes in the salt/detergent solution.

b) If any single half step of the three complete steps tested proves to be unacceptable, then three new complete steps of the same type shall be tested in accordance with the above procedures. If any of these three steps subsequently tested do not meet the requirements of this specification, then the product shall be deemed to be unacceptable.

1351.08.03 Concrete Testing

1351.08.03.01 Concrete Compressive Strength

Concrete compressive strength shall be according to CSA A257.4 except cylinders shall be cast and tested monthly.

If the specified strength requirement of the concrete has not been reached after 28 days, two cores shall be taken from a component at locations approved by the Owner. Cores shall be moisture conditioned and tested according to CSA A23.1. Repairs to the core holes shall be to the satisfaction of the Owner.

1351.08.03.02 Salt Scaling Acceptance Test

The Salt Scaling Acceptance Test shall be according to LS-412 except as noted below.

Compliance with the test requirement is based upon a loss of mass of not more than 0.8 kg/m^2 from the surface after 50 cycles of freezing and thawing. If the specimens fail the salt scale resistance test, the manufacturer shall submit proposals of remedial action to the Owner for consideration.

Salt scale resistance testing shall be done at least once a year per mix design. If any mix design components or component suppliers change or component mix design proportions change by more than 10%, then the mix design shall be considered new.

Specimens, at least 300 x 300 mm in size, shall be selected from finished and cured product. Specimens shall be representative of the manufacturer's production. Test specimens supplied from the finished and cured product are considered fully cured and salt scale resistance testing can start immediately on these specimens. Specimens do not need to be saturated with moisture before testing.

A dyke may be made of any material that will adhere to the specimen and serve to maintain the salt solution on the surface of the specimen throughout the period of the test. The dyke must be applied during the dry period. The dyke must not affect the test results. If a dyke is a precast mortar dyke, an air entrained paste shall be applied to the edges around the perimeter of the test specimen and any excess paste shall be removed. After allowing the paste to harden for 24 hours, apply epoxy sealant to the inside, top, and outside of the dyke extending the outside surface epoxy treatment to 25 mm below the joint.

1351.08.03.03 Air Voids Testing

Air voids testing in hardened concrete shall be done at least once a year per mix design according to OPSS 1350.

1351.08.03.04 Hydrostatic Testing

When specified in the Contract Documents, hydrostatic tests are to be carried out on any of the sizes of precast sections or bases to be supplied for the Contract. Such tests shall be carried out by the precast maintenance hole supplier in the presence of the Owner's representative in accordance with the following requirements:

a) A minimum of two maintenance hole riser sections shall be assembled according to the manufacturer's instructions.

b) When testing is performed in such a manner that the joint is closed, the restraining force exerted on the joint shall not exceed the force represented by the weight of a precast maintenance hole 9 m in height of the size being tested.

c) The ends of the test sections shall be bulkheaded and the section filled with water.

d) The maintenance hole sections shall be subjected to an internal hydrostatic pressure of 60 kPa for a period of ten minutes.

e) All joints shall be tested. When only two maintenance hole riser sections are tested the bulkhead joints shall also be tested.

f) There shall be no leakage through the maintenance hole joints or walls. Damp spots and beads of moisture adhering to the walls of the sections shall not be considered as leakage.

g) As an option, the two test riser sections may be allowed to soak for a period of 24 hours before proceeding with the hydrostatic test.

h) Up to 1.0% of the number of each size included in the Contract shall be tested, but in no case shall less than 2 riser sections be tested for each maintenance hole size. Riser sections supplied for testing shall be sound, full-size sections.

1351.08.04 Inspection and Testing

The Owner’s representative shall be permitted free access to all portions of the plant engaged in the production of the precast maintenance hole, catch basin, and ditch inlet components, steps, and adjustment units and shall be provided with all reasonable facilities to secure the required samples and be satisfied that the components supplied are in accordance with this specification.

1351.09 OWNER PURCHASE OF MATERIAL

1351.09.01 Measurement and Payment

For measurement purposes, a count will be made of the number of complete structures delivered and accepted.

For measurement purposes, a count will be made of the number of concrete adjustment units delivered and accepted.

Payment at the price specified in the purchasing order shall be for supply and delivery of the complete structure, individual components, steps, concrete adjustment units, or safety platforms to the destination at the time specified.

The cost of all testing, except those performed in the Owner's laboratory, shall be included in the price.

OPSS.PROV 1352 - Apr 2025

COMMON to PROV conversion with SSP 113S09 rolled-in and canceled.
Legacy Section 10 removed – DSM located on Tech Pubs

Ontario Provincial Standard Specifications (OPSSs)					
1352	November 1989	April 2025	TBD	Rev: Material Specification for Precast Concrete Barriers is implemented. The specification has been converted from the November 1989 COMMON to a PROV with no technical content changes.	Mike Pearsall
Standard Special Provisions (SSPs)					
113S09	February 2013	April 2025	TBD	Can: SSP Amendment to Material Specification for Precast Concrete Barriers is cancelled. Applicable content has been incorporated into OPSS 1352.	Mike Pearsall

ONTARIO
PROVINCIAL
STANDARD
SPECIFICATION

~~METRIC~~
OPSS.PROV 1352
~~NOVEMBER 1989~~APRIL 2025

Note: The 1352 implemented in April 2025 replaces 1352, November 1989 with no technical content changes.

MATERIAL SPECIFICATION FOR PRECAST REINFORCED CONCRETE ~~BARRIERS~~COMPONENTS FOR MAINTENANCE HOLES, CATCH BASINS, DITCH INLETS, AND VALVE CHAMBERS

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~~**1352.09.01 Measurement for Payment**~~
~~**.02 Basis of Payment**~~

~~**1352.10 DESIGNATED SOURCES REQUIREMENTS**~~

1352.01 SCOPE

This specification covers the requirements for precast concrete barriers.

1352.02 REFERENCES

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

Ontario Provincial Standard Specifications, Material:

OPSS 1301	Hydraulic Cementing Materials
OPSS 1350	Concrete (Materials and Production)
OPSS 1440	Steel Reinforcement for Concrete
OPSS 1442	Epoxy Coated Steel Reinforcement for Concrete
OPSS 1443	Organic Coatings for Steel Reinforcement (Concrete)

American National Standard Institute/American Society of Testing Materials:

ASTM C672-84 - Test Method for Scaling Resistance of Concrete Specimens Subjected to Freezing

Canadian Standards Association:

CSA G164-M1981 - Hot Dip Galvanizing of Irregularly Shaped Articles

CSA G189-1966 - Sprayed Metal Coatings for (R1980) Atmospheric Corrosion Protection

1352.05 MATERIALS

1352.05.01 Concrete

Concrete shall conform to OPSS 1350 except that the restrictions on volume batching will not apply. ~~-~~The Contractor shall assume the responsibility for the mix design.~~-~~ The following specific requirements shall apply:

Class of Concrete	30 MPa at 28 d
Coarse Aggregate	19.0 mm nominal max. size
Maximum Slump	60 mm
Air Content	6% ± 1.5%

1352.05.02 Cement

Cement shall be Portland Cement, Portland Blast-Furnace Slag Cement (Type 10S or Type 10SM) or Portland Pozzolan Cement (Type 10P) conforming to OPSS 1301. ~~-~~Ground granulated blast-furnace slag, or fly ash may

be used in conjunction with Normal Portland Cement (Type 10). Ground granulated blast-furnace slag shall conform to OPSS 1301 and it shall constitute not more than 70% by the mass of the total cementing material. Fly ash shall conform to OPSS 1301 (Type F or Type C) and it shall constitute not more than 40% by the mass of the total cementing material.

1352.05.03 Barrier Connections

The Precast Concrete Barrier connections shall be one of the following approved types:

Hook and Eye;
Concrete Key;
I-Lock Connection.

1352.05.04 Interlocking Components

All interlocking devices and exposed metal in the precast concrete barrier units shall be protected by using one of the following methods:

a. hot) Hot dip galvanizing conforming to CSA G-164 providing a minimum zinc coating of 0.61 kg^2

b. zinc) Zinc metallizing conforming to CSA G-189 providing a minimum metallized coating of 200 μm thickness;

c. coating) Coating with an approved organic coating material conforming to OPSS 1443.

1352.05.05 Steel Reinforcement

Steel reinforcement shall be according to OPSS 1440.

1352.07 PRODUCTION

1352.07.01 Curing Methods

Curing shall conform to the method as submitted and approved by the Authority.

1352.07.02 Marking

The following information shall be permanently marked on the top or sides of the precast sections:

1.a) Name or trade-mark of the manufacturer;

2.b) Identification of plant if manufacturer has more than one plant;

3c) The date of manufacture.

1352.07.03 Quality Control

1352.07.03.01 Salt Scaling Test

For quality control purposes the Contractor may use a modified version of the "Salt Scaling Test" described in Section 1352.08. The modified version to be used is the visual evaluation of the surface deterioration conforming to ASTM C672.

1352.08 QUALITY ASSURANCE

1352.08.01 Salt Scaling Test

1352.08.01.01 General

The acceptance of permanent precast concrete barrier will be based on the results of the "Salt Scaling Test" as carried out by the Authority and as described in this specification.

This test determines the resistance of concrete specimens, with a salt solution ponded on the surface, to repeated cycles of freezing and thawing. Compliance with the test requirement is based upon a loss of mass of not more than 0.8 kg/m^2 from the surface after 50 cycles of freezing and thawing.

After 50 freeze-thaw cycles the test specimen shall not exhibit deterioration in the form of cracks, spalls, aggregate disintegration or other objectionable features.

1352.08.01.02 Apparatus

The freezing apparatus shall consist of a suitable cabinet or cold room capable of maintaining an air temperature of -18 ± 2°C.

The thawing and air drying apparatus shall consist of a suitable cabinet or room with controls to maintain an air temperature of 23 ± 2°C and a relative humidity of 50 ± 5 percent. The scales or balance shall have a minimum capacity of 5000 g with an accuracy of 0.1 g. The drying oven shall be capable of maintaining a temperature of 105 ± 2°C.

1352.08.01.03 Freezing and Thawing Cycle

One freeze-thaw cycle shall be completed every 24 hours. The cycle shall consist of 16 hours ± 1 hour freezing followed by 8 hours ± 1 hours thawing. When, due to work schedules or other reasons a thaw period cannot commence at the specified time the specimens shall remain in the freezing cabinet at -18 ± 2°C.

1352.08.01.04 Test Specimens

For the purposes of the test, two specimens 75 mm thick and at least 300 x 300 mm or 300 mm in diameter will be selected from the finished product by the Authority's representative. Specimens shall be representative of the Contractor's production.

Upon receipt of the specimens in the laboratory an epoxy mortar dyke or other suitable dyke shall be cast around the edges of the test specimen to expose a surface 250 x 250 mm or 250 mm in diameter, as shown in Figure 1. The surface of the specimen ponded in this test will normally be the outside surface of the barrier.

The dyked surface shall be flooded with water, 6 mm deep for 3 days to check for possible leakage.

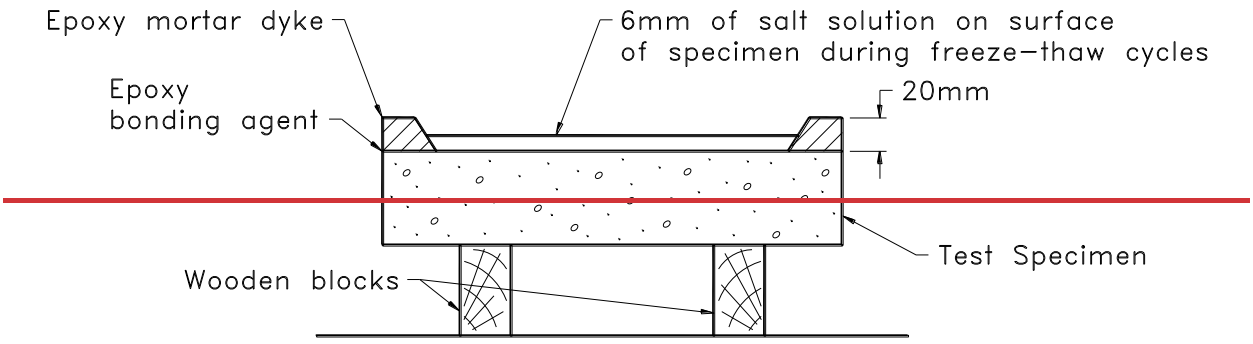

Figure 1

1352.08.01.05 Test Procedure

The water on the surface of the specimens shall be replaced by a solution of sodium chloride (concentration 3 percent by mass) to a depth of 6 mm.

The specimens shall then be subjected to continuous freeze-thaw cycles as specified in Clauses 1352.08.01.01 and 1352.08.01.03.

After each 5 cycles the salt solution and the particles of deteriorated concrete shall be removed from the slab and collected in a watertight container. The operation is best accomplished by tilting the slab into a funnel approximately 500 mm in diameter and washing the surface of the slab with a 3 percent sodium chloride solution. This washing should continue until all loose particles are removed from the concrete. The solution shall then be strained through a filter and the residue dried out at 105°C to a constant weight condition. The residue shall be cumulatively weighed after each 5 cycles. This residue shall be defined as the loss of mass and expressed in kilograms per square metre of exposed slab area.

The loss of mass shall be calculated to the nearest 0.1 kg/m^2.

After the washing of each slab a new solution of sodium chloride shall be placed on the surface.

The test shall continue until 50 freeze-thaw cycles have been completed.

During the test each specimen shall be positioned and supported to allow free air circulation under, around and over the test pieces.

The bottom of the specimens shall be supported on wooden blocks but not in a manner as to prevent movement of moisture through the test pieces.

1352.08.01.06 Report

The report shall include the following:

(ia) Identification;

(iib) Photographs of the test specimens before and after the 50 cycle freeze-thaw test. Photographs at intermediate stages of the test are optional.

~~(iii~~

c) A graph of the cumulative mass loss of each specimen plotted in kilograms per metre squared against the number of freeze-thaw cycles at 5 cycle intervals.

1352.09 AUTHORITY PURCHASE OF MATERIALS BY PURCHASE ORDER

1352.09.01 Measurement for Payment

The unit of measurement for payment will be for each precast concrete barrier unit delivered and accepted.

1352.09.02 Basis of Payment

Payment at the contract price for precast concrete barrier units shall be full compensation for all labour, equipment and materials for the supply and delivery of the units to the location and at the time specified.

~~1352.10 DESIGNATED SOURCES REQUIREMENTS~~

~~Manufacturers wishing approval to manufacture precast concrete barrier shall contact the Ministry of Transportation Purchasing and Supply Office.~~

~~Approval of the manufacturer's plant shall be based on the acceptability of the constituent materials, the degree of production control and uniformity, and whether the finished product meets the requirements of this specification. The manufacturer shall not change material type, sources, or production methods, without prior approval of the Authority.~~

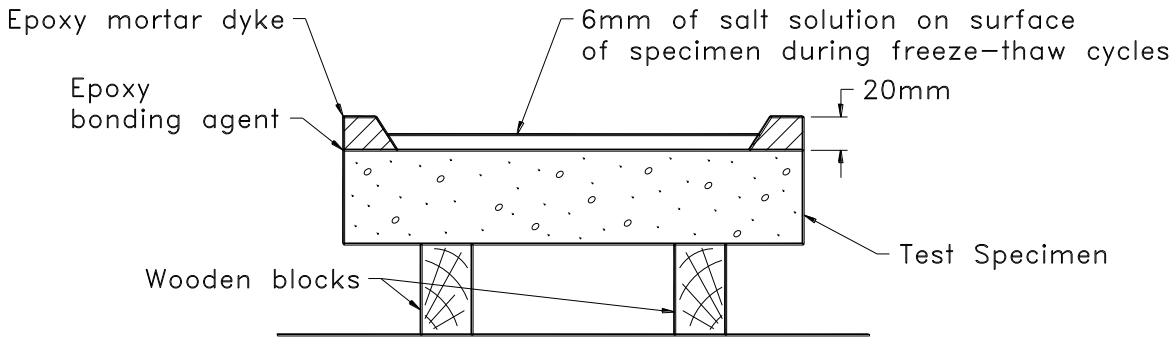

Figure 1

Note: The 1352 implemented in April 2025 replaces 1352, November 1989 with no technical content changes.

MATERIAL SPECIFICATION FOR PRECAST REINFORCED CONCRETE COMPONENTS FOR MAINTENANCE HOLES, CATCH BASINS, DITCH INLETS, AND VALVE CHAMBERS

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1352.01 SCOPE

1352.02 REFERENCES

1352.03 DEFINITIONS - Not Used

1352.04 SUBMISSION AND DESIGN REQUIREMENTS - Not Used

1352.05 MATERIALS

1352.06 EQUIPMENT - Not Used

1352.07 PRODUCTION

1352.08 QUALITY ASSURANCE

1352.09 OWNER PURCHASE OF MATERIAL

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OPSS 1350 Concrete (Materials and Production)
OPSS 1440 Steel Reinforcement for Concrete
OPSS 1442 Epoxy Coated Steel Reinforcement for Concrete
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American National Standard Institute/American Society of Testing Materials:

ASTM C672-84 - Test Method for Scaling Resistance of Concrete Specimens Subjected to Freezing

Canadian Standards Association:

CSA G164-M1981 - Hot Dip Galvanizing of Irregularly Shaped Articles

CSA G189-1966 - Sprayed Metal Coatings for (R1980) Atmospheric Corrosion Protection

1352.05 MATERIALS

1352.05.01 Concrete

Concrete shall conform to OPSS 1350 except that the restrictions on volume batching will not apply. The Contractor shall assume the responsibility for the mix design. The following specific requirements shall apply:

Class of Concrete	30 MPa at 28 d
Coarse Aggregate	19.0 mm nominal max. size
Maximum Slump	60 mm
Air Content	6% $\pm$ 1.5%

1352.05.02 Cement

Cement shall be Portland Cement, Portland Blast-Furnace Slag Cement (Type 10S or Type 10SM) or Portland Pozzolan Cement (Type 10P) conforming to OPSS 1301. Ground granulated blast-furnace slag, or fly ash may be used in conjunction with Normal Portland Cement (Type 10). Ground granulated blast-furnace slag shall conform to OPSS 1301 and it shall constitute not more than 70% by the mass of the total cementing material. Fly ash shall conform to OPSS 1301 (Type F or Type C) and it shall constitute not more than 40% by the mass of the total cementing material.

1352.05.03 Barrier Connections

The Precast Concrete Barrier connections shall be one of the following approved types:

Hook and Eye;
Concrete Key;
I-Lock Connection.

1352.05.04 Interlocking Components

All interlocking devices and exposed metal in the precast concrete barrier units shall be protected by using one of the following methods:

a) Hot dip galvanizing conforming to CSA G-164 providing a minimum zinc coating of 0.61 kg^2

b) Zinc metallizing conforming to CSA G-189 providing a minimum metallized coating of 200 μm thickness;

c) Coating with an approved organic coating material conforming to OPSS 1443.

1352.05.05 Steel Reinforcement

Steel reinforcement shall be according to OPSS 1440.

1352.07 PRODUCTION

1352.07.01 Curing Methods

Curing shall conform to the method as submitted and approved by the Authority.

1352.07.02 Marking

The following information shall be permanently marked on the top or sides of the precast sections:

a) Name or trade-mark of the manufacturer;

b) Identification of plant if manufacturer has more than one plant;

c) The date of manufacture.

1352.07.03 Quality Control

1352.07.03.01 Salt Scaling Test

For quality control purposes the Contractor may use a modified version of the "Salt Scaling Test" described in Section 1352.08. The modified version to be used is the visual evaluation of the surface deterioration conforming to ASTM C672.

1352.08 QUALITY ASSURANCE

1352.08.01 Salt Scaling Test

1352.08.01.01 General

The acceptance of permanent precast concrete barrier will be based on the results of the "Salt Scaling Test" as carried out by the Authority and as described in this specification.

This test determines the resistance of concrete specimens, with a salt solution ponded on the surface, to repeated cycles of freezing and thawing. Compliance with the test requirement is based upon a loss of mass of not more than 0.8 kg/m^2 from the surface after 50 cycles of freezing and thawing.

After 50 freeze-thaw cycles the test specimen shall not exhibit deterioration in the form of cracks, spalls, aggregate disintegration or other objectionable features.

1352.08.01.02 Apparatus

The freezing apparatus shall consist of a suitable cabinet or cold room capable of maintaining an air temperature of -18 $\pm$ 2°C.

The thawing and air drying apparatus shall consist of a suitable cabinet or room with controls to maintain an air temperature of 23 ± 2°C and a relative humidity of 50 ± 5 percent. The scales or balance shall have a minimum capacity of 5000 g with an accuracy of 0.1 g. The drying oven shall be capable of maintaining a temperature of 105 ± 2°C.

1352.08.01.03 Freezing and Thawing Cycle

One freeze-thaw cycle shall be completed every 24 hours. The cycle shall consist of 16 hours ± 1 hour freezing followed by 8 hours ± 1 hours thawing. When, due to work schedules or other reasons a thaw period cannot commence at the specified time the specimens shall remain in the freezing cabinet at -18 ± 2°C.

1352.08.01.04 Test Specimens

For the purposes of the test, two specimens 75 mm thick and at least 300 x 300 mm or 300 mm in diameter will be selected from the finished product by the Authority's representative. Specimens shall be representative of the Contractor's production.

Upon receipt of the specimens in the laboratory an epoxy mortar dyke or other suitable dyke shall be cast around the edges of the test specimen to expose a surface 250 x 250 mm or 250 mm in diameter, as shown in Figure 1. The surface of the specimen ponded in this test will normally be the outside surface of the barrier.

The dyked surface shall be flooded with water, 6 mm deep for 3 days to check for possible leakage.

1352.08.01.05 Test Procedure

The water on the surface of the specimens shall be replaced by a solution of sodium chloride (concentration 3 percent by mass) to a depth of 6 mm.

The specimens shall then be subjected to continuous freeze-thaw cycles as specified in Clauses 1352.08.01.01 and 1352.08.01.03.

After each 5 cycles the salt solution and the particles of deteriorated concrete shall be removed from the slab and collected in a watertight container. The operation is best accomplished by tilting the slab into a funnel approximately 500 mm in diameter and washing the surface of the slab with a 3 percent sodium chloride solution. This washing should continue until all loose particles are removed from the concrete. The solution shall then be strained through a filter and the residue dried out at 105°C to a constant weight condition. The residue shall be cumulatively weighed after each 5 cycles. This residue shall be defined as the loss of mass and expressed in kilograms per square metre of exposed slab area.

The loss of mass shall be calculated to the nearest 0.1 kg/m^2.

After the washing of each slab a new solution of sodium chloride shall be placed on the surface.

The test shall continue until 50 freeze-thaw cycles have been completed.

During the test each specimen shall be positioned and supported to allow free air circulation under, around and over the test pieces.

The bottom of the specimens shall be supported on wooden blocks but not in a manner as to prevent movement of moisture through the test pieces.

1352.08.01.06 Report

The report shall include the following:

a) Identification;

b) Photographs of the test specimens before and after the 50 cycle freeze-thaw test. Photographs at intermediate stages of the test are optional.

c) A graph of the cumulative mass loss of each specimen plotted in kilograms per metre squared against the number of freeze-thaw cycles at 5 cycle intervals.

1352.09 AUTHORITY PURCHASE OF MATERIALS BY PURCHASE ORDER

1352.09.01 Measurement for Payment

The unit of measurement for payment will be for each precast concrete barrier unit delivered and accepted.

1352.09.02 Basis of Payment

Payment at the contract price for precast concrete barrier units shall be full compensation for all labour, equipment and materials for the supply and delivery of the units to the location and at the time specified.

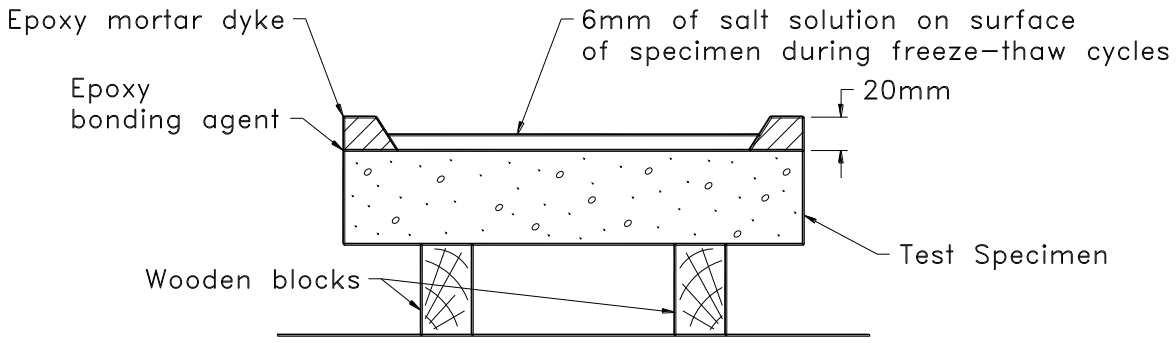

Figure 1

OPSS.PROV 1442 - Apr 2025

COMMON to PROV conversion
Legacy Section 10 removed – DSM located on Tech Pubs

Ontario Provincial Standard Specifications (OPSSs)					
1442	November 1989	April 2025	TBD	Rev: Material Specification for Epoxy Coated Steel Reinforcement for Concrete is implemented. The specification has been converted from the May 1994 COMMON to a PROV with no technical content changes. Legacy Section 10 removed.	Mike Pearsall

Note: OPSS 1442 implemented in April 2025 replaces OPSS 1442, May 1994 with no technical content changes.

MATERIAL SPECIFICATION FOR EPOXY COATED STEEL REINFORCEMENT FOR CONCRETE

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1442.08 QUALITY ASSURANCE

~~1442.08.01 Sampling and Frequency of Testing~~
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1442.09 OWNER PURCHASE OF MATERIAL - Not Used

1442.01 SCOPE

This specification covers the requirements for steel reinforcement with protective epoxy coating applied by the electrostatic spray method.

1442.02 REFERENCES

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

~~**Concrete Reinforcing Steel Institute:**~~

~~Voluntary Certification Program for Fusion - Bonded Epoxy Coating Applicator Plants~~

Ontario Provincial Standard Specifications, ~~Materials:~~Material

OPSS 1440 Steel Reinforcement for Concrete

OPSS 1443 Organic Coatings for Steel Reinforcement

~~**American Society for Testing and Materials, ASTM Standards:**~~
ASTM International

D3963/D3963M-87 - Standard Specification for Epoxy-Coated Reinforcing Steel
Concrete Reinforcing Steel Institute

Voluntary Certification Program for Fusion - Bonded Epoxy Coating Applicator Plants

1442.03 DEFINITIONS

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

Holiday~~:~~ means a pin hole.

Manufacturer~~:~~ means coating applicator, coater.

1442.05 MATERIALS

1442.05.01 Steel Reinforcement

The steel reinforcement shall conform to OPSS 1440.

1442.05.02 Coating

The epoxy coating and the patching material shall conform to OPSS 1443.

1442.07 PRODUCTION

1442.07.01 Surface Preparation and Application of Coating

All surfaces of the steel bars shall be prepared and coated in conformance with ASTM D3963/D3963M.

1442.07.02 Requirements

The requirements for film thickness, continuity of coating, adhesion and the test methods shall conform to ASTM D3963/D3963M except as modified as follows:

Film Thickness - For acceptance purposes at least 90% of all recorded film thickness measurements shall be 175 μm to 300 μm after cure. The film thickness limits do not apply to patched areas.

Continuity of Coating - The coating shall be visually inspected after cure for continuity of coating and shall be free of holes, voids, contamination, cracks, and damaged areas discernible to the unaided eye. In addition, there shall be an average of no more than five holidays per metre of bar.

Adhesion of Coating - The adhesion of the coatings shall be evaluated by bending production coated bars to a permanent set of 180° around a mandrel of a size as prescribed in Table 1. The bend test shall be made at a uniform rate and take up to four seconds to complete the test. The test shall be performed on test piece shaving a uniform temperature of less than 15°C. The Continuity of Coating test shall be conducted after the bend test.

1442.07.03 Handling and Identification

Handling and identification systems shall conform to ASTM D3963/D3963M.

Unprotected storage shall not exceed 30 days, and total storage time shall not exceed 120 days, unless stored in a heated building.

The bars shall be stored above the ground on timbers or other suitable protective cribbing spaced to prevent sags in the bundles.

Stacks of bundles of straight bars shall have adequate blocking to prevent contact between the layers of bundles.

1442.07.04 Fabrication

Fabrication of the steel reinforcing bars after application of the coating shall conform to ASTM D3963/D3963M.

1442.07.05 Repairs Required Due to Fabrication and Handling

Damage to the coating caused during the fabrication and handling at the manufacturer's premises shall be repaired as required by ASTM D3963/D3963M, except that in any linear metre of coated bar the damage shall not exceed a surface area of 10 mm^2 not including sheared ends and there shall be no more than four defects per coated bar length. All such damage shall be repaired including sheared bar ends with patching material before any rusting occurs and before shipment to the job site. Hairline cracks without bond loss shall also be repaired.

1442.07.06 Quality Control

The manufacturer shall exercise quality control procedures to ensure that the requirements of this specification are satisfied.

~~TABLE 1~~
~~BENDING PIN DIAMETERS~~

~~Bar Size~~	~~10~~	~~15~~	~~20~~	~~25~~	~~30~~	~~35~~	~~45~~	~~55~~
~~Bending Pin Dia. mm~~	~~80~~	~~120~~	~~160~~	~~200~~	~~240~~	~~350~~	~~450~~	~~550~~

1442.07.07 Certification of Manufacturer

The manufacturer shall meet the minimum quality criteria set forth by the CRSI Voluntary Certification Programme for Fusion-Bonded Epoxy Coating Applicator Plants.

Address:

Concrete Reinforcing Steel Institute
Epoxy Coating Plant Certification Programme
933 North Plum Grove Road
Schaumburg, Il. USA- 60173-4758
Phone: -(708) 517-1200- Fax: (708) 517-1206

1442.08 QUALITY ASSURANCE

1442.08.01 Sampling and Frequency of Testing

When requested, the manufacturer shall supply a 200 g sample of the dry powder coating material from each batch or lot of the powdered epoxy resin used in coating the bars. -The samples shall be packaged in airtight containers and identified by product name, batch or lot number and the contract on which the batch was used.

Film thickness will be determined in accordance with the requirements of ASTM D3963/D3963M at the rate of one bar for every 25 coated bars, or part thereof, of the same diameter produced on any one day.

One sample of bar, 1 m long will be taken and tested for flexibility for every 1500 m, or part thereof, of coated bars of the same size produced on any one day.

1442.08.02 Inspection

The inspection and sampling of the coated bars will be carried out at the coating plant, fabricating plant or at the point of delivery to the job site.

1442.08.03 Basis for Acceptance

Acceptance will be based on satisfactory evidence that the coated steel conforms to D3963/D3963M and this specification. -Culling of rejected coated reinforcing steel is permitted.

When inspected as delivered to the job-site the following criteria shall apply.

Bars with coating damage greater than 1% of their surface area in any one metre length, will be rejected.

For bars with coating damage of 1% or less of their surface area, all damaged areas of the bar coating shall be repaired.

If the additional required repairs will result in a total bar surface area covered by patching material that exceeds 5% of the bar surface area, the bar will be rejected.

TABLE 1

~~1442.10 DESIGNATED SOURCES REQUIREMENTS~~

~~As part of the approval process for inclusion on the Ministry of Transportation List of Designated Sources, the manufacturer shall file the quality control plan and proof of CRSI certification with the:~~

~~Head, Concrete Section~~
~~Ministry of Transportation of Ontario~~
~~1201 Wilson Avenue~~
~~Downsview, Ontario~~
~~M3M 1J8~~

~~The Ministry representative shall have free entry to the coating and fabrication plants as well as the finished product storage and loading areas for inspection purposes.~~

~~For continued approval, the manufacturer shall conform to this specification and shall not change the production methods and quality control plan without prior acceptance by the Head, Concrete Section, Ministry of Transportation of Ontario.~~

Bending Pin Diameters

Bar Size	10	15	20	25	30	35	45	55
Bending Pin Dia. mm	80	120	160	200	240	350	450	550

Note: OPSS 1442 implemented in April 2025 replaces OPSS 1442, May 1994 with no technical content changes.

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1442.05 MATERIALS

1442.06 EQUIPMENT - Not Used

1442.07 PRODUCTION

1442.08 QUALITY ASSURANCE

1442.09 OWNER PURCHASE OF MATERIAL - Not Used

1442.01 SCOPE

This specification covers the requirements for steel reinforcement with protective epoxy coating applied by the electrostatic spray method.

1442.02 REFERENCES

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

Ontario Provincial Standard Specifications, Material

OPSS 1440 Steel Reinforcement for Concrete
OPSS 1443 Organic Coatings for Steel Reinforcement

ASTM International

D3963/D3963M-87 - Standard Specification for Epoxy-Coated Reinforcing Steel

Concrete Reinforcing Steel Institute

Voluntary Certification Program for Fusion - Bonded Epoxy Coating Applicator Plants

1442.03 DEFINITIONS

For the purpose of this specification the following definitions apply:

Holiday means a pin hole.

Manufacturer means coating applicator, coater.

1442.05 MATERIALS

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The steel reinforcement shall conform to OPSS 1440.

1442.05.02 Coating

The epoxy coating and the patching material shall conform to OPSS 1443.

1442.07 PRODUCTION

1442.07.01 Surface Preparation and Application of Coating

All surfaces of the steel bars shall be prepared and coated in conformance with ASTM D3963/D3963M.

1442.07.02 Requirements

The requirements for film thickness, continuity of coating, adhesion and the test methods shall conform to ASTM D3963/D3963M except as modified as follows:

Film Thickness - For acceptance purposes at least 90% of all recorded film thickness measurements shall be 175 μm to 300 μm after cure. The film thickness limits do not apply to patched areas.

Continuity of Coating - The coating shall be visually inspected after cure for continuity of coating and shall be free of holes, voids, contamination, cracks, and damaged areas discernible to the unaided eye. In addition, there shall be an average of no more than five holidays per metre of bar.

Adhesion of Coating - The adhesion of the coatings shall be evaluated by bending production coated bars to a permanent set of 180° around a mandrel of a size as prescribed in Table 1. The bend test shall be made at a uniform rate and take up to four seconds to complete the test. The test shall be performed on test piece shaving a uniform temperature of less than 15°C. The Continuity of Coating test shall be conducted after the bend test.

1442.07.03 Handling and Identification

Handling and identification systems shall conform to ASTM D3963/D3963M.

Unprotected storage shall not exceed 30 days, and total storage time shall not exceed 120 days, unless stored in a heated building.

The bars shall be stored above the ground on timbers or other suitable protective cribbing spaced to prevent sags in the bundles.

Stacks of bundles of straight bars shall have adequate blocking to prevent contact between the layers of bundles.

1442.07.04 Fabrication

Fabrication of the steel reinforcing bars after application of the coating shall conform to ASTM D3963/D3963M.

1442.07.05 Repairs Required Due to Fabrication and Handling

Damage to the coating caused during the fabrication and handling at the manufacturer's premises shall be repaired as required by ASTM D3963/D3963M, except that in any linear metre of coated bar the damage shall not exceed a surface area of 10 mm^2 not including sheared ends and there shall be no more than four defects per coated bar length. All such damage shall be repaired including sheared bar ends with patching material before any rusting occurs and before shipment to the job site. Hairline cracks without bond loss shall also be repaired.

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The manufacturer shall exercise quality control procedures to ensure that the requirements of this specification are satisfied.

1442.07.07 Certification of Manufacturer

The manufacturer shall meet the minimum quality criteria set forth by the CRSI Voluntary Certification Programme for Fusion-Bonded Epoxy Coating Applicator Plants.

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Concrete Reinforcing Steel Institute
Epoxy Coating Plant Certification Programme
933 North Plum Grove Road
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Phone: (708) 517-1200 Fax: (708) 517-1206

1442.08 QUALITY ASSURANCE

1442.08.01 Sampling and Frequency of Testing

When requested, the manufacturer shall supply a 200 g sample of the dry powder coating material from each batch or lot of the powdered epoxy resin used in coating the bars. The samples shall be packaged in airtight containers and identified by product name, batch or lot number and the contract on which the batch was used.

Film thickness will be determined in accordance with the requirements of ASTM D3963/D3963M at the rate of one bar for every 25 coated bars, or part thereof, of the same diameter produced on any one day.

One sample of bar, 1 m long will be taken and tested for flexibility for every 1500 m, or part thereof, of coated bars of the same size produced on any one day.

1442.08.02 Inspection

The inspection and sampling of the coated bars will be carried out at the coating plant, fabricating plant or at the point of delivery to the job site.

1442.08.03 Basis for Acceptance

Acceptance will be based on satisfactory evidence that the coated steel conforms to D3963/D3963M and this specification. Culling of rejected coated reinforcing steel is permitted.

When inspected as delivered to the job-site the following criteria shall apply.

Bars with coating damage greater than 1% of their surface area in any one metre length, will be rejected.

For bars with coating damage of 1% or less of their surface area, all damaged areas of the bar coating shall be repaired.

If the additional required repairs will result in a total bar surface area covered by patching material that exceeds 5% of the bar surface area, the bar will be rejected.

TABLE 1
Bending Pin Diameters

Bar Size	10	15	20	25	30	35	45	55
Bending Pin Dia. mm	80	120	160	200	240	350	450	550

OPSS.PROV 1443 - Apr 2025

COMMON to PROV conversion
Legacy Section 10 removed – DSM located on Tech Pubs

Ontario Provincial Standard Specifications (OPSSs)					
1443	November 1989	April 2025	TBD	Rev: Material Specification for Organic Coatings for Steel Reinforcement is implemented. The specification has been converted from the May 1994 COMMON to a PROV with no technical content changes. Legacy Section 10 removed.	Mike Pearsall

ONTARIO
PROVINCIAL
STANDARD
SPECIFICATION

~~METRIC~~
OPSS.PROV 1443
~~MAY 1994~~APRIL 2025

Note: OPSS 1443 implemented in April 2025 replaces OPSS 1443, May 1994 with no technical content changes.

MATERIAL SPECIFICATION FOR ORGANIC COATINGS FOR STEEL REINFORCEMENT

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~~1443.10 DESIGNATED SOURCES REQUIREMENTS~~

1443.09 OWNER PURCHASE OF MATERIAL - Not Used

1443.01 SCOPE

This specification covers the requirements for organic coatings for the protection of steel reinforcement for concrete.

1443.02 REFERENCES

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

Ontario Provincial Standard Specifications, Material~~:~~

OPSS 1350 Concrete, Materials and Production

OPSS 1440 Steel Reinforcement for Concrete

OPSS 1442 Epoxy Coated Steel Reinforcement for Concrete

~~American Society for Testing and Materials, ASTM Standards:~~

ASTM International

D3963/D3963M-87 - Standard Specification for Epoxy-Coated Reinforcing Steel, Annex, A1. Prequalification of Organic Coatings for Steel Reinforcing Bars.

1443.05 MATERIALS

The coating material and the patching material shall conform to ASTM D3963/D3963M, Annex, A1 except as modified as follows:

Flexibility of Coating:

The flexibility of the coating shall be evaluated by bending three coated reinforcing bars 180°, after rebound around a 150 mm diameter padded or wooden mandrel. The bend shall be made at a uniform rate and may take up to 4 seconds to complete. The two longitudinal deformations may be placed in a plane perpendicular to the mandrel radius and the specimen shall be at a thermal equilibrium of 15°C ± 2°C.

No cracking of the coating shall be visible to the naked eye on the outside radius of any of the three bent bars. The bars shall be examined again 24 hours later to ascertain that no delayed cracking has occurred.

The continuity of coating test shall be performed and shall be in conformance with OPSS 1442.

The coating shall be of an acceptable colour which provides a contrast with the colour of rust, red-brown.

1443.07 PRODUCTION

1443.07.01 Packaging and Labelling

The coating material shall be packaged in containers and properly identified with a label which shall include:

a) Name and address of the manufacturer

b) Plant identification

c) Trade or ~~Brand Name~~brand name

d) Batch ~~Number~~number

e) Date of ~~Manufacture~~manufacture

f) Handling ~~Precautions~~precautions

h) Storage ~~Requirement~~requirement

1443.07.02 Test Methods

The test methods shall conform to ASTM D3963/D3963M, Annex, A1. Concrete for the bond strength and creep specimens shall be 30 MPa class conforming to OPSS 1350. The age of the bond specimens at the time of testing shall be 28 days.

1443.10 DESIGNATED SOURCES REQUIREMENTS

As part of the approval process for inclusion on the Ministry of Transportation List of Designated Sources, prospective suppliers shall provide the following to the Head, Concrete Section, Ministry of Transportation of Ontario, 1201 Wilson Ave., Downsview, Ontario, M3M 1J8:

a. The trade name of the product.

b. The manufacturer's name and, if applicable, the supplier's name.

c. The method and grade of metal surface preparation, the thermal treatments before and after coating application and the coating application procedures used to manufacture the test specimens and for production of coated bars.

d. A 0.5 kg sample of the coating material and one litre sample of the patching material.

e. A generic description of the coating material including the percentages of pigments, diluents, fillers, flexibilizers, and other additives.

f. An analysis of the coating material by either infrared spectroscopy or thermal analysis.

g. Twelve size 20 deformed steel reinforcing bars having a yield strength of 400 MPa and conforming to OPSS 1440, 1250 mm in length, coated to the proposed thickness.

h. Four uncoated and uncleaned size 20 reinforcing bars, 1250 mm in length and from the same lot as the steel for the coated bars.

i. Two cleaned but uncoated size 20 reinforcing bars, 1250 mm in length and from the same lot of steel and subject to the same cleaning process as the coated bars.

j. Four steel plates 100 x 100 x 1.2 mm and coated with a film thickness of 0.25 mm.

k. Three films of epoxy, of the minimum thickness proposed for use during production coating of bars, for the chloride permeability test.

l. A test certificate verifying that the coating material conforms to this specification including the requirement for creep.

When a coating is approved, its formulation shall not be changed without prior acceptance by the Head, Concrete Section, Ministry of Transportation of Ontario.

Note: OPSS 1443 implemented in April 2025 replaces OPSS 1443, May 1994 with no technical content changes.

MATERIAL SPECIFICATION FOR ORGANIC COATINGS FOR STEEL REINFORCEMENT

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1443.06 EQUIPMENT - Not Used

1443.07 PRODUCTION

1443.08 QUALITY ASSURANCE - Not Used

1443.09 OWNER PURCHASE OF MATERIAL - Not Used

1443.01 SCOPE

This specification covers the requirements for organic coatings for the protection of steel reinforcement for concrete.

1443.02 REFERENCES

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

Ontario Provincial Standard Specifications, Material

OPSS 1350 Concrete, Materials and Production
OPSS 1440 Steel Reinforcement for Concrete
OPSS 1442 Epoxy Coated Steel Reinforcement for Concrete

ASTM International

D3963/D3963M-87 Standard Specification for Epoxy-Coated Reinforcing Steel, Annex, A1. Prequalification of Organic Coatings for Steel Reinforcing Bars.

1443.05 MATERIALS

The coating material and the patching material shall conform to ASTM D3963/D3963M, Annex, A1 except as modified as follows:

Flexibility of Coating:

The flexibility of the coating shall be evaluated by bending three coated reinforcing bars 180°, after rebound around a 150 mm diameter padded or wooden mandrel. The bend shall be made at a uniform rate and may take up to 4 seconds to complete. The two longitudinal deformations may be placed in a plane perpendicular to the mandrel radius and the specimen shall be at a thermal equilibrium of 15°C $\pm$ 2°C.

No cracking of the coating shall be visible to the naked eye on the outside radius of any of the three bent bars. The bars shall be examined again 24 hours later to ascertain that no delayed cracking has occurred.

The continuity of coating test shall be performed and shall be in conformance with OPSS 1442.

The coating shall be of an acceptable colour which provides a contrast with the colour of rust, red-brown.

1443.07 PRODUCTION

1443.07.01 Packaging and Labelling

The coating material shall be packaged in containers and properly identified with a label which shall include:

a) Name and address of the manufacturer

b) Plant identification

c) Trade or brand name

d) Batch number

e) Date of manufacture

f) Handling precautions

h) Storage requirement

1443.07.02 Test Methods

The test methods shall conform to ASTM D3963/D3963M, Annex, A1. Concrete for the bond strength and creep specimens shall be 30 MPa class conforming to OPSS 1350. The age of the bond specimens at the time of testing shall be 28 days.

Appendix A – Original CPS Documents

1. OPSS 102 - October 1992
    a. SSP 101S18 - April 1994
2. OPSS 353 - September 1996
    a. SSP 353S02 - July 2007
3. OPSS 415 - February 1990
    a. SSP 415S01 - March 2012
4. OPSS 416 - February 1990
    a. SSP 416S01 - March 2012
5. OPSS 760 - November 2014
    a. SSP 760F01 - March 2018
6. OPSS 802 - November 2010
7. OPSS 1204 - November 2003
8. OPSS 1308 - November 2003
9. OPSS 1315 - September 1996
10. OPSS 1351 - November 2004
11. OPSS 1352 - November 1989
    a. SSP 113S09 - February 2013
12. OPSS 1442 - May 1994
13. OPSS 1443 - May 1994

GENERAL SPECIFICATION FOR WEIGHING OF MATERIALS

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102.10 BASIS OF PAYMENT

102.10.01 Weighing

102.01 SCOPE

This specification covers the requirements for the weighing of materials where payment is based on mass.

102.02 REFERENCES

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

Government of Canada Weights and Measures Act 1985.

Government of Canada Weights and Measures Regulations, 1990

102.03 DEFINITIONS

For the purpose of this specification the following definitions apply:

Limits of Error: means the In Service Limits of Error contained in the Government of Canada Weights & Measures Act.

Weigh Scales, weigh machines: means any device that measures mass and has a moving or movable part that has or can have an effect on the accuracy of the device.

102.04 SUBMISSION AND DESIGN REQUIREMENTS - Testing and Certification of Scales

102.04.01 Testing Procedures

The Contractor shall give the Contract Administrator a minimum of 48 h notice in advance of any test to be carried out on the weigh scales. The Contract Administrator will be present throughout the duration of the test. Failure to comply may result in a re-test being required.

102.04.02 Portable Scales

Portable scales shall be tested and certified conforming to the Government of Canada Weights and Measures Act and Government of Canada Weights and Measures Regulations.

A completed copy of the "Heavy Duty Scale Inspection Report", form CCA-1409 of the Consumer and Corporate Affairs Department, the Federal Government of Canada shall be sent to the nearest office of the District Inspector of the Weights and Measures Division in each of the following circumstances:

a. After the initial installation on a contract and before use on that contract.

b. When the scale is moved to a new location.

c. When the scale has undergone adjustments, alterations or repairs to the weighing mechanism.

d. When weighing is resumed after winter suspension.

e. When digital heads are changed or added.

A duplicate copy of the above report shall be on view in the scale house or trailer before weighing operations commence and at all times thereafter.

102.04.03 Permanently Installed Scales

Permanently installed scales shall show a Government of Canada certificate of inspection.

Where a rejection tag is on display and the Government of Canada certificate of inspection is shown as not currently in effect, but subsequent alterations, adjustments or repair have been carried out, verification of this work is required by the Contract Administrator and should either be on display or located on file in the scale house or trailer. Verification shall be documented on a form CCA-1409 including the following minimum requirements:

a. Date work carried out.

b. Items required, altered or adjusted.

c. Name and signature of person performing the work and name of firm or organization responsible for the work.

102.04.04 Conveyor Scales

Conveyor scales shall be certified by an Inspector of the Government of Canada, Weights and Measures.

a. After the initial installation on a contract and before use on that contract.

b. After every relocation on that contract.

102.06 EQUIPMENT

102.06.01 General

Where the contract includes items that require measurement for payment by weighing, weigh scales shall be provided which meet the requirements of the Government of Canada Weights and Measures Act and Regulations for the purposes for which they are to be used.

102.06.02 Platform Scales

Platform scales shall be of sufficient capacity and dimension so as to fully contain the loaded vehicle or coupled vehicle combination in one setting and so as to permit weighing of the entire load in one operation. Weighing of various axle combinations in more than one operation will not be permitted. Scale foundations shall be adequate to support the largest gross load without any settlement occurring during the weighing operation. Scale pits shall be properly drained. Substantial retaining walls, which may be concrete, shall be built at each end of the scale platform to support the entrance and exit ramps. These retaining walls shall be of sufficient strength and so placed as to support the ramp material without binding on the ends of the platform.

In order to minimize the effect of impact loads on the scale adjustment and to reduce the effect of vehicle braking and kickback on the scale platform and scale adjustments, the approach ramp shall be constructed conforming to the weights and measures requirements on a straight and level grade at the same elevation as the scale platform. Vehicles shall enter and leave the platform at a maximum speed of 8.0 km/h.

The scale platform and mechanism shall at all times be maintained clean and free from encumbrances such as gravel, asphalt, snow and ice. The mass indicator mechanism shall be enclosed in the scale house or trailer.

102.06.03 Conveyor Scales

In order to ensure that the required operating temperature has been reached, electric power for conveyor scales shall be applied to the weighing system at least 30 min before the commencement of weighing.

Each conveyor scale shall be provided with a calibration chain certified by the testing agency of the Government of Canada and readily available at all times.

The mass recording device shall clearly indicate the mass so that weigh tickets can be conveniently completed by the weigher.

The mass recording device shall be enclosed in the scale house or trailer.

Span calibration controls shall be sealed during the period of operation and accessible only to the testing personnel.

102.06.04 Scale Houses or Trailers

Each scale house or trailer shall be properly ventilated and shall be clean, dry and weathertight, with a minimum floor space of 4.5 m^2 and minimum head room of 2.1 m. They shall be equipped with windows which can be opened and closed from within and from which the weigher, while seated at the scale or console, has an unobstructed view of the vehicle to be weighed, the scale platform or conveyor and the approach ramp.

Each scale house or trailer shall also have the following:

1. A free sliding window or other approved means for passing out weigh tickets.

2. Screens for doors and windows.

3 A door located remotely from the scale platform suitable for the occupant's unobstructed exit in case of fire.

4. Theft and vandal-proof locking devices for doors and windows.

5. Door key for the weigher.

6. Table, chair and bench, so that the weigher can be seated during weighing operations in front of the scale or console.

7. Heating equipment sufficient to maintain the temperature in the scale house at 20°C.

8. Adequate lighting to facilitate office work.

9. Fuel, for heating and lighting.

10. Sanitary facilities within 100 m of the scale house or trailer.

102.07 CONSTRUCTION - Weighing

102.07.01 Mass Measurements

Mass measurements will be made by a weigher supplied by the Contract Administrator except where the weigh scales to be used are equipped with an automatic printing device capable of producing tickets conforming to the Owner's requirements.

102.07.02 Scale Location

Scales for weighing hot mixed asphaltic concrete shall be located at the mixing plant. Scales for weighing other materials shall be installed at locations selected by the Contractor.

Where material is from a commercial source, the tickets issued at the source are acceptable providing the weighing operation conforms to this specification.

When, in the opinion of the Contract Administrator, waste or loss of material between the above scale location and the material's intended destination on the contract occurs, the hauling operation may be terminated until a scale has been provided on a site which is approved by the Contract Administrator and which is close enough to the intended destination to preclude the possibility of waste or loss.

102.07.03 Vehicle Tares

102.07.03.01 General

Vehicles shall be tared for all weighing operations with the normal hauling complement of driver, accessories and fuel.

The same scale shall be used for truck taring and establishing gross vehicle mass and the mass of the material to be delivered, with the exception of commercial sources, where separate tare scales are permitted in the same pit or quarry providing the electronics are interfaced from one scale to the other.

Each truck and each coupled vehicle combination shall have a distinguishing number prominently displayed where it will be readily visible to the weigher.

102.07.03.02 Weighing Non-Liquid Materials

When a platform scale is being used on the contract, the tares of the hauling vehicles will be determined randomly at least once daily, and more frequently if required by the Owner.

102.07.03.03 Weighing Liquid Materials

Weighing of liquid materials shall be carried out on permanently installed scales with automatic printing devices.

102.07.03.04 Volumetric Measurement

Where specified in the Contract as an alternative to weighing, a metering device, conforming to the Government of Canada Weights and Measures Act and Regulations thereto, shall be used in the conversion of liquid volume, to an equivalent mass in tonnes, using the factor specified in the Contract.

102.07.04 Checking of Weigh Scales by Enforcement Officers

During normal contract working hours weigh scales shall be at the disposal of Provincial Police Officers and enforcement officers of the Owner for the purpose of checking the mass of the loads of vehicles employed on this contract.

Scale houses or trailers shall be accessible during normal contract working hours so that weighing records may be examined.

102.08 QUALITY ASSURANCE

102.08.01 Scale Accuracy

The Owner reserves the right to check the accuracy or test the Contractor's scales at any time.

Where a device is found to be in error, in excess of the Limits of Error but less than three times the Limits of Error, the Owner will accept material measured for payment by the device for a period of 48 hours from the time the Contractor is notified in writing that the error exceeds the Limits of Error.

When a device is found to be in error, in excess of three times the Limits of Error, the Owner will immediately cease to accept material measured for payment by the device.

102.08.01.01 Conveyor Scales

A conveyor scale test shall be conducted a minimum of twice weekly or as required by the Owner. A minimum ten minute run is required for this test.

The material shall be collected in truck boxes and the total mass for each truck recorded. The material shall be reweighed on a recently verified platform scale, arranged for by the Contractor, and the material mass compared. The maximum allowable variation between the truck scale mass and the conveyor scale mass shall not exceed 0.5%. The test results are to be recorded and available at all times.

The Contractor shall be responsible for arranging the use of the platform scale.

102.10 BASIS OF PAYMENT

102.10.01 Weighing

Payment for the weighing of material shall be included in the contract price of the item(s) for the materials to be placed or the work to be done and shall be deemed to include full compensation for all labour, equipment and material required to carry out the weighing operation including any delay or inconvenience due to any checking or testing carried out by the Owner.

AMENDMENT TO OPSS 102, OCTOBER 1992

Special Provision No. 101S18 April 1994

Bar Coding on Material Delivery Invoices

102.02 REFERENCES

Section 102.02 of OPSS 102 is amended by the addition of the following:

American National Standard for Materials Handling - Bar Code Symbols on Unit Loads and Transport Packages (ANSI MH10.8M-1983)

102.06.02 Platform Scales

Subsection 102.06.02 of OPSS 102 is amended by the addition of the following:

The platform scale shall be equipped with a direct cable connection to the computer for the purpose of sending mass measurements.

A printing device connected by direct cable connection to the computer shall be capable of electronically producing, in black print only, tickets conforming to the requirements specified in this special provision.

102.07.01 Mass Measurements

Subsection 102.07.01 of OPSS 102 is deleted and replaced by the following:

The Contractor shall provide personnel to conduct the mass measurements. The mass measurements shall be sent to the printing device using a print command on the computer. Any form of override of the printing process, except total transaction rejection, will not be allowed.

The system shall be capable of detecting vehicle overloads, and of automatically signalling overload occurrence to the system operator.

Tickets shall be supplied by the Contractor. Bar codes shall be printed directly onto the weigh ticket or onto labels. Bar coded labels shall be affixed to the Owner's copy of the ticket before it leaves the weigh scale building.

The following information shall be displayed as bar code groups printed in a column or left to right configuration:

1) Truck Number
2) Tare Weight
3) Net Weight
4) Ticket Number

The words "Truck", "Tare", "Net", and "Ticket" must appear beneath each appropriate bar code group.

Conventional alphanumerics shall be used elsewhere on the ticket to express the exact information contained in the bar codes.

Automated reading failure rates greater than one reading failure in twenty tickets scanned and attributable to the density or configuration of the bar codes are not acceptable. Where such rates of reading failure occur, the Contractor must take corrective action to enhance the bar code symbology to an acceptable level immediately following notification of the problem.

The bar code symbols shall conform to the American National Standard for Materials Handling -Bar Code Symbols on Unit Loads and Transport Packages (ANSI MH10.8M-1983) for 3 of 9 bar code (Code 39).

The minimum bar code height shall be 6.4 mm or 15 percent of the bar code length, whichever is greater.

In addition to the bar code group information, each weigh ticket shall contain the following:

a)	licence plate number of unit(s)	f)	source of material
b)	time and date of transaction	g)	gross weight
c)	Truck Owner	h)	overload notation
d)	contract number	i)	running total of each material
e)	type of material	j)	a place for the checker to sign

For each contract, the following reports shall be produced daily:

- truck register, including allowable gross weight for all vehicles;
- truck tare report for all vehicles, including old and new tares, and time recorded;
- summaries for each type of material;
- summaries for all cancelled loads.

The above reports shall be available for Owner pick-up at the end of daily operations or before start-up the following day.

A sample weigh ticket from each source must be supplied to the Owner two weeks prior to delivery of the material.

WARRANT: All contracts.

ONTARIO PROVINCIAL STANDARD SPECIFICATION

METRIC
OPSS 353
SEPTEMBER 1996

CONSTRUCTION SPECIFICATION FOR CONCRETE CURB AND GUTTER SYSTEMS

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353.01 SCOPE

This specification covers the requirements for the construction of concrete curb and gutter, set backs, gutter outlets and bullnoses together with the installation of catchbasin frames and grates which lie within the flow lines of the curb and gutter system.

353.02 REFERENCES

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

Ontario Provincial Standard Specifications, Construction:

OPSS 206	Grading
OPSS 314	Untreated Granular Subbase, Base, Surface, Shoulder and Stockpiling
OPSS 350	Concrete Pavement, Concrete Base and Lean Concrete Base
OPSS 407	Construction of Manholes, Catch Basins, Ditch Inlets and Valve Chambers
OPSS 501	Compacting

OPSS 502 Weighing of Materials
OPSS 904 Concrete Structures
OPSS 905 Steel Reinforcement for Concrete
OPSS 919 Formwork and Falsework

Ontario Provincial Standard Specifications, Material:

OPSS 1212 Hot Poured Rubberized Asphalt Joint Sealing Compounds
OPSS 1308 Joint Filler (Concrete)
OPSS 1315 White Pigmented Membrane Curing Compounds for Concrete
OPSS 1350 Concrete (Materials and Production)
OPSS 1440 Steel Reinforcement for Concrete
OPSS 1850 Frames, Grates, Covers and Gratings

353.03 DEFINITIONS

For the purpose of this specification the following definitions apply:

Curb and Gutter: means curb, gutter or combinations of curb and gutter.

Curb and Gutter Systems: means curb and gutter, set backs, gutter outlets, concrete spillways, bullnoses or any combination of them.

Concrete Pavement: means concrete pavement or concrete base.

353.05 MATERIALS

353.05.01 Concrete

Concrete shall conform to OPSS 1350 and the following specific requirements:

Class of Concrete	30 MPa at 28 d
Coarse Aggregate	19.0 mm nominal max. size
Maximum Slump	60 mm
Air Content	7.0 $\pm$ 1.5%

353.05.02 Catchbasin Frames and Grates

Frames and grates shall conform to OPSS 1850.

353.05.03 Joint Materials

Expansion joint fillers shall conform to OPSS 1308 for types A or C except that granulated cork fillers will not be accepted.

Hot rubberized asphalt joint sealing compound shall conform to OPSS 1212.

353.05.04 Curing Compound

Curing compound shall conform to OPSS 1315.

353.05.05 Forms

Forms shall conform to OPSS 919.

353.05.06 Reinforcing Steel

Reinforcing steel shall conform to OPSS 1440.

353.07 CONSTRUCTION

353.07.01 General

The following construction sub-sections 353.07.02 to 353.07.12 apply equally to concrete curb and gutter, concrete spillways and concrete gutter outlets.

353.07.02 Foundation and Backfill

Excavation and embankment construction shall conform to OPSS 206.

Granular base and granular backfill construction shall conform to OPSS 314.

353.07.03 Compaction

Compaction shall conform to OPSS 501.

353.07.04 Reinforcing Steel

Placement of reinforcing steel shall conform to OPSS 905.

353.07.05 Formwork

Forms shall conform to OPSS 919 and shall be set true to the lines and grades specified in the contract and in direct contact with the subgrade or granular course.

353.07.06 Joints

When concrete curb and gutter is constructed adjacent to concrete pavement, the transverse joint spacing of the curb and gutter shall coincide with that of the concrete pavement. When concrete curb and gutter is constructed adjacent to asphalt pavement, transverse joints shall have a uniform spacing not exceeding 6 m. In addition to the foregoing, joints shall be constructed between the curb structure including catchbasin frames, set backs and gutter outlets.

Joints, including those between curb and gutter systems and any abutting sidewalk, catchbasin frames, setbacks, gutter outlets, or any structure, shall be formed with 12 mm thick panels of joint filler except as follows:

a. Contraction joints in extruded curb and gutter and in formed curb and gutter may be saw cut or formed by the use of a "guillotine" knife.

b Longitudinal joints, as shown in the contract, shall be sawn between a curb and gutter system and concrete pavement and shall conform to OPSS 350 when the curb and gutter system is placed adjacent to the concrete pavement. The joint shall be sealed with liquid joint sealer and shall conform to OPSS 350.

Joint filler panels shall be set in a vertical position and if for transverse joints, shall be set normal to the inside edge of the structure.

Panels shall be precut from a single piece of joint filler to the shape of the curb and gutter cross section as shown on the standard drawings but so as to provide a 6 mm recess on the exposed surfaces. Cutting and tolerances shall conform to OPSS 1308.

Expansion joint material shall be set in place before concrete placement begins and shall be supported by removable forms.

The Contractor has the option of either providing a 6mm deep, 12 mm wide cap strip, to be removed after the concrete has hardened and not edging the joints, or carefully removing all concrete immediately above the filler material to form a 6 mm deep, 12 mm wide recess then finishing both edges of each joint to 6 mm radius with a suitable short edging tool. However, should the Contractor choose the latter method and should he construct joints which do not conform to the requirements, the Engineer may, without prejudicing any other provisions of the contract, require that all remaining work be carried out using cap strips.

Contraction joints shall be formed within a sufficient time of placing of the curb and gutter to prevent uncontrolled cracking. The width of the joint shall be 3mm to 5 mm and the depth 65 mm minimum.

353.07.07 Hook Bolt Dowels

Where the plans require a concrete pavement to be anchored to the curb and gutter system with hook bolt dowels, the installation of the hook bolt dowels shall be considered as part of the work of constructing the concrete pavement.

353.07.08 Concrete

353.07.08.01 Placement of Concrete

Concrete shall not be placed until the base course on which the concrete is to be placed, and the forms, have been inspected by the Authority.

Before placing concrete, the Contractor shall wet down the subgrade immediately ahead of the concrete placing by means of a uniform spray of water sufficient to wet the subgrade thoroughly without leaving standing water.

The concrete shall be placed and compacted in a manner such that segregation of the aggregate does not occur.

Concrete shall be placed continuously and contact with partially set concrete shall be avoided. When placement of concrete is interrupted, it shall be at a vertical form. A 5 mm bituminous fibre joint filler shall be placed before recommencing placement of concrete.

The concrete shall be thoroughly consolidated against all formwork and all entrapped air shall be eliminated.

353.07.08.02 Concrete Finishing

The concrete on the upper surfaces shall be floated to a smooth uniform finish of the required cross section, free of open texturing, plucked aggregate and local projections. Only hardwood or magnesium trowels shall be used for hand finishing.

Care shall be taken to avoid over finishing or working more mortar to the surface than is actually required. Unless otherwise provided, back edges shall be rounded by use of a 6 mm radius edging tool. Neat cement shall not be used as a drier to facilitate finishing.

Any honeycombed areas occurring along the formed surfaces shall be filled with mortar composed of one part Portland cement, and two parts sand with 12% of entrained air.

353.07.08.03 Concrete Curing

Concrete curing shall conform to OPSS 904.

353.07.08.04 Concrete Tolerances

The exposed surfaces of the finished concrete shall be such that when tested with a 3 m long straight edge placed anywhere along the surface parallel to the edge, there shall be no deviation greater than 3 mm between the bottom of the straight edge and the surface of the concrete nor shall there be any deviation from alignment in excess of 3 mm.

353.07.09 Extrusion Methods

The provisions of this specification may be modified by the Authority at the Contractor's request to suit construction by extrusion methods if the Contractor can demonstrate to the Authority's satisfaction that by such methods a quality will be achieved at least equal to that produced by standard methods. Notwithstanding approval of such modification, the Authority may, at any time, require the Contractor to revert to standard methods if, in the Authority's opinion, the required results are not being obtained.

353.07.10 Cold Weather Concreting

Protection shall conform to OPSS 904. The components of the Curb and Gutter System shall be considered as slabs on the ground.

353.07.11 Catchbasin and Maintenance Hole Frames and Grates

Catchbasin and maintenance hole frames and grates which lie within the flow lines of the curb and gutter system shall be installed as part of the construction of the various components making up the curb and gutter system. Frames shall be set to their final elevations on full beds of mortar and shall conform to OPSS 407. The exposed surfaces of the mortar bed shall be left in a smooth condition, free of depressions and sharp protuberances. All remaining formwork shall be removed.

353.07.12 Identification Stamp

At the request of the Authority, the Contractor shall clearly and legibly mark with an approved stamp each end of the work, every 20 m and all other places directed by the Authority. The mark shall be located in the centre of an exposed face of the curb and gutter systems. The mark shall bear the Contractor's name and the year of construction.

353.07.13 Field Sampling and Testing of Concrete

Field sampling and testing of concrete shall be according to OPSS 904.

353.09 MEASUREMENT FOR PAYMENT

353.09.01 Actual Measurement

353.09.01.01 Concrete Curb and Gutter

Measurement of concrete curb and gutter will be made in metres along the flow lines of the gutter whether straight or circular, without separation into types. Measurement will include the space occupied by setbacks, gutter outlets and frames and grates.

353.09.01.02 Concrete Spillways

Measurement of concrete spillways will be made in metres from the end of the gutter outlet to the spillway termination.

353.09.01.03 Concrete Gutter Outlets

Measurement will be by the number of setbacks and gutter outlets installed without separation into types.

353.09.02 Plan Quantity Measurement

353.09.02.01 Concrete Curb and Gutter

Measurement of concrete curb and gutter is by Plan Quantity, as may be revised by Adjusted Plan Quantity, of the horizontal length in metres along the flow lines of the gutter whether straight or circular, without separation into types. Measurement will include the space occupied by setbacks, gutter outlets and frames and grates.

353.09.02.02 Concrete Spillways

Measurement of concrete spillways is by Plan Quantity, as may be revised by Adjusted Plan Quantity, of the contour length in metres from the end of the gutter outlet to the spillway termination.

353.09.02.03 Concrete Gutter Outlets

Measurement of the number of concrete gutter outlets and setbacks is by Plan Quantity, as may be revised by Adjusted Plan Quantity, without separation into types.

353.09.03 Bullnose Fillets

353.09.03.01 Concrete

There will be no measurement of concrete used for fillets in bullnoses.

353.09.03.02 Hot Mix

Hot mix designated for fillets in bullnoses will be measured in tonnes conforming to OPSS 502.

353.09.04 Granular

Measurement for payment for granular material shall conform to OPSS 314. When roadbed granular material is measured in square metres, no measurement will be made for the material directly below or behind the concrete curb and gutter system.

353.09.05 Excavation

Measurement for excavation that overlaps that required for concrete curb and gutter systems shall conform to the specification for such other work as though no excavation were required for curb and gutter systems construction.

353.09.06 Reinforcing Steel

There will be no measurement of reinforcing steel used in concrete curb and gutter systems.

353.10 BASIS OF PAYMENT

353.10.01 Concrete Curb and Gutter - Item
Concrete Spillways - Item
Concrete Gutter Outlets - Item

Payment at the contract price for the above item(s) shall be full compensation for all labour, equipment and material required to do the work.

When roadbed granular material is measured in square metres, the contract price for the above item(s) shall include full compensation for all labour, equipment and material for the material directly below or behind the concrete curb and gutter system.

353.10.02 Hot Mix

Hot mix designated for constructing bullnose fillets shall be paid for at the contract price for the appropriate Hot Mix item.

353.10.03 Granular

Payment for granular material shall conform to OPSS 314.

353.10.04 Excavation

Payment for excavation that overlaps that required for concrete curb and gutter systems shall be made conforming to the specification for such other work as though no excavation were required for curb and gutter construction.

353.10.05 Reinforcing Steel

Costs for supplying and placing reinforcing steel are deemed to be included in the items comprising concrete curb and gutter systems.

CONCRETE CURB AND GUTTER - Item No.

Special Provision No. 353S02 July 2007

OPSS 353, September 1996 Construction Specification for Concrete Curb and Gutter Systems is amended as follows:

353.05.01 Concrete

Subsection 353.05.01 of OPSS 353 is deleted and replaced with the following:

Concrete shall be according to OPSS 1350 and the following:

Minimum specified 28-Day compressive strength:	30 MPa,
Coarse aggregate:	19 mm nominal maximum size.

353.07.08.03 Concrete Curing

Clause 353.07.08.03 of OPSS 353 is deleted and replaced with the following:

Formed and slipformed concrete shall be cured according to OPSS 904. The use of white pigmented curing compound is permitted except that curing with curing compound shall not be used on any construction joint or when cold weather concreting is in effect.

353.07.13 Field Sampling and Testing of Concrete

Subsection 353.07.13 of OPSS 353 is deleted and replaced with the following:

Field sampling and testing of concrete shall be according to OPSS 1350.

WARRANT: Always with this tender item.

ONTARIO PROVINCIAL STANDARD SPECIFICATION

METRIC
OPSS 415
FEBRUARY 1990

CONSTRUCTION SPECIFICATION FOR TUNNELLING

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415.09.02.01 Tunnel
.02 Rock Excavation in Tunnelling

415.10 BASIS OF PAYMENT

415.10.01 Tunnel - Item
Rock Excavation in Tunnelling - Item

415.01 SCOPE

This specification covers the requirements for tunnel construction.

415.02 REFERENCES

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

Ontario Provincial Standard Specifications, Construction:

OPSS 517 Dewatering

Ontario Provincial Standard Specifications, Material:

OPSS 1004 Aggregates - Miscellaneous
OPSS 1350 Concrete (Materials and Production)
OPSS 1440 Steel Reinforcement for Concrete

Canadian Standards Association:

CAN/CSA-A5-M88 - Portland Cement

415.03 DEFINITIONS

For the purpose of this specification the following definition applies.

Rock: means natural beds or massive fragments, of the hard, stable, cemented part of the earth's crust, igneous, metamorphic, of sedimentary in origin, which may or may not be weathered.

415.04 SUBMISSION AND DESIGN REQUIREMENTS

The Contractor shall submit primary liner design details to the Engineer for review at least two weeks prior to commencing work where the primary liner design is not specified in the contract.

A written agreement regarding the disposal site setting out the terms, conditions and ultimate responsibility for the materials as placed, shall be obtained from the property owner and submitted to the Engineer.

415.05 MATERIALS

415.05.01 Concrete

Concrete shall conform to OPSS 1350 and the minimum compressive strength shall be 25 MPa.

415.05.02 Concrete Reinforcement

Steel reinforcing for concrete work shall conform to OPSS 1440.

415.05.03 Timber

Timber shall be sound, straight, free from cracks, shakes and large or loose knots.

415.05.04 Cement Grout

Grout shall consist of a mixture of one part Portland cement conforming to the requirements of CAN/CSA-A5-M and two parts mortar sand conforming to OPSS 1004 wetted with only sufficient water to make the mixture plastic.

415.05.05 Primary Liner

The primary liner shall be as specified in the Contract.

415.05.06 Rock Bolts

Rock bolts and nuts shall be manufactured from steel having a minimum tensile strength of 700 MPa. Rock bolts shall have a minimum diameter of 15 mm and a length adequate for the conditions encountered, shall have clean, well lubricated threads and shall be supplied with a nut, hardened round washer, expansion shell and a steel bolt plate not less than 100 mm x 100 mm by 6 mm in size.

415.06 EQUIPMENT

415.06.01 General

The Contractor shall ensure that all hoisting and compressed air equipment as required is installed and ready for operation before commencing tunnelling operations.

Shafts and tunnels are to be provided with electric lights of a sufficient number to ensure proper work and inspection.

415.06.02 Use of Compressed Air

Complete compressing equipment and air locks shall be provided as required to supply and control air pressure in tunnels.

Electrically driven compressors with stand-by diesel or gas driven equipment shall be provided.

Stand-by equipment for low pressure air shall be arranged so that equipment will start automatically in case of failure of the electric power supply.

Compressing equipment shall be installed in a weatherproof building insulated against sound transmission.

Compressors shall be provided that are equipped with silencers and receivers on the intake and exhaust lines.

415.07 CONSTRUCTION

415.07.01 General

The location of tunnels shall be established by the Contractor from the lines and elevations as indicated on the contract drawings.

Labour, instruments and materials shall be provided for setting out all reference points necessary to construct the tunnel and appurtenances.

The Engineer shall be provided with assistance and access necessary to check the layout of the tunnel and associated appurtenances.

415.07.02 Alignment Holes

Alignment holes shall be in place near each bend with at least one hole in a straight section between bends and at any other locations specified.

Alignment holes shall be located at the time of construction.

Alignment holes may be used for other purpose after their primary purpose is fulfilled.

A 250 mm diameter steel casing shall be place in a drilled hole over the centreline of the tunnel and used for alignment.

Casings shall be set vertically and provided with a removable steel cover plate.

After the tunnel section is completed, the casings shall be removed to the depth specified and any opening in the tunnel wall filled with concrete. The remainder of the casing and the hole shall be filled as specified in the contract.

Provision shall be made by the contractor for controlling alignment in the case of tunnels constructed under compressed air.

415.07.03 Construction Shafts

Construction shafts shall be provided at locations specified or as approved by the Engineer.

Shafts shall be maintained in a drained condition.

A 3.5 m high close boarded fence shall be installed around the perimeter of the working area with gates and truck entrances at the shafts and the fence shall be removed on completion of the work.

415.07.04 Stability of Excavation

The Contractor shall employ such construction methods, plant, procedures and precautions that will ensure that excavations are stable, free from disturbance and maintained in a drained condition.

Such construction methods may include, but are not limited to tight timber and/or steel primary liner; ground water control systems employing well points, deep wells, educators, or compressed air; free water control

systems employing drains, pipes and pumps, and soil stabilization methods employing cement grouting, chemical grouting or chemical freezing.

The Contractor shall employ such construction methods, plant and materials that will prevent the migration of soil material into tunnels or shafts from adjacent ground.

415.07.05 Tunnelling

The method of tunnelling selected by the Contractor shall be reviewed with the Engineer prior to commencement of the work.

A competent superintendent, experienced in the construction of tunnels, shall supervise the work at all times.

The tunnelling method shall be modified as needed due to changing conditions which may be encountered during the progress of the work.

The tunnel is to be kept sufficiently dry at all times to permit work to be performed in a safe and satisfactory manner.

415.07.06 Dewatering

Dewatering shall conform to OPSS 517.

415.07.07 Excavated Materials

Satisfactory re-usable excavated material shall be separated from unsuitable excavated material.

415.07.08 Disposal of Materials

Unsuitable or surplus material shall be disposed off site.

Excavated material which cannot be incorporated into the work shall be disposed as specified. If the Authority cannot make use of the unwanted excavated material, arrangements for disposal sites shall be made by the Contractor.

The disposal site shall be kept stable and materials shall be dumped in a manner not to cause nuisance, injury or inconvenience until the property owner assumes responsibility under the terms of the agreement referred to in Section 415.04.

415.07.09 Primary Lining

The primary lining shall be designed to support all soil and hydrostatic pressures an to withstand any additional loads caused by grouting or jacking thrusts.

The primary liner shall be installed so that the exterior is as tight as possible to the excavated surface of the tunnel and allows the placement of the full design thickness of the secondary lining.

All voids between the primary lining and the surface of the excavation shall be filled with grout as the primary lining is placed. If a continuous liner is used, the space outside the liner plates shall be grouted at least daily.

Tunnels excavated in sound rock shall be supported in a manner that prevents scaling and unravelling of the rock and also protects from weathering or deterioration.

Where a tunnel is excavated in unstable rock the Contractor shall supply and install rock bolts or equivalent acceptable to the Engineer. The rock bolts shall be of such length and spacing that they safely sustain the tunnel crown and walls to the satisfaction of the Engineer. Rock bolts complete with hardened round washers and bolt plates shall be installed as soon as possible after the surface to be supported has been exposed and the rock has been scaled down.

415.07.10 Secondary Lining

A secondary lining of air-entrained concrete to the strength and dimensions specified shall be provided.

415.07.11 Mixing Grout

Grout shall be mixed in a mechanical mixer capable of maintaining a continuous supply of grout.

Grout shall not be left in the mixer for more than 30 minutes.

415.07.12 Placing Grout

The space outside the finished secondary liner shall be pressure grouted. Pumps for grouting shall be capable of supplying grout at a pressure of 1 MPa.

Grout holes shall be provided in the locations and at the spacings specified.

Grouting shall be done through pipes a minimum of 40 mm in diameter or through holes drilled in the finished secondary liner. The pipes shall be set at the time of placement of the concrete for the secondary liner.

Grout shall not be placed until the lining has achieved 85% of its specified strength. Grouting shall be limited to such operating pressures, sequences and programs as are necessary to avoid damaging any part of the works or any other structure or property.

415.07.13 Wiring

Separate circuits shall be installed for each lighting and power purpose.

All wires shall be installed and securely supported in shafts in waterproof conduits.

All wiring and conduits in shafts and tunnels shall be removed as directed by the Engineer.

415.07.14 Approaching Closure

Caution shall be exercised when approaching a closure while operating under compressed air.

Air pressure shall be reduced to a safe limit when closure is approached.

415.09 MEASUREMENT FOR PAYMENT

415.09.01 Actual Measurement

415.09.01.01 Tunnel

Measurement will be in metres along the centre line of the tunnel from centre to centre of manholes or chambers or from the end of the tunnel where no manhole or chamber is installed.

415.09.01.02 Rock Excavation in Tunnelling

Measurement will be in cubic metres based on the neat lines of the tunnel as shown in the Contract.

415.09.02 Plan Quantity Measurement

415.09.02.01 Tunnel

Measurement is by Plan Quantity, as may be revised by Adjusted Plan Quantity, of the length in metres along the centre line of the tunnel from centre to centre of manholes or chambers or from the end of the tunnel where no manhole or chamber is installed.

415.09.02.02 Rock Excavation in Tunnelling

Measurement is by Plan Quantity, as may be revised by Adjusted Plan Quantity of the volume in cubic metres.

415.10 BASIS OF PAYMENT

415.10.01 Tunnel - Item
Rock Excavation in Tunnelling - Item

Payment at the contract price for the above item(s) shall be full compensation for all labour, equipment and material required to do the work.

The removal of boulders having a volume in excess of 0.5 cubic metres will be paid for as extra work.

Special Provision No. 415S01 March 2012

Amendment to OPSS 415, February 1990

Interceptor Drains and Service Connections

415.10 BASIS OF PAYMENT

Section 415.10 of OPSS 415 is amended by the addition of the following:

Payment for connecting intercepted drains and service connections into the tunnel shall be made on the following basis:

a) Where such drains and service connections are shown on the Contract Drawings the cost of connections shall be included in the Contractor's bid price for the tender item "Tunnel".

b) Where such drains and service connections are not shown on the Contract Drawings the cost of connections will be considered as a Change in the Work.

WARRANT: Always with this tender item.

ONTARIO PROVINCIAL STANDARD SPECIFICATION

METRIC
OPSS 416
FEBRUARY 1990

CONSTRUCTION SPECIFICATION FOR JACKING AND BORING

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416.10.01	Jacking and Boring - Item

416.01 SCOPE

This specification covers the requirements for the installation of pipes by jacking and boring methods.

416.02 REFERENCES

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

Ontario Provincial Standard Specifications, Construction:

OPSS 517 Dewatering

Ontario Provincial Standard Specifications, Material:

OPSS 1004 Aggregates - Miscellaneous
OPSS 1820 Concrete Pipe

American Water Works Association:

AWWA C200-80 Steel Water Pipe 6 Inches and Larger
AWWA C206-82 Field Welding of Steel Water Pipe

Canadian Standards Association:

CAN/CSA-A5-M88 Portland Cement

416.04 SUBMISSION AND DESIGN REQUIREMENTS

Plans shall be submitted showing proposed locations of shafts, pits or approach tunnels, and details of the proposed method, materials and equipment to be used, at least two weeks prior to commencement of the work.

Design assumptions and material data shall be submitted for review by the Engineer, when materials other than those specified are proposed for use.

A written agreement regarding the disposal site setting out the terms, conditions and ultimate responsibility for the materials as placed, shall be obtained from the property owner and submitted to the Engineer.

416.05 MATERIALS

416.05.01 Pipe Materials

Concrete pipe shall conform to OPSS 1820.

Steel pipe shall conform to AWWA C200 with welded joints.

416.05.02 Cement Grout

Grout shall consist of a mixture of one part Portland cement conforming to CAN/CSA-A5-M88 and two parts mortar sand conforming to OPSS 1004 wetted with only sufficient water to make the mixture plastic.

416.07 CONSTRUCTION

416.07.01 Method of Installation

Method of installation to be used by the Contractor shall be reviewed with the Engineer prior to commencing the work and shall be subject to the following limitations.

a. Only smooth walled steel or concrete pipe shall be used.

b. Hydraulically operated jacks in adequate number and capacity shall be provided to ensure smooth and uniform advancement without overstressing of the pipe.

c. A jacking head shall be provided to transfer and distribute jacking pressure uniformly over the entire end bearing area of the pipe. In the case of concrete pipe, the jacking head shall be suitably padded.

d. Two or more lubricated guide rails or sills shall be provided of sufficient length to fully support the pipe at the specified line and grade in the jacking pit.

416.07.02 Construction Shafts

Construction shafts shall be provided at the downstream end at the locations specified.

Shafts shall be maintained in a drained condition.

A 3.5 m high close boarded fence shall be installed around the perimeter of the working area with gates and truck entrances at the shafts and the fence shall be removed on completion of the work.

416.07.03 Dewatering

Dewatering shall conform to OPSS 517.

416.07.04 Pipe Installation

Pipe shall be installed to the line and grade specified.

Long delays shall be avoided between jacking operations.

Butt welding of pipe joints shall conform to AWWA C 206 when steel pipe is used.

The space between concrete pipe and the wall of the excavation shall be kept filled with a bentonite slurry.

Joints shall be protected from crushing by placing 15 mm thick plywood on spigot shoulder. The plywood shall be cut to form a ring with the outer surface conforming to the outer circumference of the pipe.

416.07.05 Grouting

All voids remaining between the pipe and the excavation wall shall be grouted as soon as the pipe is jacked.

416.07.06 Excavated Materials

Satisfactory re-usable excavated material required for backfill shall be separated from unsuitable excavated material.

416.07.07 Disposal of Materials

Unsuitable or surplus material shall be disposed off site.

Excavated material which cannot be incorporated into the work shall be disposed as specified. If the Authority cannot make use of the unwanted excavated material, arrangements for disposal sites shall be made by the Contractor.

The disposal site shall be kept stable and materials shall be dumped in a manner not to cause nuisance, injury or inconvenience until the property owner assumes responsibility under the terms of the agreement referred to in Section 416.04.

416.09 MEASUREMENT FOR PAYMENT

416.09.01 Actual Measurement

416.09.01.01 Jacking and Boring

Measurement will be in metres along the centre line of the pipe from centre to centre of manholes or chambers or from the end of the pipe where no manhole or chamber is installed.

416.09.02 Plan Quantity Measurement

416.09.02.01 Jacking and Boring

Measurement is by Plan Quantity, as may be revised by Adjusted Plan Quantity, of the length in metres along the centre line of the pipe from centre to centre of manholes or chambers or from the end of the pipe where no manhole or chamber is installed.

416.10 BASIS OF PAYMENT

416.10.01 Jacking and Boring - Item

Payment at the contract price for the above item shall be full compensation for all labour, equipment and material required to do the work.

The removal of boulders having a volume in excess of 0.5 cubic metres will be paid for as extra work.

JACKING AND BORING - Item No.

Special Provision No. 416S01 March 2012

Amendment to OPSS 416, February 1990

Interceptor Drains and Service Connections

416.10 BASIS OF PAYMENT

Section 416.10 of OPSS 416 is amended by the addition of the following:

Payment for connecting intercepted drains and service connections into the jacked and bored pipe shall be made on the following basis:

a) Where such drains and service connections are shown on the Contract Drawings the cost of connections shall be included in the Contractor's bid price for the Jacking and Boring tender item.

b) Where such drains and service connections are not shown on the Contract Drawings the cost of connections will be considered as a Change in the Work.

WARRANT: Always with this tender item.

CONSTRUCTION SPECIFICATION FOR NOISE BARRIER SYSTEMS

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APPENDICES

760-A **Commentary**

760.01 SCOPE

This specification covers the requirements for the installation of noise barrier systems.

760.01.01 Specification Significance and Use

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

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

760.01.02 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.

760.02 REFERENCES

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

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, Construction

OPSS 206 Grading
OPSS 501 Compacting
OPSS 510 Removal
OPSS 609 Grounding
OPSS 904 Concrete Structures
OPSS 906 Structural Steel for Bridges

Ontario Provincial Standard Specifications, Material

OPSS 1350 Concrete - Materials and Production
OPSS 1440 Steel Reinforcement for Concrete

CSA Standards

S6-06 Canadian Highway Bridge Design Code

ASTM International

A 123/A 123M-13	Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
A 780/ A 780M-09	Repair of Damaged and Uncoated Areas of Hot Dip Galvanized Coatings
B 209-10	Aluminum and Aluminum-Alloy Sheet and Plate

760.03 DEFINITIONS

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

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.

Manufacturer means the party that supplies and/or specifies the design, materials, and components for the proprietary noise barrier system selected by the Contractor.

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

760.04 DESIGN AND SUBMISSION REQUIREMENTS

760.04.01 Design Requirements

Noise barrier system design shall be as specified in the Contract Documents and according to the manufacturer's specifications.

760.04.01.01 Footings

760.04.01.01.01 General

Depth of footings shall be according to CAN/CSA S6 and based on the soil design parameters and wind load as specified in the Contract Documents.

760.04.01.01.02 Footings in Earth

When footings are to be installed on or within 1 m from a downward slope of 3H:1V or steeper, the Working Drawings shall reflect this and shall note an increase in embedment depth of a minimum of 0.5 m greater than the requirements specified in CAN/CSA S6.

760.04.01.01.03 Footing in Rock

When rock is encountered within the specified excavation depth for footings in earth, the footing shall be designed and constructed according to the Footings in Earth clause based on soil properties and wind load as specified in the Contract Documents. Alternatively, the design depth into rock shall be designed based on rock properties provided by the Owner. The minimum design depth below final grade shall not be less than 1.5 m or to the frost depth, whichever is the greater.

760.04.02 Submission Requirements

760.04.02.01 Working Drawings

The Contractor shall submit 6 copies of Working Drawings for the noise barrier system to the Contract Administrator at least 4 weeks prior to the commencement of construction. The Working Drawings shall show full details of noise barrier related items, erection procedures and, if applicable, connections to structures. An Engineer's seal and signature shall be affixed on the Working Drawings verifying that the drawings are consistent with the Contract Documents.

760.05 MATERIALS

760.05.01 General

All components for noise barrier systems shall be according to the manufacturer's specifications and as specified in the Contract Documents.

760.05.02 Granular Materials

Granular material shall be as specified in the Contract Documents.

760.05.03 Footings

Cast-in-place concrete in footings shall be according to OPSS 1350 with a nominal minimum 28-Day compressive strength of 30 MPa.

760.05.04 Steel Reinforcement

Steel reinforcement for the footings shall be according to OPSS 1440.

760.07 CONSTRUCTION

760.07.01 General

Noise barrier systems shall be installed according to manufacturer's specifications at locations specified in the Contract Documents.

760.07.02 Site Grading and Preparation

Grading and berm construction associated with the barrier installation shall be completed to within 25 mm below the bottom of the barrier prior to constructing the barrier footings. Grading up to 300 mm shall be part of installation of noise barrier system.

All grading shall be according to OPSS 206.

Earth and granular materials shall be compacted according to OPSS 501.

There shall be no visible gaps between any barrier panels or beneath the bottom panels after completion of the barrier.

Tree pruning and removal shall be kept to a minimum and shall be subject to the approval of the Contract Administrator prior to the commencement of any pruning and removal.

760.07.03 Footings

Concrete shall be according to OPSS 904.

Concrete for drilled footings shall be cast entirely against undisturbed soil.

For other footings, the footing shall be formed and the excavation shall be backfilled with granular materials and compacted to at least 95% standard Proctor maximum dry density.

When required, the top of all footings shall be shaped to provide for full horizontal seating of panels and the remaining surface area shall be sloped away from the post to shed water. Stepped footings shall be constructed to suit grade changes.

Concrete in the footings shall be cured to meet design strength as specified by the Engineer prior to the installation of noise barrier panels.

All excavations into rock shall be backfilled entirely with concrete. Excavation above the top of rock shall be formed to the required dimensions and the remainder of the excavation backfilled with granular material.

760.07.04 Posts

Structural steel posts shall be according to OPSS 906.

Steel posts and components shall be hot dip galvanized after fabrication according to ASTM A 123. Galvanized surfaces that are abraded shall be cleaned and painted with a zinc-rich paint according to ASTM A 780.

The top of footing and underside of post base plate shall be filled with non-shrink grout according to the manufacturer's specifications.

Tolerance for post plumb shall be according to the manufacturer's specifications.

760.07.05 Panels

Panels shall be installed horizontally and stepped when necessary to match the elevation profile specified on the Working Drawings. Changes in horizontal direction shall be made using special arrangements of the posts according to the manufacturer's specifications.

All panels shall be cleaned of any oils, dirt, and debris.

760.07.06 Noise Barriers on Structures

Noise barrier system shall be attached to the structure as specified in the Contract Documents.

Flashing shall be installed and sealed in a manner so that water will not pond on the structure according to the manufacturer's specifications.

760.07.07 Precast Noise and Traffic Barriers

Precast noise or traffic barrier units or both shall be constructed to the line and grades as specified in the Contract Documents with a tolerance of ±10 mm.

When changes in horizontal alignment are greater than 2° or when changes in vertical alignment are greater than 2% between adjacent units occur, the ends of the units shall be manufactured with the appropriate skewed end detail. Units required to match ground profiles with grades in excess of 2% shall be manufactured with skewed ends to match the vertical post detail. The space between each unit on the traffic side surface shall not exceed 25 mm at the base of the traffic barrier. The difference in elevation between adjacent units shall not exceed 25 mm. Any levelling or plumbing of units shall be done according to the manufacturer's specifications.

Granular base for the precast noise or traffic barrier units or both shall be placed in a manner to ensure that there are no voids between the bottom surface of units and the granular material and that the units are set to the correct line and grades.

Precast noise or traffic barrier units or both shall be set according to the manufacturer's specifications. Top of footings shall be clear of foreign material, ice, snow, or water.

Precast noise or traffic barrier units or both shall be positioned to have complete contact with the post flange along the traffic side of the units.

Top of the noise or traffic barrier units or both shall be cleared of any foreign or loose material, ice, snow, or water prior to installing the noise barrier panels.

The point of contact between the top of the precast noise or traffic unit or both and the bottom of the noise barrier panels shall be sealed according to manufacturer's specifications.

760.07.08 Noise Barrier Access Openings

Openings, frames, doors, and hardware for noise barrier access shall be supplied and installed in accordance with the manufacturer's Working Drawings and installation instructions at the locations and of the types specified in the Contract Documents.

Openings shall be cut a minimum distance of 1,000 mm from the centerline of the noise barrier post to the centerline of the opening.

The centre of fire hose access openings shall be located within the range of 1,300 to 1,500 mm measured from the finished ground surface.

Standard opening sizes for fire hose access and person door access are shown in Table 1. Dimensions and details for all other access opening types including, but not limited to electrical access, vehicle access, and hydraulic access are as specified in the Contract Documents. The openings shall meet the specified dimensions and shall be centred between adjacent posts.

Each noise barrier access opening shall be fitted with a hinged door that opens away from the roadway to a minimum opening angle of 110º.

When doors are in the closed position, there shall be no impact to the acoustical characteristics of the noise barrier system. All gaps between openings and frames shall be sealed to ensure that there are no gaps.

760.07.09 Connection to Existing Fence

When sections of an existing parallel or cross fence are to be removed or replaced or both with a noise barrier system, the Contractor shall ensure that a sufficient length of existing fence is maintained in good condition to adequately allow for connection to a new post at locations shown in the Contract Documents.

Removal of any fence shall be according to OPSS 510.

760.07.10 Underground Utility and Drainage Crossings

Reduced post spacing shall be allowed according to the manufacturer's specifications to avoid placing posts on top of utilities and drainage facilities.

760.07.11 Existing Overhead High Voltage Lines

When the potential of arcing exists due to the close proximity of existing overhead high voltage lines, steel noise barrier panels and posts shall be grounded according to OPSS 609.

760.07.12 Marking

Identification plates, provided by the manufacturer, shall be attached to the completed noise barrier system at the following intervals:

a) At the start and end of noise barrier system.

b) At a maximum interval of 300 m.

The identification plate shall be located within 300 mm of a terminal post with the top of the plate located approximately 1.2 m above the ground. The maximum dimensions of the plate shall be 200 by 200 mm. The plate shall be made from 0.81 mm thick anodized aluminum sheet according to ASTM B 209 series 1100 or 5005-H34.

Each plate shall be engraved with the following information:

a) Contract number.

b) Name of manufacturer of noise barrier system.

c) Name of Subcontractor that installed the noise barrier system.

d) Date of completed installation (i.e., yyyy-mm).

The height of the letters and numerals shall be within the range of 6 to 32 mm.

760.07.13 Quality Control

760.07.13.01 Interim Inspection of Footings and Posts

During construction of the noise barrier footings and posts and prior to the installation of the noise barrier panels from the fabrication facility, the Quality Verification Engineer shall conduct an inspection during the work to verify that the footings and posts have been constructed in general conformance with the Contract Documents and issue the Contractor written permission to proceed with the work. A copy of the written permission to proceed shall be submitted to the Contract Administrator prior to commencement of the next operation.

760.07.13.02 Certificate of Conformance

A completed Certificate of Conformance shall be submitted to the Contract Administrator upon completion of the installation of the noise barrier system. The Quality Verification Engineer shall affix his or her seal and signature to the completed Certificate of Conformance confirming that the installation has been carried out in general conformance with the Contract Documents and manufacturer's specifications.

760.07.14 Site Restoration

After noise barrier system installation, the site shall be cleaned and trimmed and the ground restored to a neat condition.

760.07.15 Management of Excess Material

Management of excess material shall be according to the Contract Documents.

760.08 QUALITY ASSURANCE

760.08.01 Construction

Noise barrier components damaged in transit or during placement shall be replaced by the Contractor at no cost to the Owner.

The Contractor shall install noise barrier materials that are visually uniform in appearance in terms of colour, pattern, and texture. Uniformity of appearance is subject to approval of the Contract Administrator. Noise barrier panels shall visually match adjacent panels. Inspection shall occur at a distance of approximately 15 metres from the noise barrier system.

Final inspection of the complete noise barrier system shall not be made until it has been installed.

760.09 MEASUREMENT FOR PAYMENT

760.09.01 Actual Measurement

760.09.01.01 Noise Barrier System
Noise Barrier System Including Precast Noise/Traffic Barrier
Noise Barrier System on Structures

Measurement of noise barrier system shall be along the horizontal length in metres of the specified height. Transitions between barrier heights shall form part of the higher barrier and terminations shall form part of the adjoining barrier.

At the discretion of the Contract Administrator, if unidentified difficult soil conditions (i.e., rock, shale, or unstable earth) are encountered above the design footing depths, work necessary to complete the design requirements such as caissons, dewatering, additional concrete, or different augering equipment, shall be paid for as Additional Work.

760.09.01.02 Noise Barrier Access

For measurement purposes, a count shall be made of the number of accesses installed.

760.09.02 Plan Quantity Measurement

When measurement is by Plan Quantity, such measurement shall be based on the units shown in the clauses under Actual Measurement.

760.10 BASIS OF PAYMENT

760.10.01 ***"height"*** **Noise Barrier System - Item**
"height" **Noise Barrier System Including Precast Noise/Traffic Barrier - Item**
"height" **Noise Barrier System on Structures - Item**
Noise Barrier Access - Item

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

Grading up to 300 mm shall be included as part of the noise barrier system item. For earth grading requirements greater than 300 mm, the full grading is provided under the earth excavation item.

760.10.02 Removals and Replacements

Cost associated with any required removals and replacements of defective workmanship or materials shall be the Contractor's responsibility at no cost to the Owner.

TABLE 1
Noise Barrier Access Standard Opening Sizes

Type of Door / Opening	Opening Size (W mm x H mm)
Fire Hose Access	254 x 254
Person Door Access	915 x 2438

Appendix 760-A, November 2014
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:

- Noise barrier system design requirements should include the following: (760.04.01)

a) Acoustics

The noise barrier system shall be designed for one of the following acoustical characteristic:

i. Either sound absorptive or reflective
ii. Sound absorptive on the highway side
iii. Sound absorptive on the residential side
iv. Sound absorptive on both sides.

If more than one acoustical characteristic apply to this Contract for various sections, then each section shall be designed accordingly with clearly defined limits.

b) Height

The designer shall select an appropriate height according to the acoustical requirements, which shall not be more than 5 metres.

c) Aesthetics

The designer shall plan the number of colours and textures for the Contract. The designer shall also specify the patterns and proportions in which each is required. The exact colour, texture, and pattern for the noise barrier system shall be specified following the award of the Contract, but will be within the following parameters:

The number of colours adjacent to highway is _____;

in the proportion of: _____ _____ _____ _____

The number of textures is _____;

in the proportion of: _____ _____ _____ _____

The number of colours adjacent to residential property is _____;

in the proportion of: _____ _____ _____ _____

The number of textures is: _____;

in the proportion of: _____ _____ _____ _____

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Final colour selections shall be determined by the Contract Administrator at the point of manufacture from samples prepared by the manufacturer.

If only one colour and texture are to be used, the noise barrier shall be constructed using only one colour and texture, which shall be specified by the Contract Administrator following the award of the Contract. Final colour selection shall be determined at the point of manufacture from samples prepared by the manufacturer.

d) Noise Barrier Access

The designer should provide station and offset (Lt. or Rt.) locations for all required barrier access points and indicate the type of access opening required at each location. Opening sizes for fire hose access and person access are standard. Opening sizes for other types of access including, but not limited to electrical access, vehicle access, and hydraulic access are site specific and should be specified by location and opening size.

- Soil design parameters and wind loads for footings should include the following: (760.04.01.01.01)

a) Footings

The designer shall design the noise barrier system footings according to CAN/CSA S6 with the assistance of soil design parameters. The designer shall also provide the soil design parameters as per the example below.

Station to Station	Soil Design Parameter
<u>East Bound Lane</u> 17+320 to 17+790 (shoulder)	Ø = 28º
<u>West Bound Lanes</u> 17+100 to 17+600 (ROW) 17+600 to 17+720 (ROW) 17+700 to 18+050 (shoulder)	Ø = 28º Cu = 12 Kpa Ø = 28º

b) Wind Pressure

The wind pressure information shall be used from CAN/CSA S6 for the city where the project is located (e.g., 415 Pa for Hamilton area).

- Noise barrier system material requirements. (760.05.01)

- Granular material to be used. (760.05.02)

- Noise barrier system locations. (760.07.01)

- Attachment requirements for noise barrier system to structure. (760.07.06)

- Line and grade specifications for precast noise/traffic barrier units. (760.07.07)

- Noise barrier access opening requirements. (760.07.08)

Appendix 760-A

- Locations where noise barrier system connects to existing fence.

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.

***"height"* NOISE BARRIER SYSTEM - Item No.**
***"height"* NOISE BARRIER SYSTEM INCLUDING PRECAST NOISE/TRAFFIC BARRIER - Item No.**
***"height"* NOISE BARRIER SYSTEM ON STRUCTURES - Item No.**
NOISE BARRIER ACCESS - Item No.

Special Provision No. 760F01 March 2018

Amendment to OPSS 760, November 2014

760.03 DEFINITIONS

Section 760.03 of OPSS 760 is amended by the deletion of the definitions for **Certificate of Conformance** and **Quality Verification Engineer**.

760.04 DESIGN AND SUBMISSION REQUIREMENTS

760.04.01 Design Requirements

760.04.01.01 Footings

760.04.01.01.01 General

Clause 760.04.01.01.01 of OPSS 760 is amended by the addition of the following paragraph:

The soil design parameters for the design of footings shall be as specified in Table A: [* Designer Fill-In for Table A, See Notes to Designer].

Table A
Soil Design Parameters

Location	Soil Design Parameter

Subsection 760.04.01 of OPSS 760 is amended by the addition of the following clauses:

760.04.01.02 Wind Load

The wind load applied for the design of structure shall be: [** Designer Fill-In, See Notes to Designer].

760.04.01.03 Acoustics

The minimum acoustical characteristic of the noise barrier system shall be such that the noise barrier is: [*** Designer Fill-In, See Notes to Designer].

760.04.01.04 Aesthetics

The colour and texture for the noise barrier system shall be within the following parameters:

Number of colours adjacent to highway: [**** Designer Fill-in – See Notes to Designer]

in the proportion of _____ _____ _____ _____

Number of textures _____

in the proportion of _____ _____ _____ _____

Number of colours adjacent to residential property: [**** Designer Fill-In, See Notes to Designer].

in the proportion of _____ _____ _____ _____

Number of textures _____

in the proportion of _____ _____ _____ _____

Final colour selections shall be determined by the Contract Administrator at the point of manufacture from samples prepared by the manufacturer.

If only one colour and texture are specified, the noise barrier shall be constructed using the colour and texture specified by the Contract Administrator following the award of the Contract. Final colour selection shall be determined at the point of manufacture from samples prepared by the manufacturer.

760.07 CONSTRUCTION

760.07.13 Quality Control

760.07.13.01 Interim Inspection of Footings and Posts

Clause 760.07.13.01 of OPSS 760 is deleted in its entirety and replaced with the following:

760.07.13.01 Inspection before Installation of Noise Barrier Panels

A Request to Proceed shall be submitted to the Contract Administrator after the construction of the noise barrier footings and posts and prior to the installation of the noise barrier panels

The installation of the noise barrier panels shall not proceed until a Notice to Proceed has been received from the Contract Administrator.

760.07.13.02 Certificate of Conformance

Clause 760.07.13.02 of OPSS 760 is deleted in its entirety and replaced by the following:

760.07.13.02 Inspection after Installation of Noise Barrier System

A Certificate of Conformance shall be submitted to the Contract Administrator upon completion of the installation of the noise barrier system.

NOTES TO DESIGNER:

* Insert station to station limits and soil design parameters in Table A as per the example below:

Example

Location	Soil Design Parameter
East Bound Lane 17+320 to 17+790 (shoulder)	Ø = 28º
West Bound Lanes 17+100 to 17+600 (ROW) 17+600 to 17+720 (ROW) 17+700 to 18+050 (shoulder)	Ø = 28º Cu = 12 Kpa Ø = 28º

** Insert the reference wind load along with its respective area or city (e.g., 415 Pa for Hamilton area).

*** Insert one of the following acoustical characteristics:

- Either sound absorptive or reflective
- Sound absorptive on the highway side
- Sound absorptive on the residential side
- Sound absorptive on both sides.

If more than one acoustical characteristic applies to this Contract, each section shall be designed accordingly with clearly defined limits.

**** Insert the number of colours planned for this contract, the proportions in which each are required, the number of textures if applicable and their proportions of the total noise barrier area in the locations specified.

WARRANT: Always with these tender items.

CONSTRUCTION SPECIFICATION FOR TOPSOIL

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802.07 **CONSTRUCTION**

802.08 **QUALITY ASSURANCE - Not Used**

802.09 **MEASUREMENT FOR PAYMENT**

802.10 **BASIS OF PAYMENT**

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802-A **Commentary**

802.01 SCOPE

This specification covers the requirements for stockpiling, supplying, and placing topsoil.

802.01.01 Specification Significance and Use

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

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

802.01.02 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.

802.02 REFERENCES

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

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, Construction

OPSS 206 Grading

802.05 MATERIALS

802.05.01 Topsoil

Topsoil shall be a fertile loam material that is free of roots, vegetation, or other debris of a size and quantity that prevents proper placement of the topsoil. The topsoil shall not contain material greater than 25 mm in size, such as stones and clods.

Imported topsoil shall not have contaminants that adversely affect plant growth.

Soil from swamps or muskeg areas may be used in place of topsoil, when approved by the Contract Administrator.

802.07 CONSTRUCTION

802.07.01 Stockpiling Topsoil

Topsoil shall be removed, stockpiled, and managed according to the Contract Documents. Stockpiles shall be constructed neatly with uniform surfaces. When required, the top surface shall be dished.

802.07.02 Preparation for Topsoil

Areas where topsoil is to be placed shall be fine graded to a uniform surface according to OPSS 206. The surface shall be loosened to a depth of 25 mm. It shall be free of all vegetation, debris, and stones which would not be covered by the depth of topsoil specified in the Placement of Topsoil subsection.

These areas shall be maintained in the condition described above until the topsoil is placed.

802.07.03 Placement of Topsoil

Topsoil shall be placed to a uniform depth of 50 mm on areas specified in the Contract Documents and up to the subgrade elevation on the roadway front slope.

Soil from swamps or muskeg areas, when used in place of topsoil, shall be placed according to the Contract Documents to a uniform depth of 75 mm, with no woody material protruding more than 50 mm above the surface.

802.07.04 Management of Excess Material

Management of excess material shall be according to the Contract Documents.

802.09 MEASUREMENT FOR PAYMENT

802.09.01 Actual Measurement

802.09.01.01 Topsoil from Stockpiles

Measurement shall be by volume in cubic metres of topsoil placed from a stockpile.

802.09.01.02 Topsoil, Imported

Measurement shall be by volume in cubic metres of topsoil imported and placed.

802.10 BASIS OF PAYMENT

802.10.01 Preparation for Topsoil - Item

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

Payment for this item shall be on surfaces graded under a previous Contract that require preparation for topsoil.

There is no payment for this item on surfaces constructed on this Contract.

802.10.02 Topsoil from Stockpiles - Item

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

802.10.03 Topsoil, Imported - Item

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

Appendix 802-A, November 2010
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:

- Topsoil removal and stockpiling areas. (802.07.01)

- Topsoil placement areas. (802.07.03)

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.

MATERIAL SPECIFICATION FOR POLYVINYL CHLORIDE WATERSTOPS

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1204.07 **PRODUCTION**

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1204.09 **OWNER PURCHASE OF MATERIAL**

APPENDICES

1204-A **Commentary**

1204.01 SCOPE

This specification covers the polyvinyl chloride waterstops for joints in concrete structures.

1204.01.01 Significance and use of Appendices

Appendices are not a mandatory part of this specification unless invoked by the Owner.

Appendix 1204-A is a commentary appendix to provide designers with information on the use of this specification in a Contract.

1204.02 REFERENCES

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

ASTM International

D 412-98a	Standard Test Methods for Vulcanised Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers - Tension
D 624-98	Standard Test for Tear Strength of Conventional Vulcanised Rubber and Thermoplastic Elastomers
D 2240-97el	Standard Test Method for Rubber Property - Durometer Hardness

1204.05 MATERIALS

1204.05.01 General Requirements

The waterstops shall be extruded from a polyvinyl chloride compound to meet the performance requirements given in this specification. Reworked polyvinyl chloride may be used but reclaimed polyvinyl chloride will not be permitted.

1204.05.02 Physical Requirements

The waterstop shall meet the requirements specified in Table 1. All tests shall be made on specimens prepared from the extruded waterstops.

When required, the thickness of specimens shall be reduced to between 1.5 and 3.0 mm by buffing, or slicing.

The extruded material shall be dense, homogeneous, of smooth surface, and free from porosity and other imperfections.

1204.07 PRODUCTION

1204.07.01 General

The waterstops shall be of the shape and dimensions specified in the Contract Documents. The cross-section of the waterstop shall be uniform along its length and shall be symmetrical transversely so that the thickness at any given distance from either edge of the waterstop will be uniform.

All splices in the waterstop shall be watertight.

1204.07.02 Quality Control

1204.07.02.01 Testing Procedures

1204.07.02.01.01 General

Testing procedures shall be according to the relevant ASTM standards indicated in Table 1, except that modulus of elasticity, effect of alkali, accelerated extraction, cold bend, and low temperature impact resistance shall be determined according to the procedures described in the following clauses.

1204.07.02.01.02 Modulus of Elasticity

Conformance shall be determined on the average of the results from tests on 3 specimens. Testing shall be carried out according to the following:

a) Each specimen shall be 25 mm in length and of the full cross-section of the finished waterstop.

b) The specimen shall be clamped in the testing machine in such a manner as to form a cantilever beam with the 25 mm dimension as the beam width.

c) The specimen shall be held between the bulb and the nearest rib on either side of the bulb.

d) The load shall be applied at the rib farthest from the clamp, across the full width of the specimen by a rigid blade type loading head of 0.8 mm contact edge radius.

e) With the load value being that obtained for a deflection rate of 5 mm/min the modulus of elasticity of the material shall be calculated from the following formula.

$$E = \frac{4P\,x\,L^3}{\Delta\,x\,b\,x\,t^3}$$

Where

E = modulus of elasticity, kilopascals
P = applied load, kilonewtons
L = span length, millimetre
Δ = deflection under applied load, millimetres
b = width of the specimen 25 mm
t = average thickness of the specimen, millimetres

1204.07.02.01.03 Effect of Alkali

Testing shall be carried out according to the following:

a) Three specimens shall be cut from the waterstop, each having a mass of 75 grams.

b) The specimens shall be washed in tap water, rinsed with distilled water, wiped with a clean cloth, and allowed to dry in laboratory air for approximately 1 hour.

c) The mass of each specimen shall be recorded to the nearest 0.001 gram.

d) Using a Shore durometer, Type A, a durometer reading shall be taken according to ASTM D 2240.

e) The specimens shall be completely immersed in a freshly made solution containing 5.0 grams of chemically pure sodium hydroxide and 5.0 grams of chemically pure potassium hydroxide in one litre of distilled water kept at 21 to 24°C. The solution shall be replaced every 7 Days.

f) At the end of 7 Days and at the end of 28 Days the specimens shall be removed, rinsed with distilled water, the surfaces wiped with a clean cloth, and allowed to dry in laboratory air for approximately 1 hour.

g) The mass shall be measured and recorded at the end of 7 Days and at the end of 28 Days. The durometer hardness shall be measured and recorded at the end of 7 Days. Mass changes shall be recorded as a percentage of the original mass and the hardness change in durometer units.

1204.07.02.01.04 Accelerated Extraction

Testing shall be carried out according to the following:

a) Five tensile test specimens according to ASTM D 412 Die C, each weighed to the nearest 0.001 gram, shall be placed in a one litre tall form beaker with spout.

b) The beaker shall be filled to within 50 mm of the top, with a solution made by dissolving 5.0 grams of chemically pure potassium hydroxide in one litre of distilled water. The specimens shall be completely immersed and the top of the beaker covered with a watch glass.

c) The beaker shall then be placed in a constant temperature bath and the temperature of the solution maintained between 60 and 65°C. The solution shall be changed every 24 hours, with the new solution being warmed to 65°C before replacing the old.

d) A 6 mm diameter glass tube shall be inserted in the spout of the beaker to within 12 mm of the bottom of the beaker. Air shall then be gently bubbled through the solution at the rate of about one bubble per second.

e) Once daily each of the five specimens shall be removed from the beaker, rinsed lightly with distilled water, and then superficially dried with a clean cloth. Ten minutes after the specimens have been thus dried, the group of five specimens shall be weighed and mass recorded.

f) The sequence of testing shall be carried out continuously for a period of not less than 14 Days.

g) After the 14 Day period, provided the specimens have reached constant mass, they shall be tested for tensile strength and elongation. Constant mass is assumed to have been achieved when the masses of the group of specimens on three successive weighings do not differ from each other by more than 0.05% of the original mass. Prior to being tested for tensile strength and elongation, the specimens shall be removed, rinsed, stored for 10 minutes and weighed. If the tests for tensile strength and elongation cannot be made within 1 hour after completion of the weighings indicating the achievement of constant mass, the specimens shall be stored immersed in a fresh alkali solution at room temperature. Tensile strength shall be calculated from the total load at failure, the nominal width, and the thickness as determined prior to the extraction test. The tensile strength and elongation shall be determined not more than 72 hours after the weighings which demonstrated that constant mass had been achieved.

h) If constant mass has not been achieved after 90 Days, the exposure shall be terminated, the specimen tested for tensile strength and elongation, and a note added to the report indicating the mass losses between the last successive weighings and the fact that constant mass, as here defined, was not achieved.

1204.07.02.01.05 Cold Bend

Three specimens, each between 1.5 and 3.0 mm thick, 25 mm wide, and 150 mm long shall be cooled to 10°C then immediately bent through 180 degrees around a 6 mm diameter mandrel. Any cracking shall constitute a failure.

1204.07.02.01.06 Low Temperature Impact Resistance

Testing shall be carried out according to the following:

a) Three specimens from a finished waterstop, each 100 to 150 mm long and of full cross-section, shall be rigidly clamped in a horizontal position in such a manner as to form a cantilever beam of length equal to the cross-sectional width. There shall be a minimum of 125 mm vertical clearance below the unsupported section of the beam.

b) The test assembly and specimens shall be cooled to a temperature of -35°C.

c) At that temperature the unsupported section shall be struck centrally with a 3.6 kg steel ball dropped freely through 1.5 m.

Any cracking or chipping of the specimen shall constitute failure

1204.07.03 Test Certificates

Two certified copies of the manufacturer's test results for the lot numbers shall be provided for all shipments to the Contract or storage depots. One copy shall be included with the shipment and a second copy shall be sent to the Contract Administrator.

1204.07.04 Acceptance or Rejection

All waterstops failing to meet any of the requirements of this specification shall be rejected. Rejected materials shall be expeditiously removed and replaced with acceptable materials at no additional expense to the Owner.

1204.07.05 Marking

All waterstops shall be identified as to the manufacturer by means of a colour. These colours shall be registered with the Owner and shall be used in all waterstops produced by the respective manufacturer.

The waterstop shall be marked with the lot number.

1204.07.06 Packaging

The waterstop shall be packaged as coils in containers so constructed as to ensure safe delivery. The inside diameter of the coil shall be at least 300 mm.

The waterstop in the coil shall be of continuous length.

The waterstop shall be clearly identified by affixing labels to the coils and containers. The labels shall indicate the following:

a) Manufacturer's name.

b) Trade name.

c) Lot number.

d) Coil number.

e) Length of the waterstop in the coil.

f) Size.

1204.08 QUALITY ASSURANCE

The Owner may perform such inspection, sampling, and testing at such times and locations deemed necessary to determine the acceptability of the waterstops.

1204.09 OWNER PURCHASE OF MATERIAL

1204.09.01 Measurement and Payment

Payment at the price specified in the purchasing order, in metres along the length of the waterstops for the type specified, shall be full compensation for all labour, Equipment, and Material to supply the waterstops to the destination at the time specified.

Where material is sampled by the Owner's representative after packaging, measurement shall be made of the original quantity as packed.

Table 1
Physical Requirements for Waterstops

Property	Physical Requirements	Test Procedure
Tensile Strength, Mpa	minimum 10 average of 5 specimens	ASTM D 412 Die C
Ultimate Elongation, %	minimum 275 average of 5 specimens	ASTM D 412 Die C
Tear Resistance, N/mm	minimum 44 average of 3 specimens	ASTM D 624 Die B
Modulus of Elasticity, MPa	minimum 24	See Modulus of Elasticity clause
Effect of Alkali 7 Day - mass increase, % - mass decrease, % - hardness change, points 28 Day - mass increase, % - mass decrease, %	 maximum 0.25 maximum 0.10 ± 5 maximum 0.40 maximum 0.30	See Effect of Alkali clause.
Accelerated Extraction Tensile Strength, MPa Ultimate Elongation, %	 minimum 90 minimum 250	 See Accelerated Extraction clause
Cold Bend	Pass	See Cold Bend clause
Low Temperature Impact Resistance	Pass	See Low Temperature Impact Resistance clause

Appendix 1204-A, Commentary for OPSS 1204, November 2003

Note: This appendix does not form part of the standard specification. It is intended to provide information to the designer on the use of this specification in a Contract.

Designer Action/Considerations

The designer should specify the following in the Contract Documents:

- Waterstop shape and dimensions. (1204.07.01)

Related Ontario Provincial Standard Drawing

OPSD 4670.000 Construction and Expansion Joint In Concrete

MATERIAL SPECIFICATION FOR JOINT FILLER IN CONCRETE

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1308.07 **PRODUCTION**

1308.08 **QUALITY ASSURANCE**

1308.09 **OWNER PURCHASE OF MATERIAL**

APPENDICES

1308-A **Commentary**

1308.01 SCOPE

This specification covers preformed expansion joint fillers for joints in concrete.

1308.01.01 Significance and Use of Appendices

Appendices are not a mandatory part of this specification unless invoked by the Owner.

Appendix 1308-A is a commentary appendix to provide designers with information on the use of this specification in a Contract.

1308.02 REFERENCES

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

ASTM International

D 1751(99)	Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
D 1752-84(1996)el	Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction

1308.05 MATERIALS

1308.05.01 Joint Filler

The joint filler shall be according to ASTM D 1751 for Type A or ASTM D 1752 for Type B.

The type of material supplied shall be as specified in the Contract Documents.

1308.07 PRODUCTION

1308.07.01 Cutting and Tolerance

The joint filler shall be cut neatly, free from burrs to the sizes specified in the Contract Documents.

Holes for dowel bars in the joint filler shall be neatly punched in the exact position specified and shall be free from loose fibres.

Pieces of the joint filler shall be according to the dimensions in the Contract Documents with the following tolerances:

Thickness	0 to 1.5 mm
Depth	$\pm$ 3 mm
Length	$\pm$ 3 mm

1308.07.02 Packaging and Marking

Each shipment of joint filler shall be provided with an itemized statement of the number and dimensions of the pieces. The brand name and the thickness of the material shall be clearly stamped on the pieces or on a label attached securely to each bundle.

Each piece of self-expanding cork filler shall be individually wrapped in waterproof material and shall be sealed in a manner that will prevent the entrance of moisture.

The material shall be suitably packaged to permit shipping, handling, and storage without damage.

1308.08 QUALITY ASSURANCE

1308.08.01 Sampling and Testing

Samples of the material for quality assurance testing shall be available to the Owner from deliveries to the site for testing according to ASTM D 1751 and D 1752.

1308.09 OWNER PURCHASE OF MATERIAL

1308.09.01 Measurement and Payment

Payment at the price specified in the purchasing order, by either linear metres for strips, or by a count for other shapes, shall be full compensation for all labour, Equipment, and Material required for the supply and delivery of the joint filler to the destination and at the time specified.

The cost of the samples for testing and the cost of all testing except that performed by the Owner shall be included in the price.

Appendix 1308-A, Commentary for OPSS 1308, November 2003

Note: This appendix does not form part of the standard specification. It is intended to provide information to the designer on the use of this specification in a Contract.

Designer Action/Considerations

The following shall be specified in the Contract Documents:

- Type and size of material to be supplied.

Related Ontario Provincial Standard Drawings

OPSD 4670.000 Construction and Expansion Joint In Concrete

ONTARIO PROVINCIAL STANDARD SPECIFICATION

METRIC
OPSS 1315
SEPTEMBER 1996

MATERIAL SPECIFICATION FOR WHITE PIGMENTED CURING COMPOUNDS FOR CONCRETE

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1315.09	**Not Used**
1315.10	**Not Used**

1315.01 SCOPE

This specification covers membrane forming compounds for curing concrete.

1315.02 REFERENCES

This specification refers to the following standards, specifications:

American Society for Testing and Materials Standards:

ASTM C156-93 Water Retention of Concrete Curing Materials Test

ASTM C309-93 Specification for Liquid Membrane Forming Compound for Curing Concrete

ASTM D244-94 Test Methods for Emulsified Asphalts

Other:

Ministry of Transportation Ontario - Laboratory Standards:

L.S. 413 Method of Test for Non-Volatile Content of Chemical Admixtures, Latex Admixtures and Curing Compounds

L.S. 416 Method of Test For Settling Rates -Curing Compounds

1315.04 SUBMISSION AND DESIGN REQUIREMENTS

1315.04.01 Submissions

1315.04.01.01 Product Data

The following product data shall be submitted to Owner.

a. the trade name of the compound.
b. the manufacturer's and supplier's name.
c. a test certificate, from an independent laboratory, containing test results for the tests performed on the designated compound required by this specification.
d. infrared spectra of the curing compound.
e. a statement as to the type of solids, type of solvents, pigment content, total solids content, specific gravity and viscosity of the designated compound.
f. production tolerances for solids content and specific gravity.
g. Manufacturer's Safety Data Sheet.

1315.04.01.02 Product Sample

A 1 L sample shall be submitted when requested by the Owner.

1315.05 MATERIALS

1315.05.01 Requirements

The curing compound shall be white pigmented Type 2 Class B curing compound according to ASTM C309 and this specification.

When performing the water retention test according to ASTM C156 the curing compound shall restrict the loss of water present in the test specimen at the time of application of the compound to not more than 300 g/m^2 of treated surface.

The curing compound shall not react deleteriously with concrete.

When tested according to LS 416, the compound shall have such a rate of settling that the uniformly white portion, as visible to the eye, is not less than 145 ml at 2 hours nor less than 125 ml at 24 hours after filling the cylinder.

The testing shall be done by an organization certified by the Standard Council of Canada or by an organization participating in the Cement and Concrete Reference Laboratory at the National Institute of Standards and Technology correlation and inspection program. When the laboratory is the manufacturer's laboratory, an Engineer employed by an independent certified organization shall witness the testing and affix their Engineer's stamp to the test report.

1315.08 QUALITY ASSURANCE

1315.08.01 Sampling and Testing

Quality assurance samples of the white pigmented curing compound will be taken by the Owner from deliveries to its work.

The frequency of sampling and testing will be at the discretion of the Owner.

1315.08.02 Physical Tests

Testing for the non-volatile content will be done according to L.S. 413. Testing for relative density will be done according to ASTM D244. Test for settling rate will be done according to L.S. 416.

1315.08.03 Acceptance or Rejection

The material properties shall conform to the product data information submitted to the Owner at the time of the initial evaluation.

The non-volatile content shall be within $\pm$ 2.5% of the approved curing compound. The relative density shall be within $\pm$ 0.01 of the approved curing compound. When tested for settlement the rate shall be according to the Materials Section.

ailure of any quality assurance sample to comply with the requirements of this specification shall be sufficient cause to prohibit the use of the material represented by the sample.

MATERIAL SPECIFICATION FOR PRECAST REINFORCED CONCRETE COMPONENTS FOR MAINTENANCE HOLES, CATCH BASINS, DITCH INLETS, AND VALVE CHAMBERS

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1351.06 **EQUIPMENT - Not Used**

1351.07 **PRODUCTION**

1351.08 **QUALITY ASSURANCE**

1351.09 **OWNER PURCHASE OF MATERIAL**

APPENDICES

1351-A **Commentary**

1351.01 SCOPE

This specification covers the requirements for precast reinforced concrete components for the construction of maintenance holes, catch basins, ditch inlets, and valve chambers, maintenance hole steps, and aluminum safety platforms.

1351.01.01 Significance and Use of Appendices

Appendices are not a mandatory part of this specification unless invoked by the Owner.

Appendix 1351-A is a commentary appendix to provide designers with information on the use of the specification in a Contract.

1351.02 REFERENCES

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

Ontario Provincial Standard Specifications, Materials

OPSS 1002 Aggregates - Concrete
OPSS 1301 Cementing Materials
OPSS 1302 Water
OPSS 1303 Air Entraining and Chemical Admixtures for Concrete
OPSS 1315 White Pigmented Curing Compounds for Concrete
OPSS 1350 Concrete - Materials and Production
OPSS 1440 Steel Reinforcement for Concrete

Ministry of Transportation Publications

MTO Laboratory Testing Manual:
LS-412 Scaling Resistance of Concrete Surfaces Exposed to Deicing Chemicals

Structural Manual:
Division 1, Exceptions to the Canadian Highway Bridge Design Code

Canadian Standards Association

A23.1-00 Concrete Materials and Methods of Concrete Construction [Part of CAN/CSA-A23.1-00/A23.2-00, Concrete Materials and Methods of Concrete Construction/Method of Test for Concrete]
A257.3-03 Joints for Circular Concrete Sewer and Culvert Pipe, Manhole Sections, and Fittings using Rubber Gaskets [Part of A257 Series-03, Standards for Concrete Pipe and Manhole Sections]
A257.4-03 Precast Reinforced Circular Concrete Manhole Sections, Catch Basins, and Fittings [Part of A257 Series-03, Standards for Concrete Pipe and Manhole Sections]
A3000-03 Cementitious Materials Compendium
S6-00 Canadian Highway Bridge Design Code
S157-M83 (R2002) Strength Design in Aluminum

ASTM International

B 221-96 Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes

Canadian Food and Drug Act and Regulations

Division 23

United States Federal Specifications

United States Code of Federal Regulations, Section 177.1520 (Olefin Polymers)

SS-S-210A Sealing Compound Preformed Plastic for Pipe Joints

Plant Prequalification Program Publication

Prequalification Requirements for Precast Concrete Drainage Products

1351.03 DEFINITIONS

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

Engineer means a professional engineer licensed by the Professional Engineers of Ontario to practice in the Province of Ontario.

Hoop Steel means a continuous ring of deformed steel wire reinforcement.

1351.04 SUBMISSION AND DESIGN REQUIREMENTS

1351.04.01 Submission Requirements

1351.04.01.01 Special Design Drawings

When the Contract Documents do not include Drawings for precast reinforced concrete components, 2 copies of detailed structural design drawings of the components shall be supplied to the Owner for review. Details of precast concrete adjustment units, maintenance hole steps, and the name of the step manufacturer shall also be included.

Detailed structural design drawings shall bear the seals and signatures of the design and checking Engineers.

1351.04.02 Design Requirements

1351.04.02.01 Circular Maintenance Holes, Catch Basins, Ditch Inlets, and Valve Chambers

Circular precast concrete components shall be designed according to CSA A257.4, CAN/CSA-S6, and the Structural Manual, Division 1.

1351.04.02.02 Square or Rectangular Maintenance Holes, Catch Basins, Ditch Inlets, and Valve Chambers

Square or rectangular precast maintenance holes, catch basins, ditch inlets, and valve chambers shall be designed according to CAN/CSA-S6 and the Structural Manual, Division 1.

1351.04.02.03 Precast Concrete Adjustment Units

Precast concrete adjustment units shall be designed according to CSA A257.4.

1351.04.02.04 Steps

Steps that are cast, mortared, or attached by mechanical means into the walls of risers or tapered top sections shall be designed according to CSA A257.4 except that:

a) The steps shall be evenly spaced at a distance of 300 mm centre to centre.

b) The steps shall be located a minimum of 150 mm from the ends of the sections.

c) The clearance between the wall face and the centre of the inside surface of the step shall not be less than 150 mm.

1351.04.02.05 Aluminum Safety Platforms

Aluminum safety platforms shall be designed according to CAN3-S157-M.

1351.04.02.06 Joints

Joints shall be designed as to be formed by a male end of a precast concrete section joining with a female end on the adjoining section.

All joints of precast concrete sanitary sewer maintenance holes and valve chambers shall be provided with a joint seal system which shall be the sole element depended upon to make the joint watertight.

Joints shall be of such a design that when joined they will withstand, without cracking and fracturing, the forces caused by the compression of the joint seal system, and any stresses resulting from the hydrostatic test specified in this specification.

1351.04.02.07 Precast Base Slabs and Monolithic Base Sections

Structural design, including minimum reinforcing steel requirements, shall be based on worst condition installation for standard precast maintenance hole bases. Live load, dead load, hydrostatic uplift, and other possible forces shall be considered for a burial depth of 10 m. Depth of bury is to be measured from grate elevation at the top of the precast maintenance hole to the top of its base. Where greater depth of bury is required, a specially designed base shall be used.

1351.04.02.08 Precast Transition Slabs

Structural design, including minimum reinforcing steel requirements, shall be based on worst condition installation for standard precast maintenance hole transition slabs. Live load, dead load, hydrostatic uplift, and other possible forces shall be considered for a burial depth of:

a) 10 m for tapered transition slabs and transition slabs 1500 mm to 2400 mm in diameter;

b) 8 m for transition slabs greater than 2400 mm in diameter.

Depth of bury is to be measured from grate elevation at the top of the precast maintenance hole to the top of its transition slab. Where greater depths of bury are required, a specially designed transition slab shall be used.

1351.05 MATERIALS

1351.05.01 Aggregates

Aggregates shall be according to OPSS 1002, except that the requirement for gradation need not apply.

1351.05.02 Cement

Cement shall be Portland cement Type GU or blended cements Type GUb, i.e., Portland blast-furnace slag cement and Portland fly ash cement. Ground granulated blast-furnace slag or fly ash may also be added separately to Type GU Portland cement. Whether added separately or in the form of blended cement, ground granulated blast furnace slag shall constitute not more than 70 percent by mass of the total cementing material and fly ash shall constitute not more than 40 percent by mass of the total cementing materials.

Portland cement Type GU, blended cements Type GUb, ground granulated blast furnace slag, and fly ash shall be according to CAN/CSA A3000.

1351.05.03 Water

Water for concrete shall be according to OPSS 1302.

1351.05.04 Chemical and Air Entraining Admixtures

Chemical and air entraining admixtures shall be according to OPSS 1303.

1351.05.05 Steel Reinforcement

Steel reinforcement shall be according to OPSS 1440 and as specified in the Contract Documents.

Steel reinforcement for precast concrete components may be:

a) Reinforcing steel bars.

b) Welded steel wire fabric, 500 MPa minimum yield strength.

c) Welded deformed steel wire fabric, 500 MPa minimum yield strength.

Steel reinforcement for precast concrete adjustment units shall be according to CSA A257.4.

1351.05.06 Steps

Steps shall be made of plastic encased or unencased aluminum, stainless steel, or plastic encased steel. Aluminum steps shall be according to ASTM B 221, Alloy 6351, Temper T6. Stainless steel steps shall be made of stainless steel type 304.

For plastic encased steps, the casing shall be of a solid, low-density virgin polyethylene material which has been deemed nonobjectionable by the Health Protection Branch of Health and Welfare Canada based on the Canadian Food and Drug Act and Regulations, Division 23. In addition, the polyethylene material must be in compliance with Title 21 of the United States Code of Federal Regulations, Section 177.1520 (Olefin Polymers).

The minimum thickness of the polyethylene material shall not be less than 3 mm along the top wearing surface of the step, excluding anchor portion. The bottom part of the step and the entire anchor portion shall have a polyethylene coating not less than 2 mm in thickness.

1351.05.07 Concrete

Concrete for precast concrete components, including circular valve chambers and adjustment units shall be according to OPSS 1350 with a nominal 28-Day compressive strength of 30 MPa, except that the nominal 28-Day compressive strength for precast rectangular valve chambers shall be 40 MPa.

1351.05.08 Aluminum Safety Platforms

Aluminum safety platforms shall be according to ASTM B 221, Alloy 6351, Temper T6.

1351.05.09 Joint Seal System

Joint seal system for circular precast components for maintenance holes, catch basins, ditch inlets, and valve chambers shall comply with one of the following requirements:

a) Until May 1, 2006, either a dense homogeneous rubber according to CSA A257.3, Clause 8 and 9, or a flexible preformed gasket according to U.S. Federal Specifications SS-S-210A.

b) After May 1, 2006, a dense homogeneous rubber according to CSA A257.3, Clauses 8 and 9.

Joint seal system square or rectangular precast components for maintenance holes, catch basins, ditch inlets, and valve chambers shall comply with one of the following requirements:

a) A dense homogeneous rubber according to CSA A257.3, Clauses 8 and 9.

b) A flexible preformed gasket according to U.S. Federal Specifications SS-S-210-A.

1351.05.10 Membrane Curing Compound

Membrane curing compound shall be according to OPSS 1315.

1351.07 PRODUCTION

1351.07.01 General

A manufacturer producing precast reinforced concrete components for maintenance holes, catch basins, and ditch inlets must possess a current Prequalification Certificate, issued under the Plant Prequalification Program as outlined in the publication, Prequalification Requirements for Precast Concrete Drainage Products.

1351.07.02 Production Method

Production of all precast reinforced concrete components shall be according to CSA A257.4.

1351.07.03 Marking

Markings shall be according to CSA A257.4 and be permanently marked on all precast components in a position readily visible for inspection. The following information shall also be marked on maintenance hole, catch basin, and ditch inlet components:

a) The term *HOOP* on precast concrete riser sections utilizing hoop steel reinforcement.

b) The Prequalification Stamp as outlined in the publication, Prequalification Requirements for Precast Concrete Drainage Products.

1351.08 QUALITY ASSURANCE

1351.08.01 General

Acceptance of the precast reinforced concrete components will be based on the results of the step testing; concrete testing; hydrostatic testing, when specified in the Contract Documents; and salt scaling acceptance test for dry-cast concrete or air voids testing for wet-cast concrete.

Precast reinforced concrete components, equipment, other material, and labour used to perform the testing shall be supplied without charge to the Owner.

When specified in the Contract Documents, the Owner shall be notified in writing at least 72 hours before testing is carried out. In the event that the Owner is unable to be present during the test, the manufacturer shall provide an affidavit affirming the actual recorded test results.

1351.08.02 Step Testing

1351.08.02.01 Horizontal Load Testing

The horizontal load testing of steps shall be according to CSA A257.4, except that a load of 1.3 kN shall be applied on the tread over the width of 90 mm, next to the point the step turns into the wall to form the anchorage. If the step sustains a permanent set of 6 mm or less after application of the horizontal load, then the test is acceptable.

1351.08.02.02 Vertical Load Testing

The vertical load testing of steps shall be according to CSA A257.4. If the step sustains a permanent set of 10 mm or less after application of the vertical load, then the test is acceptable.

1351.08.02.03 Integrity of Plastic Encased Steps to be Installed in New Maintenance Holes and Valve Chambers

This test applies only to steps to be installed in new concrete, less than 1 hour old for dry cast and less than 12 hours old for wet cast. Three steps of the same type shall be tested for integrity of the plastic coating in the following manner:

a) The steps shall be maintained at -23°C ±2°C for 24 hours.

b) The steps shall then be left at 20°C ±2°C for 24 hours.

c) The steps shall then be cut in half, vertically, at the midpoint of the tread and the coating removed at the cut end of each half step to expose approximately 10 mm of metal.

d) A water solution shall be prepared containing sodium chloride, 3% by mass, and a wetting agent, e.g., liquid detergent, 0.25% by volume.

e) A wire shall be connected from an anode in the salt/detergent solution to an ohm meter.

f) Each half step shall then be tested separately for integrity of the plastic coating by connecting the exposed end to the ohm meter and placing the sample in the salt/detergent solution to within 50 mm of the exposed metal end for at least 5 minutes.

For acceptance of the steps, the following criteria shall apply:

a) There shall be no cracking, fracturing, or openings through the plastic encasement. An unacceptable casing will be indicated by a resistance of less than 1 megaohm after 5 minutes in the salt/detergent solution. An acceptable coating will be indicated by a near infinite resistance greater than 1 megaohm after 5 minutes in the salt/detergent solution.

b) If any single half step of the three complete steps tested proves to be unacceptable, then three new complete steps of the same type shall be tested in accordance with the above procedures. If any of these three steps subsequently tested do not meet the requirements of this specification, then the product shall be deemed to be unacceptable.

1351.08.02.04 Integrity of Plastic Encased Steps to be Installed in Existing Maintenance Holes and Valve Chambers

This test applies only to steps to be installed in existing concrete, older than 1 hour for dry cast and older than 12 hours for wet cast. Three steps of the same type shall be tested for integrity of the plastic coating in the following manner.

a) The steps shall be maintained in a cold room at -23°C ±2°C for 24 hours.

b) Within 5 minutes of removing them from the cold room, the steps shall be driven into 25 mm diameter holes drilled in 30 MPa concrete using a standard 1.45 kg rubber mallet. The concrete shall have been cured at least 28 days.

c) Taking care to avoid damage to the casing, the concrete shall be chipped away from around the steps and the steps left at room temperature at 20°C ±2°C for 24 hours.

d) The steps shall be cut in half vertically at the midpoint of the tread and the coating removed at the cut end of each half step to expose approximately 10 mm of metal.

e) A water solution shall be prepared containing sodium chloride, 3% by mass, and a wetting agent, e.g., liquid detergent, 0.25% by volume.

f) A wire shall be placed from an anode in the salt/detergent solution to an ohm meter.

g) Each half step shall then be tested separately for integrity of the plastic coating by connecting the exposed end to the ohm meter and placing the sample in the salt/detergent solution to within 50 mm of the exposed metal end for at least 5 minutes.

For acceptance of the steps, the following criteria shall apply:

a) There shall be no cracking, fracturing, or openings through the plastic encasement. An unacceptable casing will be indicated by a resistance of less than 1 megaohm after 5 minutes in the salt/detergent solution. An acceptable coating will be indicated by a near infinite resistance, greater than 1 megaohm after 5 minutes in the salt/detergent solution.

b) If any single half step of the three complete steps tested proves to be unacceptable, then three new complete steps of the same type shall be tested in accordance with the above procedures. If any of these three steps subsequently tested do not meet the requirements of this specification, then the product shall be deemed to be unacceptable.

1351.08.03 Concrete Testing

1351.08.03.01 Concrete Compressive Strength

Concrete compressive strength shall be according to CSA A257.4 except cylinders shall be cast and tested monthly.

If the specified strength requirement of the concrete has not been reached after 28 days, two cores shall be taken from a component at locations approved by the Owner. Cores shall be moisture conditioned and tested according to CSA A23.1. Repairs to the core holes shall be to the satisfaction of the Owner.

1351.08.03.02 Salt Scaling Acceptance Test

The Salt Scaling Acceptance Test shall be according to LS-412 except as noted below.

Compliance with the test requirement is based upon a loss of mass of not more than 0.8 kg/m^2 from the surface after 50 cycles of freezing and thawing. If the specimens fail the salt scale resistance test, the manufacturer shall submit proposals of remedial action to the Owner for consideration.

Salt scale resistance testing shall be done at least once a year per mix design. If any mix design components or component suppliers change or component mix design proportions change by more than 10%, then the mix design shall be considered new.

Specimens, at least 300 x 300 mm in size, shall be selected from finished and cured product. Specimens shall be representative of the manufacturer's production. Test specimens supplied from the finished and cured product are considered fully cured and salt scale resistance testing can start immediately on these specimens. Specimens do not need to be saturated with moisture before testing.

A dyke may be made of any material that will adhere to the specimen and serve to maintain the salt solution on the surface of the specimen throughout the period of the test. The dyke must be applied during the dry period. The dyke must not affect the test results. If a dyke is a precast mortar dyke, an air entrained paste shall be applied to the edges around the perimeter of the test specimen and any excess paste shall be removed. After allowing the paste to harden for 24 hours, apply epoxy sealant to the inside, top, and outside of the dyke extending the outside surface epoxy treatment to 25 mm below the joint.

1351.08.03.03 Air Voids Testing

Air voids testing in hardened concrete shall be done at least once a year per mix design according to OPSS 1350.

1351.08.03.04 Hydrostatic Testing

When specified in the Contract Documents, hydrostatic tests are to be carried out on any of the sizes of precast sections or bases to be supplied for the Contract. Such tests shall be carried out by the precast maintenance hole supplier in the presence of the Owner's representative in accordance with the following requirements:

a) A minimum of two maintenance hole riser sections shall be assembled according to the manufacturer's instructions.

b) When testing is performed in such a manner that the joint is closed, the restraining force exerted on the joint shall not exceed the force represented by the weight of a precast maintenance hole 9 m in height of the size being tested.

c) The ends of the test sections shall be bulkheaded and the section filled with water.

d) The maintenance hole sections shall be subjected to an internal hydrostatic pressure of 60 kPa for a period of ten minutes.

e) All joints shall be tested. When only two maintenance hole riser sections are tested the bulkhead joints shall also be tested.

f) There shall be no leakage through the maintenance hole joints or walls. Damp spots and beads of moisture adhering to the walls of the sections shall not be considered as leakage.

g) As an option, the two test riser sections may be allowed to soak for a period of 24 hours before proceeding with the hydrostatic test.

h) Up to 1.0% of the number of each size included in the Contract shall be tested, but in no case shall less than 2 riser sections be tested for each maintenance hole size. Riser sections supplied for testing shall be sound, full-size sections.

1351.08.04 Inspection and Testing

The Owner’s representative shall be permitted free access to all portions of the plant engaged in the production of the precast maintenance hole, catch basin, and ditch inlet components, steps, and adjustment units and shall be provided with all reasonable facilities to secure the required samples and be satisfied that the components supplied are in accordance with this specification.

1351.09 OWNER PURCHASE OF MATERIAL

1351.09.01 Measurement and Payment

For measurement purposes, a count will be made of the number of complete structures delivered and accepted.

For measurement purposes, a count will be made of the number of concrete adjustment units delivered and accepted.

Payment at the price specified in the purchasing order shall be for supply and delivery of the complete structure, individual components, steps, concrete adjustment units, or safety platforms to the destination at the time specified.

The cost of all testing, except those performed in the Owner's laboratory, shall be included in the price.

Appendix 1351-A, Commentary for OPSS 1351, November 2004

Note: This appendix does not form part of the standard specification. It is intended to provide information to the designer on the use of this specification in a Contract.

Designer Action/Considerations

The designer should specify the following in the Contract Documents:

- Precast reinforced concrete component drawings. (1351.04.01.01)

- If Owner wishes 72 hours notice prior to quality assurance testing being carried out. (1351.08.01)

- If the Owner requires hydrostatic testing. For deeper maintenance hole test sections, higher hydrostatic test pressures to 90 kPa may be requested. (1351.08.03.03)

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

Related Ontario Provincial Standard Drawings

OPSD 404.020 to 404.022	Aluminum Safety Platforms
OPSD 405.010 to 405.020	Maintenance Hole Steps
OPSD 701.010 to 701.015	Precast Concrete Maintenance Holes, 1200 to 3600mm Diameter
OPSD 701.030 to 701.081	Precast Concrete Maintenance Hole Components, 1200 to 3600mm Diameter
OPSD 702.040	Precast Concrete Ditch Inlet Maintenance Hole Type A, 1200 x 1200mm
OPSD 702.050	Precast Concrete Ditch Inlet Maintenance Hole Type B, 1200 x 1200mm
OPSD 703.011 to 703.015	Precast Concrete Single Inlet Flat Cap, 1500 to 3600mm Diameter
OPSD 703.021 to 703.024	Precast Concrete Twin Inlet Flat Cap, 1500 to 3600mm Diameter
OPSD 704.010	Precast Concrete Adjustment Units for Maintenance Holes and Catch Basins
OPSD 705.010	Precast Concrete Catch Basin, 600 x 600mm
OPSD 705.020	Precast Concrete Twin Inlet Catch Basin, 600 x 1450mm
OPSD 705.030	Precast Concrete Ditch Inlet, 600 x 600mm
OPSD 705.040	Precast Concrete Ditch Inlet, 600 x 1200mm
OPSD 706.010 to 706.041	Precast Concrete Ditch Inlets 600 x 1200mm with 1500 to 3000mm Diameter Flat Caps
OPSD 1101.010	Precast Valve Chamber, 1200mm and 1500mm Diameter
OPSD 1101.012 to 1101.015	Precast Concrete Valve Chamber with Poured-In-Place Thrust Blocks, 1800 x 2400mm
OPSD 1101.016 to 1101.019	Precast Concrete Valve Chamber with Poured-In-Place Thrust Blocks, 2400 x 3000mm

ONTARIO PROVINCIAL STANDARD SPECIFICATION

METRIC
OPSS 1352
NOVEMBER 1989

MATERIAL SPECIFICATION FOR PRECAST CONCRETE BARRIERS

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1352.01 SCOPE

This specification covers the requirements for precast concrete barriers.

1352.02 REFERENCES

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

Ontario Provincial Standard Specifications, Material:

OPSS 1301	Hydraulic Cementing Materials
OPSS 1350	Concrete (Materials and Production)
OPSS 1440	Steel Reinforcement for Concrete
OPSS 1442	Epoxy Coated Steel Reinforcement (Concrete)
OPSS 1443	Organic Coatings for Steel Reinforcement (Concrete)

American National Standard Institute/American Society of Testing Materials:

ASTM C 672-84 - Test Method for Scaling Resistance of Concrete Specimens Subjected to Freezing

Canadian Standards Association:

CSA G164-M1981 - Hot Dip Galvanizing of Irregularly Shaped Articles

CSA G189-1966 - Sprayed Metal Coatings for (R1980) Atmospheric Corrosion Protection

1352.05 MATERIALS

1352.05.01 Concrete

Concrete shall conform to OPSS 1350 except that the restrictions on volume batching will not apply. The Contractor shall assume the responsibility for the mix design. The following specific requirements shall apply:

Class of Concrete	30 MPa at 28 d
Coarse Aggregate	19.0 mm nominal max. size
Maximum Slump	60 mm
Air Content	6% $\pm$ 1.5%

1352.05.02 Cement

Cement shall be Portland Cement, Portland Blast-Furnace Slag Cement (Type 10S or Type 10SM) or Portland Pozzolan Cement (Type 10P) conforming to OPSS 1301. Ground granulated blast-furnace slag, or fly ash may be used in conjunction with Normal Portland Cement (Type 10). Ground granulated blast-furnace slag shall conform to OPSS 1301 and it shall constitute not more than 70% by the mass of the total cementing material. Fly ash shall conform to OPSS 1301 (Type F or Type C) and it shall constitute not more than 40% by the mass of the total cementing material.

1352.05.03 Barrier Connections

The Precast Concrete Barrier connections shall be one of the following approved types:

Hook and Eye;
Concrete Key;
I-Lock Connection.

1352.05.04 Interlocking Components

All interlocking devices and exposed metal in the precast concrete barrier units shall be protected by using one of the following methods:

a. hot dip galvanizing conforming to CSA G-164 providing a minimum zinc coating of 0.61 kg^2

b. zinc metallizing conforming to CSA G-189 providing a minimum metallized coating of 200 μm thickness;

c. coating with an approved organic coating material conforming to OPSS 1443.

1352.05.05 Reinforcing Steel

All reinforcing steel in permanent precast concrete barriers shall be epoxy coated conforming to OPSS 1442. All reinforcing steel in temporary concrete barriers shall conform to OPSS 1440.

1352.07 PRODUCTION

1352.07.01 Curing Methods

Curing shall conform to the method as submitted and approved by the Authority.

1352.07.02 Marking

The following information shall be permanently marked on the top or sides of the precast sections:

1. Name or trade-mark of the manufacturer;

2. Identification of plant if manufacturer has more than one plant;

3 The date of manufacture.

1352.07.03 Quality Control

1352.07.03.01 Salt Scaling Test

For quality control purposes the Contractor may use a modified version of the "Salt Scaling Test" described in Section 1352.08. The modified version to be used is the visual evaluation of the surface deterioration conforming to ASTM C672.

1352.08 QUALITY ASSURANCE

1352.08.01 Salt Scaling Test

1352.08.01.01 General

The acceptance of permanent precast concrete barrier will be based on the results of the "Salt Scaling Test" as carried out by the Authority and as described in this specification.

This test determines the resistance of concrete specimens, with a salt solution ponded on the surface, to repeated cycles of freezing and thawing. Compliance with the test requirement is based upon a loss of mass of not more than 0.8 kg/m^2 from the surface after 50 cycles of freezing and thawing.

After 50 freeze-thaw cycles the test specimen shall not exhibit deterioration in the form of cracks, spalls, aggregate disintegration or other objectionable features.

1352.08.01.02 Apparatus

The freezing apparatus shall consist of a suitable cabinet or cold room capable of maintaining an air temperature of -18 $\pm$ 2°C.

The thawing and air drying apparatus shall consist of a suitable cabinet or room with controls to maintain an air temperature of 23 $\pm$ 2°C and a relative humidity of 50 $\pm$ 5 percent. The scales or balance shall have a minimum capacity of 5000 g with an accuracy of 0.1 g. The drying oven shall be capable of maintaining a temperature of 105 $\pm$ 2°C.

1352.08.01.03 Freezing and Thawing Cycle

One freeze-thaw cycle shall be completed every 24 hours. The cycle shall consist of 16 hours $\pm$ 1 hour freezing followed by 8 hours $\pm$ 1 hours thawing. When, due to work schedules or other reasons a thaw period cannot commence at the specified time the specimens shall remain in the freezing cabinet at -18 $\pm$ 2°C.

1352.08.01.04 Test Specimens

For the purposes of the test, two specimens 75 mm thick and at least 300 x 300 mm or 300 mm in diameter will be selected from the finished product by the Authority's representative. Specimens shall be representative of the Contractor's production.

Upon receipt of the specimens in the laboratory an epoxy mortar dyke or other suitable dyke shall be cast around the edges of the test specimen to expose a surface 250 x 250 mm or 250 mm in diameter, as shown in Figure 1. The surface of the specimen ponded in this test will normally be the outside surface of the barrier.

The dyked surface shall be flooded with water, 6 mm deep for 3 days to check for possible leakage.

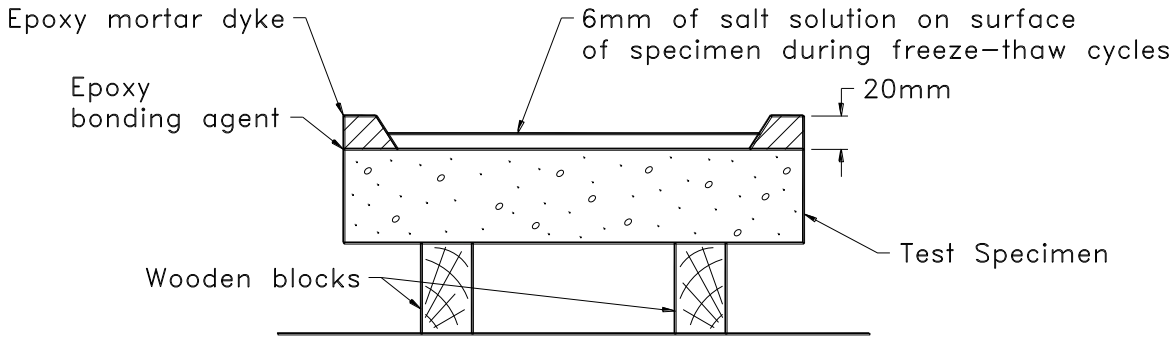

Figure 1

1352.08.01.05 Test Procedure

The water on the surface of the specimens shall be replaced by a solution of sodium chloride (concentration 3 percent by mass) to a depth of 6 mm.

The specimens shall then be subjected to continuous freeze-thaw cycles as specified in Clauses 1352.08.01.01 and 1352.08.01.03.

After each 5 cycles the salt solution and the particles of deteriorated concrete shall be removed from the slab and collected in a watertight container. The operation is best accomplished by tilting the slab into a funnel approximately 500 mm in diameter and washing the surface of the slab with a 3 percent sodium chloride solution. This washing should continue until all loose particles are removed from the concrete. The solution shall then be strained through a filter and the residue dried out at 105°C to a constant weight condition. The residue shall be cumulatively weighed after each 5 cycles. This residue shall be defined as the loss of mass and expressed in kilograms per square metre of exposed slab area.

The loss of mass shall be calculated to the nearest 0.1 kg/m^2.

After the washing of each slab a new solution of sodium chloride shall be placed on the surface.

The test shall continue until 50 freeze-thaw cycles have been completed.

During the test each specimen shall be positioned and supported to allow free air circulation under, around and over the test pieces.

The bottom of the specimens shall be supported on wooden blocks but not in a manner as to prevent movement of moisture through the test pieces.

1352.08.01.06 Report

The report shall include the following:

(i) Identification;

(ii) Photographs of the test specimens before and after the 50 cycle freeze-thaw test. Photographs at intermediate stages of the test are optional.

(iii) A graph of the cumulative mass loss of each specimen plotted in kilograms per metre squared against the number of freeze-thaw cycles at 5 cycle intervals.

1352.09 AUTHORITY PURCHASE OF MATERIALS BY PURCHASE ORDER

1352.09.01 Measurement for Payment

The unit of measurement for payment will be for each precast concrete barrier unit delivered and accepted.

1352.09.02 Basis of Payment

Payment at the contract price for precast concrete barrier units shall be full compensation for all labour, equipment and materials for the supply and delivery of the units to the location and at the time specified.

1352.10 DESIGNATED SOURCES REQUIREMENTS

Manufacturers wishing approval to manufacture precast concrete barrier shall contact the Ministry of Transportation Purchasing and Supply Office.

Approval of the manufacturer's plant shall be based on the acceptability of the constituent materials, the degree of production control and uniformity, and whether the finished product meets the requirements of this specification. The manufacturer shall not change material type, sources, or production methods, without prior approval of the Authority.

AMENDMENT TO OPSS 1352, NOVEMBER 1989

Special Provision No. 113S09 February 2013

1352.02 REFERENCES

Section 1352.02 of OPSS 1352 is amended by deletion of the following under:

Ontario Provincial Standard Specifications, Material

OPSS 1442 Epoxy Coated Steel Reinforcement for Concrete

1352.05 MATERIALS

1352.05.05 Reinforcing Steel

Subsection 1352.05.05 of OPSS 1352 is deleted in its entirety and replaced with the following:

1352.05.05 Steel Reinforcement

Steel reinforcement shall be according to OPSS 1440.

WARRANT: Always with precast concrete barriers.

MATERIAL SPECIFICATION FOR EPOXY COATED STEEL REINFORCEMENT FOR CONCRETE

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1442.01 SCOPE

This specification covers the requirements for steel reinforcement with protective epoxy coating applied by the electrostatic spray method.

1442.02 REFERENCES

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

Concrete Reinforcing Steel Institute:

Voluntary Certification Program for Fusion - Bonded Epoxy Coating Applicator Plants

Ontario Provincial Standard Specifications, Materials:

OPSS 1440 Steel Reinforcement for Concrete

OPSS 1443 Organic Coatings for Steel Reinforcement

American Society for Testing and Materials, ASTM Standards:

D3963/D3963M-87 - Standard Specification for Epoxy-Coated Reinforcing Steel

1442.03 DEFINITIONS

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

Holiday: means a pin hole.

Manufacturer: means coating applicator, coater.

1442.05 MATERIALS

1442.05.01 Steel Reinforcement

The steel reinforcement shall conform to OPSS 1440.

1442.05.02 Coating

The epoxy coating and the patching material shall conform to OPSS 1443.

1442.07 PRODUCTION

1442.07.01 Surface Preparation and Application of Coating

All surfaces of the steel bars shall be prepared and coated in conformance with ASTM D3963/D3963M.

1442.07.02 Requirements

The requirements for film thickness, continuity of coating, adhesion and the test methods shall conform to ASTM D3963/D3963M except as modified as follows:

Film Thickness - For acceptance purposes at least 90% of all recorded film thickness measurements shall be 175 μm to 300 μm after cure. The film thickness limits do not apply to patched areas.

Continuity of Coating - The coating shall be visually inspected after cure for continuity of coating and shall be free of holes, voids, contamination, cracks, and damaged areas discernible to the unaided eye. In addition, there shall be an average of no more than five holidays per metre of bar.

Adhesion of Coating - The adhesion of the coatings shall be evaluated by bending production coated bars to a permanent set of 180° around a mandrel of a size as prescribed in Table 1. The bend test shall be made at a uniform rate and take up to four seconds to complete the test. The test shall be performed on test piece shaving a uniform temperature of less than 15°C. The Continuity of Coating test shall be conducted after the bend test.

1442.07.03 Handling and Identification

Handling and identification systems shall conform to ASTM D3963/D3963M.

Unprotected storage shall not exceed 30 days, and total storage time shall not exceed 120 days, unless stored in a heated building.

The bars shall be stored above the ground on timbers or other suitable protective cribbing spaced to prevent sags in the bundles.

Stacks of bundles of straight bars shall have adequate blocking to prevent contact between the layers of bundles.

1442.07.04 Fabrication

Fabrication of the steel reinforcing bars after application of the coating shall conform to ASTM D3963/D3963M.

1442.07.05 Repairs Required Due to Fabrication and Handling

Damage to the coating caused during the fabrication and handling at the manufacturer's premises shall be repaired as required by ASTM D3963/D3963M, except that in any linear metre of coated bar the damage shall not exceed a surface area of 10 mm^2 not including sheared ends and there shall be no more than four defects per coated bar length. All such damage shall be repaired including sheared bar ends with patching material before any rusting occurs and before shipment to the job site. Hairline cracks without bond loss shall also be repaired.

1442.07.06 Quality Control

The manufacturer shall exercise quality control procedures to ensure that the requirements of this specification are satisfied.

TABLE 1
BENDING PIN DIAMETERS

Bar Size	10	15	20	25	30	35	45	55
Bending Pin Dia. mm	80	120	160	200	240	350	450	550

1442.07.07 Certification of Manufacturer

The manufacturer shall meet the minimum quality criteria set forth by the CRSI Voluntary Certification Programme for Fusion-Bonded Epoxy Coating Applicator Plants.

Address:

Concrete Reinforcing Steel Institute
Epoxy Coating Plant Certification Programme
933 North Plum Grove Road
Schaumburg, Il. USA 60173-4758
Phone: (708) 517-1200 Fax: (708) 517-1206

1442.08 QUALITY ASSURANCE

1442.08.01 Sampling and Frequency of Testing

When requested, the manufacturer shall supply a 200 g sample of the dry powder coating material from each batch or lot of the powdered epoxy resin used in coating the bars. The samples shall be packaged in airtight containers and identified by product name, batch or lot number and the contract on which the batch was used.

Film thickness will be determined in accordance with the requirements of ASTM D3963/D3963M at the rate of one bar for every 25 coated bars, or part thereof, of the same diameter produced on any one day.

One sample of bar, 1 m long will be taken and tested for flexibility for every 1500 m, or part thereof, of coated bars of the same size produced on any one day.

1442.08.02 Inspection

The inspection and sampling of the coated bars will be carried out at the coating plant, fabricating plant or at the point of delivery to the job site.

1442.08.03 Basis for Acceptance

Acceptance will be based on satisfactory evidence that the coated steel conforms to D3963/D3963M and this specification. Culling of rejected coated reinforcing steel is permitted.

When inspected as delivered to the job-site the following criteria shall apply.

Bars with coating damage greater than 1% of their surface area in any one metre length, will be rejected.

For bars with coating damage of 1% or less of their surface area, all damaged areas of the bar coating shall be repaired.

If the additional required repairs will result in a total bar surface area covered by patching material that exceeds 5% of the bar surface area, the bar will be rejected.

1442.10 DESIGNATED SOURCES REQUIREMENTS

As part of the approval process for inclusion on the Ministry of Transportation List of Designated Sources, the manufacturer shall file the quality control plan and proof of CRSI certification with the:

Head, Concrete Section
Ministry of Transportation of Ontario
1201 Wilson Avenue
Downsview, Ontario
M3M 1J8

The Ministry representative shall have free entry to the coating and fabrication plants as well as the finished product storage and loading areas for inspection purposes.

For continued approval, the manufacturer shall conform to this specification and shall not change the production methods and quality control plan without prior acceptance by the Head, Concrete Section, Ministry of Transportation of Ontario.

MATERIAL SPECIFICATION FOR ORGANIC COATINGS FOR STEEL REINFORCEMENT

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1443.10 **DESIGNATED SOURCES REQUIREMENTS**

1443.01 SCOPE

This specification covers the requirements for organic coatings for the protection of steel reinforcement for concrete.

1443.02 REFERENCES

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

Ontario Provincial Standard Specifications, Material:

OPSS 1350 Concrete, Materials and Production

OPSS 1440 Steel Reinforcement for Concrete

OPSS 1442 Epoxy Coated Steel Reinforcement for Concrete

American Society for Testing and Materials, ASTM Standards:

D3963/D3963M-87 - Standard Specification for Epoxy-Coated Reinforcing Steel, Annex, A1. Prequalification of Organic Coatings for Steel Reinforcing Bars.

1443.05 MATERIALS

The coating material and the patching material shall conform to ASTM D3963/D3963M, Annex, A1 except as modified as follows:

Flexibility of Coating:

The flexibility of the coating shall be evaluated by bending three coated reinforcing bars 180°, after rebound around a 150 mm diameter padded or wooden mandrel. The bend shall be made at a uniform rate and may take up to 4 seconds to complete. The two longitudinal deformations may be placed in a plane perpendicular to the mandrel radius and the specimen shall be at a thermal equilibrium of 15°C ± 2°C.

No cracking of the coating shall be visible to the naked eye on the outside radius of any of the three bent bars. The bars shall be examined again 24 hours later to ascertain that no delayed cracking has occurred.

The continuity of coating test shall be performed and shall be in conformance with OPSS 1442.

The coating shall be of an acceptable colour which provides a contrast with the colour of rust, red-brown.

1443.07 PRODUCTION

1443.07.01 Packaging and Labelling

The coating material shall be packaged in containers and properly identified with a label which shall include:

Name and address of the manufacturer
Plant identification
Trade or Brand Name
Batch Number
Date of Manufacture
Handling Precautions
Storage Requirement

1443.07.02 Test Methods

The test methods shall conform to ASTM D3963/D3963M, Annex, A1. Concrete for the bond strength and creep specimens shall be 30 MPa class conforming to OPSS 1350. The age of the bond specimens at the time of testing shall be 28 days.

1443.10 DESIGNATED SOURCES REQUIREMENTS

As part of the approval process for inclusion on the Ministry of Transportation List of Designated Sources, prospective suppliers shall provide the following to the Head, Concrete Section, Ministry of Transportation of Ontario, 1201 Wilson Ave., Downsview, Ontario, M3M 1J8:

a. The trade name of the product.

b. The manufacturer's name and, if applicable, the supplier's name.

c. The method and grade of metal surface preparation, the thermal treatments before and after coating application and the coating application procedures used to manufacture the test specimens and for production of coated bars.

d. A 0.5 kg sample of the coating material and one litre sample of the patching material.

e. A generic description of the coating material including the percentages of pigments, diluents, fillers, flexibilizers, and other additives.

f. An analysis of the coating material by either infrared spectroscopy or thermal analysis.

g. Twelve size 20 deformed steel reinforcing bars having a yield strength of 400 MPa and conforming to OPSS 1440, 1250 mm in length, coated to the proposed thickness.

h. Four uncoated and uncleaned size 20 reinforcing bars, 1250 mm in length and from the same lot as the steel for the coated bars.

i. Two cleaned but uncoated size 20 reinforcing bars, 1250 mm in length and from the same lot of steel and subject to the same cleaning process as the coated bars.

j. Four steel plates 100 x 100 x 1.2 mm and coated with a film thickness of 0.25 mm.

k. Three films of epoxy, of the minimum thickness proposed for use during production coating of bars, for the chloride permeability test.

l. A test certificate verifying that the coating material conforms to this specification including the requirement for creep.

When a coating is approved, its formulation shall not be changed without prior acceptance by the Head, Concrete Section, Ministry of Transportation of Ontario.