Amendment to OPSS.MUNI 401 (Nov 2015) – Construction Specification for Trenching, Backfilling and Compacting

OPSS 401.05 MATERIALS

OPSS 401.05.01 Embedment Material

Subsection 401.05.01 of OPSS.MUNI 401 is deleted in its entirety and replaced with the following:

Embedment material shall be Granular A or Granular A RCM according to TS 1010.

OPSS 401.05.02 Bedding Material

Subsection 401.05.02 of OPSS.MUNI 401 is deleted in its entirety and replaced with the following:

Bedding material shall be Granular A or Granular A RCM according to TS 1010.

OPSS 401.05.04 Granular Material

Subsection 401.05.04 of OPSS.MUNI 401 is deleted in its entirety and replaced with the following:

Granular material shall be according to TS 1010.

OPSS 401.05.06 Unshrinkable Fill

Subsection 401.05.06 of OPSS.MUNI 401 is deleted in its entirety and replaced with the following:

Unshrinkable fill shall be according to TS 13.10.

OPSS 401.05.05.01 General

Subsection 401.05.05.01 of OPSS.MUNI 401 is deleted in its entirety and replaced with the following:

Backfill material shall be one of the following, as specified in the Contract Documents:

a) Granular A or Granular A RCM according to TS 1010

b) Unshrinkable fill

OPSS 401.07 CONSTRUCTION

OPSS 401.07.04 Removals

Subsection 401.07.04 of OPSS.MUNI 401 is deleted in its entirety and replaced with the following:

Removals shall be according to TS 510.

OPSS 401.07.10.01 General

Clause 401.07.10.01 of OPSS.MUNI 401 is amended by deleting the third sentence in its entirety and replacing it with the following:

Compacting of embedment, bedding, cover, and backfill materials during pipe installation shall be according to TS 501.

OPSS 401.07.10.03 Bedding

Clause 401.07.10.03 of OPSS.MUNI 401 is amended by deleting the fifth sentence in its entirety and replacing it with the following:

Bedding material shall be placed in uniform layers not exceeding 200 mm in thickness, loose measurement, and each layer shall be compacted according to TS 501 before a subsequent layer is placed.

OPSS 401.07.10.04 Cover

Clause 401.07.10.04 of OPSS.MUNI 401 is amended by deleting the second sentence in its entirety and replacing it with the following:

Cover material shall be placed in uniform layers not exceeding 200 mm in thickness, loose measurement, and each layer shall be compacted according to TS 501 before a subsequent layer is placed.

OPSS 401.07.10.05 Backfill

Clause 401.07.10.05 of OPSS.MUNI 401 is amended by deleting the first sentence in its entirety and replacing it with the following:

Backfill material shall be placed in uniform layers not exceeding 300 mm in thickness, loose measurement, for the full width of the trench and each layer shall be compacted according to TS 501 before a subsequent layer is placed.

CONSTRUCTION SPECIFICATION FOR TRENCHING, BACKFILLING, AND COMPACTING

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401.01 SCOPE

This specification covers the requirements for excavating, backfilling, and compacting trenches for the installation of sanitary and storm pipe sewers; pipe culverts and end sections; pipe subdrains; forcemains and associated appurtenances; watermains and associated appurtenances; and other underground Utilities.

401.01.01 Specification Significance and Use

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

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

401.01.02 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.

401.02 REFERENCES

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

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

Ontario Provincial Standard Specifications, Construction

OPSS 206	Grading
OPSS 403	Rock Excavation for Pipelines, Utilities, and Associated Structures in Open Cut
OPSS 404	Support Systems
OPSS 412	Sewage Forcemain Installation in Open Cut
OPSS 441	Watermain Installation in Open Cut
OPSS 490	Site Preparation for Pipelines, Utilities, and Associated Structures
OPSS 491	Preservation, Protection, and Reconstruction of Existing Facilities
OPSS 492	Site Restoration Following Installation of Pipelines, Utilities, and Associated Structures
OPSS 501	Compacting
OPSS 510	Removal
OPSS 517	Dewatering of Pipeline, Utility, and Associated Structure Excavation
OPSS 539	Temporary Protection Systems
OPSS 902	Excavating and Backfilling - Structures

Ontario Provincial Standard Specifications, Material

OPSS 1010	Aggregates - Base, Subbase, Select Subgrade, and Backfill Material
OPSS 1359	Unshrinkable Backfill

Provincial Statute

Occupational Health and Safety Act
R.S.O. 1990,
c. O.1, as amended
Ontario Regulations 213/91 - Regulations for Construction Projects, as amended

401.03 DEFINITIONS

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

Additional Excavation means all excavation ordered in writing by the Contract Administrator beyond excavation specified in the Contract Documents.

Associated Appurtenances means as defined in OPSS 412 and OPSS 441.

Backfilling means the operation of filling the trench with bedding, cover, and backfill material or embedment and backfill material.

Backfill Material means fill material used above the embedment or cover material and below the lower of the subgrade or finished grade or the original ground.

Bedding Class means a classification system that defines the depth of the bedding material.

Bedding Material means material as it relates to rigid pipe, from the bottom of the trench to the bottom of the cover.

Cover Material means the material placed from the top of the bedding to the bottom of the backfill for rigid pipe.

Embedment Material means material as it relates to flexible pipe, from the bottom of the trench to the bottom of the backfill.

Excavation, Earth and Rock means the excavation classified as earth and rock according to OPSS 206.

Flexible Pipe means pipe that can deflect 2% or more without cracking such as polyvinyl chloride, polyethylene, or steel pipe.

Imported Material means material obtained from a source other than the Work Area.

Native Material means the material removed to form an excavation within the Work Area for return to the same or other excavation.

Pipe means sanitary or storm pipe sewers, watermains, forcemains, pipe culverts, and subdrains.

Rigid Pipe means pipe that cannot deflect more than 2% without cracking such as concrete pipe.

Trench means the definition as provided in the *Occupational Health and Safety Act* and Regulations for Construction Projects.

Trenching means the earth or rock excavation required to construct a trench in which to install pipes and their associated appurtenances.

Trench Width means the horizontal distance between the trench walls as measured at the bedding grade.

Unshrinkable Fill means as defined in OPSS 1359.

401.05 MATERIALS

401.05.01 Embedment Material

Embedment material shall be one of the following, as specified in the Contract Documents:

a) Granular A.

b) Granular B, Type I, II, or III, with 100% passing the 26.5 mm sieve.

c) Unshrinkable fill.

401.05.02 Bedding Material

Bedding material shall be one of the following, as specified in the Contract Documents:

a) Granular A.

b) Granular B, Type I, II, or III, with 100% passing the 26.5 mm sieve.

c) Unshrinkable fill.

401.05.03 Cover Material

Cover material shall be one of the following, as specified in the Contract Documents:

a) Granular A.

b) Granular B, Type I, II, or III, with 100% passing the 26.5 mm sieve.

401.05.04 Granular Material

Granular material shall be according to OPSS 1010.

401.05.05 Backfill Material

401.05.05.01 General

Backfill material shall be one of the following, as specified in the Contract Documents:

a) Granular A.

b) Granular B, Type I, II, or III.

c) Unshrinkable fill.

d) Native material.

401.05.05.02 Native and Imported Material

Native and imported material shall be approved by the Contract Administrator. All material shall be free from frozen lumps, cinders, ashes, refuse, vegetable or organic matter, rocks and boulders over 150 mm in any dimension, and other deleterious material.

401.05.06 Unshrinkable Fill

Unshrinkable fill shall be according to OPSS 1359.

401.07 CONSTRUCTION

401.07.01 General

Trenches shall be stable and dry, unless designated as subaqueous Work.

401.07.02 Site Preparation

Site preparation shall be according to OPSS 490.

401.07.03 Preservation and Protection of Existing Facilities

Preservation and protection of existing facilities shall be according to OPSS 491.

401.07.04 Removals

Removals shall be according to OPSS 510.

401.07.05 Dewatering

Dewatering shall be according to OPSS 517 for placement of pipe or to OPSS 902 for placement of structure.

401.07.06 Support Systems

Support systems shall be according to OPSS 404.

401.07.07 Temporary Protection Systems

The construction of all temporary protection systems shall be according to OPSS 539. When the stability, safety, or function of an existing roadway, railway, other works, or proposed works may be impaired due to the method of operation, appropriate protection shall be provided. Protection may include sheathing, shoring, and the driving of piles, when necessary.

401.07.08 Removal of Frozen Ground

Written permission shall be obtained from the Contract Administrator prior to starting any excavation in frozen ground. The method used for removal of frozen ground shall not cause damage to adjacent structures or Utilities.

401.07.09 Trenching

Trenches shall be excavated to the lines, grades, and dimensions specified in the Contract Documents. The width of the trench at the bottom shall not exceed the width at the top.

Trenching for pipe culverts shall include the excavation for frost tapers and end sections.

No more than 15 m of trench shall be open in advance of the completed pipe system.

The Contract Administrator shall be notified immediately if the bottom of the trench appears to give an unsuitable foundation.

When installing rigid pipe, if the trench is excavated wider than the allowable width without authorization, the Contract Administrator may require the use of a stronger pipe or a higher class of bedding or both.

If the trench depth is excavated beyond the limits of the required excavation without the Contract Administrator's authorization, granular material shall be placed and compacted in the trench to reinstate the required trench limits prior to backfilling the trench as specified in the Contract Documents. Alternatively, another structurally accepted design shall be provided by adjusting the limits of the excavation prior to backfilling.

Rock excavation for trenches shall be according to OPSS 403.

401.07.10 Backfilling and Compacting

401.07.10.01 General

The diameter or the span and rise of flexible pipes shall not vary from the manufactured dimensions by more than 5% during cover and backfill placing operations.

Pipe installation and backfilling shall be completed prior to the start of subbase and base course construction over the pipe location.

Compacting of embedment, bedding, cover, and backfill materials during pipe installation shall be according to OPSS 501.

Prior to allowing the movement of any construction equipment or vehicular traffic over the buried infrastructure, the depth of backfill shall be sufficient enough to protect the buried infrastructure from damage.

401.07.10.02 Embedment

Placement of embedment material shall be as described in the Bedding and Cover clauses.

401.07.10.03 Bedding

Pipe bedding shall be of the class specified in the Contract Documents.

The surface upon which the pipe is to be laid shall be true to grade and alignment.

The pipe bedding shall be shaped to the dimensions specified in the Contract Documents. When bell and spigot pipe is to be laid, recesses shall be shaped to receive the bells.

Bedding material placed in the haunches shall be compacted prior to continued placement of cover material.

Bedding material shall be placed in uniform layers not exceeding 200 mm in thickness, loose measurement, and each layer shall be compacted according to OPSS 501 before a subsequent layer is placed.

Bedding material shall be placed on each side of the pipe and shall be completed simultaneously. At no time shall the levels on each side differ by more than the 200 mm uncompacted layer.

401.07.10.04 Cover

Cover material shall be placed so that damage to or movement of the pipe is avoided.

Cover material shall be placed in uniform layers not exceeding 200 mm in thickness, loose measurement, and each layer shall be compacted according to OPSS 501 before a subsequent layer is placed.

Cover material shall be placed on each side of the pipe and shall be completed simultaneously. At no time shall the levels on each side differ by more than the 200 mm uncompacted layer.

401.07.10.05 Backfill

Backfill material shall be placed in uniform layers not exceeding 300 mm in thickness, loose measurement, for the full width of the trench and each layer shall be compacted according to OPSS 501 before a subsequent layer is placed.

Backfill material shall be placed to a minimum depth of 900 mm above the crown of the pipe before power operated tractors or rolling equipment shall be used for compacting. Uniform layers of backfill material exceeding 300 mm in thickness may be placed with the approval of the Contract Administrator.

When the Contract specifies native backfill material, acceptable earth backfill material may be substituted with the approval of the Contract Administrator. In areas within the roadway, for a depth equal to the frost treatment, the earth backfill material shall have frost susceptible characteristics similar to the adjacent material.

401.07.11 Additional Trenching, Backfilling, and Compacting

Additional trenching, backfilling, and compacting shall be as described in the Trenching and Backfilling and Compacting subsections.

Unsuitable material shall be excavated and the resulting excavation shall be backfilled and compacted to obtain a suitable foundation.

401.07.12 Site Restoration

Site restoration shall be according to OPSS 492.

401.07.13 Management of Excess Material

Management of excess material shall be as specified in the Contract Documents.

401.09 MEASUREMENT FOR PAYMENT

401.09.01 Actual Measurement

401.09.01.01 Additional Trenching, Backfilling, and Compacting

Additional trenching, backfilling, and compacting shall be based on the volume of the additional excavation measured in cubic metres prior to installation of the pipe.

The volume of the excavation that is in addition to the limits specified in the Contract Documents shall be determined.

401.10 BASIS OF PAYMENT

401.10.01 Trenching, Backfilling, and Compacting

Payment at the Contract price for the appropriate tender items for the installation of sanitary and storm pipe sewers, pipe culverts and end sections, subdrains, forcemains and associated appurtenances, watermains and associated appurtenances, and other underground Utilities shall be full compensation for all labour, Equipment, and Material to do the work.

When the Contract contains separate items for work required by this specification, payment shall be at the Contract prices and according to the specifications for such work.

Any expenses for remedial work resulting from unauthorized over-excavation of the trench width and depth shall be borne by the Contractor.

When native material is deemed unsuitable for backfill for reasons other than those attributed to the Contractor's mode of operation, any additional work done to provide acceptable backfill beyond the work herein specified shall be paid for as Extra Work.

401.10.02 Additional Trenching, Backfilling, and Compacting - Item

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

401.10.03 Rock Excavation for Trenches

Payment for rock excavation for trenches shall be according to OPSS 403.

Appendix 401-A, November 2013
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 may consider including soil boring data, a geotechnical report, a subsurface report, or a soils report in the tender documents.

The designer may consider specifying requirements for a pre-condition survey in the Contract Documents.

The designer should specify the following in the Contract Documents:

- Type of embedment material. (401.05.01)

- Type of bedding material. (401.05.02)

- Type of cover material. (401.05.03)

- Type of backfill material. (401.05.05.01)

- Trench line, grade, and dimensions. (401.07.09)

- Pipe bedding class and dimensions. (401.07.10.03)

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

OPSD 802.010	Flexible Pipe Embedment and Backfill, Earth Excavation
OPSD 802.013	Flexible Pipe Embedment and Backfill, Rock Excavation
OPSD 802.014	Flexible Pipe Embedment in Embankment, Original Ground: Earth or Rock
OPSD 802.020	Flexible Pipe Arch Embedment and Backfill, Earth Excavation
OPSD 802.023	Flexible Pipe Arch Embedment and Backfill, Rock Excavation
OPSD 802.024	Flexible Pipe Arch Embedment in Embankment, Original Ground: Earth or Rock
OPSD 802.030	Rigid Pipe Bedding, Cover and Backfill, Type 1 or 2 Soil - Earth Excavation
OPSD 802.031	Rigid Pipe Bedding, Cover and Backfill, Type 3 Soil - Earth Excavation
OPSD 802.032	Rigid Pipe Bedding, Cover and Backfill, Type 4 Soil - Earth Excavation
OPSD 802.033	Rigid Pipe Bedding, Cover and Backfill, Rock Excavation
OPSD 802.034	Rigid Pipe Bedding and Cover in Embankment, Original Ground: Earth or Rock
OPSD 802.050	Horizontal Elliptical Rigid Pipe Bedding, Cover and Backfill, Type 1 or 2 Soil - Earth Excavation
OPSD 802.051	Horizontal Elliptical Rigid Pipe Bedding, Cover and Backfill, Type 3 Soil - Earth Excavation
OPSD 802.052	Horizontal Elliptical Rigid Pipe Bedding, Cover and Backfill, Type 4 Soil - Earth Excavation
OPSD 802.053	Horizontal Elliptical Rigid Pipe Bedding, Cover and Backfill, Rock Excavation
OPSD 802.054	Horizontal Elliptical Rigid Pipe Bedding and Cover in Embankment, Original Ground: Earth or Rock
OPSD 803.010	Backfill and Cover for Concrete Culverts
OPSD 803.030	Frost Treatment - Pipe Culverts, Frost Penetration Line Below Bedding Grade
OPSD 803.031	Frost Treatment - Pipe Culverts, Frost Penetration Line Between Top of Pipe and Bedding Grade