CONSTRUCTION SPECIFICATION FOR
EXCAVATING AND BACKFILLING - STRUCTURES

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902.01 SCOPE

This specification covers the requirements for excavating and backfilling for structures, including dewatering.

902.01.01 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.
902.01.02 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.

902.02 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 specifications, standards, or publications:

Ontario Provincial Standard Specifications, Construction

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902.03 DEFINITIONS

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

**Bedding** means granular material to be placed in areas so designated in the Contract Documents.

**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.

**Channel** means a natural or artificial watercourse.

**Culvert** means a structure that provides an opening through an embankment and to which roadway loads are distributed through fill or that is designated as a culvert in the Contract Documents.

**Designated Payment Surface** means the original ground surface shown in the Contract Documents, unless a specially designated payment surface is shown either by elevation or by profile. The specially designated payment surface is horizontal in the transverse direction.

For rock excavation the designated payment surface shall be the existing rock surface as established in the field before rock excavation begins, unless another designated payment surface is specified.

**Earth** means all soils except those defined as rock, and excludes stone masonry, concrete and other manufactured materials.

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

**Foundation** means that portion of the ground below the structure base or footings that supports the structure or that portion of the ground supporting the pile caps.

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

**Rock** means natural beds or massive fragments, of the hard, stable, cemented part of the earth's crust, igneous, metamorphic, or sedimentary in origin, which may or may not be weathered, and includes boulders having a volume of 1 cubic m or greater.

**Soil** means all loose or moderately cohesive organic or inorganic deposits of the earth's crust such as silt, sand, gravel, or clay or any of their mixtures.

**Structure** means any bridge, tunnel, concrete culvert, retaining wall, dock, guideway, or sign support.

902.04 DESIGN AND SUBMISSION REQUIREMENTS

902.04.01 Design Requirements

902.04.01.01 Dewatering

Where dewatering is required, the Contractor shall be responsible for the design of the dewatering scheme for the intended purpose.
902.04.02 Submission Requirements

902.04.02.01 Preconstruction Survey

Prior to commencing the work, a condition survey of property and structures that may be affected by the work shall be submitted to the Contract Administrator. The survey shall include the locations and conditions of adjacent properties; buildings; underground structures; Utility services; and structures, such as walls abutting the site.

902.04.02.02 Milestone Inspections

The Quality Verification Engineer shall witness the following Interim Inspections of the work:

a) Dewatering of excavation for structure.
b) Completion of excavation for foundation.
c) Excavation for backfill and frost tapers.
d) Backfilling.

A copy of the written permission to proceed shall be submitted to the Contract Administrator prior to commencement of the successive operation.

902.05 MATERIALS

902.05.01 Granular

Granular material to be used for backfill, bedding, and frost tapers shall be according to OPSS 1010.

The 19.0 mm clear stone to be used for wall drains shall be according to OPSS 1004.

902.05.02 Native Backfill

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.

902.05.03 Clay Seal

Clay seal shall be according to OPSS 1205.

902.05.04 Geotextile

Geotextile shall be according to OPSS 1860 and be of the type, class, and filtration opening size (FOS) range specified in the Contract Documents.

902.06 EQUIPMENT

902.06.01 Compaction Equipment

Compaction equipment shall be according to OPSS 501.
902.07  CONSTRUCTION

902.07.01  Removals

Removals shall be according to OPSS 510.

902.07.02  Removal of Ice and Snow

All ice and snow shall be removed from all portions of the work area before any excavation and backfill operations proceed. Frozen materials shall not be incorporated into the work. Material shall not be placed over frozen ground, ice, or snow.

902.07.03  Protection Systems

Protection systems shall be according to OPSS 539.

Protection systems shall be installed:

a) Where the stability, safety, or function of an existing structure, roadway, railway, or other facility can be impaired by an excavation or temporary slope.

b) To permit excavation where there is a necessity to retain the sidewalls of an excavation and to permit dewatering by restricting water flow and facilitating safe execution of the work.

902.07.04  Dewatering Structure Excavation

Until backfilling has been completed and to permit the placing of concrete in the dry, the Contractor shall carry out all work necessary to control the flow of water into the excavation and to prevent disturbance of the founding material.

Control of water shall be according to OPSS 518.

All temporary dewatering shall remain the property of the Contractor and shall be removed from the right-of-way when they are no longer required.

902.07.05  Excavation

902.07.05.01  General

Deterioration of the foundation soil or rock, surface water from entering and eroding the face of the excavation, and build up of hydrostatic pressures that may have harmful effects upon the temporary or permanent structures shall be prevented.

902.07.05.02  Excavation for Foundations

Excavation for footings, working slabs, and granular pads shall be to the neat lines specified in the Contract Documents.

The bottom of the excavation on which the footing, working slab, or granular pad is to rest shall not be disturbed. In soft conditions, construction of the footing or structural slab shall commence immediately after the final removal of material to the foundation level has been completed.

In the case of concrete culverts of the open footing type, no excavation shall be made between the footings below the level of the stream bed or the top of the footings, whichever elevation is lower, unless authorized in writing by the Contract Administrator.

The elevation of the bottom of the footing, working slab, or granular pad shall not be changed without the approval of the Contract Administrator.
Overexcavated areas shall be restored to their original conditions. Overexcavated areas shall be backfilled with a material suitable for the particular application and approved by the Contract Administrator. Concrete fill shall be used for overexcavation in rock. Where material other than concrete is used, the material shall be compacted to the dry density specified in OPSS 501.

When authorized by the Contract Administrator, additional excavation, as may be required, shall be carried out.

**902.07.05.03 Excavation for Backfill and Frost Tapers**

Excavation for backfill and frost tapers shall be to the neat lines specified in the Contract Documents.

Overexcavated areas shall be restored with material approved by the Contract Administrator. The material shall be compacted to the dry density specified in OPSS 501.

**902.07.05.04 Preservation of Channel**

Where a channel cross-section is altered, it shall be restored to its original condition.

**902.07.06 Backfilling**

**902.07.06.01 General**

Frozen materials shall not be incorporated into the work.

Footings shall be protected against frost action.

Other than the backfill placed to the tops of the footings, no fill shall be placed against an abutment, wingwall, retaining wall, or concrete culvert until the concrete has reached 70% of its design strength.

Backfilling around culverts, arches, rigid frames, and piers shall proceed simultaneously and evenly on both sides of the structure. The differential in surface elevation of the backfill material on each side of the structure and individual component shall not be greater than 500 mm.

All voids around abutments, piers, or other permanent work shall be backfilled to the level of the surrounding ground or to the grade specified in the Contract Documents, whichever is the lower before the general backfilling commences.

When rock fill is to be placed around a structure the structure shall be protected to prevent damage from the rock fill.

The minimum height of fill specified in the Contract Documents shall be placed before traffic or construction equipment shall pass over the culvert.

Granular material shall be placed within the lines and grades specified in the Contract Documents.

Wall drains shall have a 0.05 m³ pocket of 19 mm minimum size clear stone wrapped in geotextile placed over the opening of the wall drain at the backfilled side of the wall.

**902.07.06.02 Compaction**

Backfill shall be placed according to OPSS 206 and compacted according to OPSS 501.

Only hand operated vibratory type compaction equipment shall be used for compaction of fill material within the restricted zone behind all earth retaining structures.
902.07.07 Clay Seal

When specified in the Contract Documents, clay seals shall be placed to the dimensions shown.

902.07.08 Certificate of Conformance

A completed Certificate of Conformance shall be submitted to the Contract Administrator upon completion of the work. The Qualification Verification Engineer's seal and signature shall be affixed on the completed Certificate of Conformance confirming that the work has been carried out in general conformance with the Contract Documents.

902.07.09 Management of Excess Material

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

902.09 MEASUREMENT FOR PAYMENT

902.09.01 Actual Measurement

902.09.01.01 Excavation for Structure

Measurement of earth or rock excavation for structure shall be by volume in cubic metres.

Measurement of excavation for footings shall be based on the neat horizontal dimensions of the footing to the depth of the bottom of the footing, working slab, or granular pad.

Except as noted below, the quantity of excavation shall include only the quantities below the designated payment surface within the neat lines specified in the Contract Documents.

The above measurement also includes:

a) Removal of asphalt pavement, except where there is a separate tender item for pavement removal that includes pavement overlapping the area of structure excavation.

b) The excavation quantities, below the designated payment surface, required for placing granular backfill and granular frost tapers.

c) For open footing culverts, the excavation quantities as measured below the designated payment surface but between the plan areas of the footings and above the stream bed or the tops of the footings, whichever is higher.

Where the structure excavation overlaps excavation required for other work, the measurement shall be made as specified in the Contract Documents with no deductions for overlap.

The volume of boulders in an excavation shall be calculated from the three maximum rectilinear dimensions. The following provisions shall apply:

a) Only the amount removed shall be considered for payment.

b) The volume of the boulders removed shall be deducted from the volume of excavation as calculated above.

The measurement of the total volume of materials considered for payment shall not exceed the calculated volume of excavation within the theoretical lines.
Measurement for payment of granular backfill shall be by volume in cubic metres or tonnes as specified in the Contract Documents.

The quantity of granular backfill and granular bedding shall include only those quantities measured below the subgrade and as measured within the theoretical line and grades specified in the Contract Documents.

Where the Contractor has excavated beyond the limits specified in the Contract Documents, the conversion factor of 2 t/m$^3$ shall be used in measurement of the excess volume when it is replaced with granular on a tonne basis.

The weighing of granular material supplied on a tonnage basis shall be according to the Contract Documents.

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

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

When the Contract Administrator requests excavation for concrete working slabs, granular working pads, or granular bedding, payment shall be at the Contract price for the type of excavation required.

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

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

When the Contract Documents do not include a separate item for granular backfill to structure, the Contract price for the items directly associated with the granular backfill to structure shall be full compensation for all labour, Equipment, and Material required to do the work.

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

Payment shall not be made for overexcavation that has not been approved by the Contract Administrator or for backfill restoration of such overexcavation.
Appendix 902-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:

- Geotextile requirements. (902.05.04)
- Neat lines of excavations for footings, working slabs, and granular pads. (902.07.05.02)
- Neat lines of excavation for backfill and frost tapers. (902.07.05.03)
- Grade of backfill around abutments, piers, and other permanent work. (902.06.01)
- Lines and grades for granular materials. (902.06.01)
- Measurement units for granular material. (902.09.01.02)

The designer should determine if the following is required and, if so, it should be specified in the Contract Documents:

- Clay seals and dimensions for clay seals. (902.07.07)

OPSS 902 contains information written for provincial contracts. To ensure completeness of municipal Contract Documents, the designer should invoke Appendix 902-B. The appendix contains supplemental requirements that modify OPSS 902 so it can be used by a municipality in its contracts.

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

Related Ontario Provincial Standard Drawings

OPSD 3090.100 Foundation, Frost Penetration Depths for Northern Ontario
OPSD 3090.101 Foundation, Frost Penetration Depths for Southern Ontario
OPSD 3101.150 Walls, Abutment, Backfill, Minimum Granular Requirement
OPSD 3101.200 Walls, Abutment, Backfill, Rock
OPSD 3102.100 Walls, Abutment, Backfill Drain
OPSD 3120.100 Walls, Retaining, Concrete Toe Wall
OPSD 3121.150 Walls, Retaining, Backfill, Minimum Granular Requirement
OPSD 3190.100 Walls, Retaining and Abutment, Wall Drain
Appendix 902-B, November 2010
FOR USE IN MUNICIPAL CONTRACTS, WHEN REFERENCED IN THE CONTRACT DOCUMENTS

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

Supplemental Requirements for Using OPSS 902 in Municipal Contracts

OPSS 902 Excavation and Backfilling - Structures, is amended as follows:

902.03 Definitions

Section 902.03 is amended by the deletion of the definitions for Certificate of Conformance and for Quality Verification Engineer.

902.04.02.02 Milestone Inspections

Clause 902.04.02.02 is deleted in its entirety and replaced with the following:

The Contract Administrator shall witness the following interim inspections of the work:

a) Dewatering of excavation for structure.

b) Completion of excavation for foundation.

c) Excavation for backfill and frost tapers.

d) Backfilling.

The next operation shall not proceed until the Contract Administrator has examined the excavation and given approval in writing to perform subsequent work.

902.07.04 Dewatering Structure Excavation

The third paragraph of clause 902.07.04 is deleted in its entirety and replaced with the following:

After the dewatering, the excavation shall be inspected and accepted by the Contract Administrator prior to construction of the footing. The Contractor shall not proceed with subsequent work until the Contract Administrator has given permission in writing.

902.07.08 Certificate of Conformance

Subsection 902.07.08 is deleted in its entirety.