MATERIAL SPECIFICATION FOR UNSHRINKABLE BACKFILL

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1359.01 SCOPE

This specification covers the requirements for treated aggregate known as unshrinkable backfill, in underground service and Utility trenches, and around in-ground structures.

1359.01.01 Significance and Use of Appendices

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

Appendix 1359-A is a commentary appendix to provide designers with information on the use of the specification in a Contract.
1359.02 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 1350 Concrete - Materials and Production

**Canadian Standards Association**
- A23.2-3C Making and Curing Concrete Compression and Flexural Test Specimens [Part of CAN/CSA A23.1/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete]
- A23.2-9C Compressive Strength of Cylindrical Concrete Specimens [Part of CAN/CSA A23.1/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete]
- A3001-03 Cementitious Materials for Use in Concrete [Part of CAN/CSA A3000-03 Cementitious Materials Compendium]

1359.03 DEFINITIONS

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

**Unshrinkable Backfill** means a self-compacting cement treated aggregate with flowable consistency and controlled low strength properties.

1359.04 SUBMISSION AND DESIGN REQUIREMENTS

1359.04.01 Submission Requirements

The Contractor shall be responsible for designing the unshrinkable backfill mix and shall submit the unshrinkable backfill mix design data using the Concrete Mix Design Submission forms specified in the Contract Documents.

The mix design submission shall be accompanied by data on 28-Day compressive strengths of the backfill.

1359.05 MATERIALS

1359.05.01 Cementing Materials

Cementing materials shall be according to OPSS 1301.

1359.05.02 Water

Water shall be according to OPSS 1302.
1359.06.03  Aggregates

Aggregates shall be according to OPSS 1002 and shall have a maximum aggregate size of 25 mm. Slag aggregate shall not be used.

1359.06.04  Mix Requirements

Mix requirements shall be according to the following:

a) The unshrinkable backfill shall contain 25 kg/m³ of Type II Portland cement according to CAN/CSA A3001 and may contain additional supplementary cementing materials.

b) Slump at point of discharge shall be a minimum of 150 mm and the unshrinkable backfill shall be uniformly mixed throughout.

c) The material shall be designed such that it can flow into the excavation and fill the entire space without vibration and segregation.

d) The 28-Day compressive strength shall be a maximum of 0.70 MPa.

e) The mixture may contain foaming agents.

1359.06.05  Unshrinkable Backfill Material Placement Requirements

The material shall be placed into the excavation so that it fills the entire space without voids being created beneath horizontal projections or in other locations within the excavation.

The unshrinkable backfill material shall be completely placed within a period of 2 hours from the time of the batching.

The unshrinkable backfill material shall be protected from cold weather according to OPSS 350.

When shoring, bracing, or sheeting is to be removed, the support system shall be removed prior to or during the backfilling operation.

When placed behind abutment as backfill, layers of unshrinkable backfill material shall be placed alternately at each abutment. The layers shall not exceed 400 mm and the height of the layers shall be approximately the same. At no time shall the difference in elevation be greater than 400 mm. Each layer shall be allowed to set for a period of minimum of 4 hours before a new layer is placed.

Where vehicular traffic, including construction equipment, needs to be accommodated, the unshrinkable backfill shall be protected by covering it with a steel plate suitable for the traffic loading for a minimum of 24 hours.

1359.06  EQUIPMENT

1359.06.01  Mixing Equipment

A central mixing or dry batch plant capable of accurately proportioning aggregate, cement, and water shall be used, according to OPSS 1350.

1359.06.02  Transport Equipment

Unshrinkable backfill shall be transported to the site by means of ready mix trucks.
1359.08 QUALITY ASSURANCE

1359.08.01 Testing Requirements

Compressive strength testing shall be according to CSA-A23.2-3C and CSA-A23.2-9C and with the following requirements:

a) Only cardboard moulds shall be used to cast the test cylinders. A disc of wax paper matching the inside diameter of the cylinder mould shall be placed at the base of the cylinder mould prior to casting. The interior sidewalls of the cardboard mould shall be treated with a light coating of release agent to assist in the demoulding operation.

b) The cylinders shall only be demoulded on the same day of testing for compressive strength.

c) The load indicating mechanism of the compression testing machine shall be capable of showing load changes of 100 newtons or less. The loading rate shall be 0.11 MPa/s or lower.

d) The minimum test requirement shall be one set of two test cylinders, per supplier, per day.

1359.08.02 Acceptance

Unshrinkable backfill shall be accepted when

a) the material does not deform under traffic loading, and

b) the compressive strength requirements are met.
Appendix 1359-A, Commentary for OPSS 1359, November 2006

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:

- Concrete Mix Design Submission forms to be used. (1359.04.01)

For shallow applications within the depth of frost penetration, differential frost heaving may occur.

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 509.010  Pavilion Reinstatement for Utility Cuts