

**AMENDMENTS TO OPSS.MUNI 1350 (NOV 08) – MATERIAL SPECIFICATION FOR
CONCRETE – MATERIALS AND PRODUCTION**

This amendment provides the following extra information to supplement the OPSS.MUNI 1350 (Nov 08) – Material Specification for Concrete – Materials and Production. The contents of OPSS.MUNI 1350 (Nov 08) are amended by the addition of the following.

OPSS.MUNI 1350.01 is amended by the addition of the following:

TS 1350.01 **SCOPE**

In addition to OPSS.MUNI 1350 (Nov 08), this Specification also covers the requirements for material acceptance of concrete material for the construction of road base, curb and gutter, sidewalk, streetcar track and all other non-structural concrete items.

This specification shall be read in conjunction with OPSS.MUNI 1350 (Nov 08). OPSS.MUNI 1350 (Nov 08) shall form a normative part of this specification as a completed document. All requirements of OPSS.MUNI 1350 (Nov 08) Appendix 1350-A shall apply in this specification.

OPSS.MUNI 1350.02 is amended by the addition of the following:

TS 1350.02 **REFERENCES**

Ontario Provincial Standards (OPS)

OPSS 1306 – Burlap
OPSS 1315 – White Pigmented Curing Compounds
OPSS 1440 – Steel Reinforcement for Concrete

Canadian Standards Association (CSA)

G30.3 – Cold Drawn Steel Wire for Concrete Reinforcement
G30.5 – Welded Steel Wire Fabric for Concrete Reinforcement
G30.18 – Billet Steel Bars for Concrete Reinforcement
G40.21 – Structural Quality Steels

American Society for Testing and Materials (ASTM)

C 109 – Standard Test Method for Compressive Strength of Hydraulic Cement Mortars
C 171 – Sheet Materials for Curing Concrete
C 174 – Measuring Length of Drilled Concrete Cores
C 309 – Liquid Membrane-Forming Compounds for Curing Concrete
C 666 – Resistance of Concrete to Rapid Freezing and Thawing
D 1751 – Expansion Joint Filler for Concrete Paving and Structural Construction

City of Toronto Standard Specifications (TS)

- TS 3.40 – Construction Specification for Concrete Road Base
- TS 3.50 – Construction Specification for Concrete Curb and Concrete Curb and Gutter
- TS 3.65 – Construction Specification for Concrete Crosswalk
- TS 3.70 – Construction Specification for Concrete Sidewalk and Concrete Raised Median
- TS 3.75 – Construction Specification for Streetcar Track Pavement and Foundation Slab
- TS 904 – Amendments to OPSS 904 – Construction Specification for Structural Concrete
- TS 905 – Amendments to OPSS 905 – Construction Specification for Steel Reinforcement for Concrete Structures
- TS 1860 – Amendments to OPSS 1860 – Material Specification for Geotextiles

Transportation Research Board

NCHRP Report 244 – Concrete Sealers for Protection of Bridge Structures

OPSS.MUNI 1350.03 is amended by the addition of the following:

TS 1350.03 **DEFINITIONS**

Admixtures: means ingredients in concrete other than Portland cement, water and aggregates that are added to the concrete mixture before or during mixing.

Alkali-Aggregate Reactivity: means a chemical reaction between the cementing material and certain minerals in the aggregates which cause expansive cracking in the hardened concrete.

Cold Weather: means those conditions when the air temperature is at or below 5°C. It is also considered to exist when the air temperature is at or is likely to fall below 5°C within 96 hours after concrete placement. Temperature refers to shade temperature.

Crushed Material: means aggregate particles having at least one well-defined face resulting from fracture. Particles with smooth faces and rounded edges or with only small chips removed are not considered crushed.

Epoxy: means a multi-component resin grout.

Falsework: means a temporary structure erected to support work in the process of construction - composed of shoring or vertical posting, formwork for beams and slabs, and lateral bracing.

Form A: means a complete City of Toronto concrete mix design submission form for performance specification alternative. OPSS.MUNI 1350 (Nov 08) OPSF 1350-1 is replaced by Form A.

Form B: means a complete City of Toronto concrete mix design submission form to be submitted by the concrete supplier after executing a confidentially agreement. OPSS.MUNI 1350 (Nov 08) OPSF 1350-2 is replaced by Form B.

Formwork: means a total system of support for freshly placed concrete including moulds or sheathing as well as all supporting membranes, hardware and bracing.

Grout: means a mixture of cementing materials, with or without admixtures, and water. The consistency varies from stiff to fluid.

Mortar: means a mixture of cementing materials, sand and water, with a butter-like consistency.

Non-Structural Concrete: means concrete used for the construction of catch basins, maintenance holes, valve chambers, pipe support, road base, curb and gutter, crosswalk, sidewalk, streetcar track and all other concrete that does not classify as structural concrete.

Slurry: means a pourable mixture of cementing materials, sand and water.

Superplastized (Flowing) Concrete: means normal slump concrete to which a high-range water reducing admixture has been added to produce a high-slump flowing concrete.

Structural Concrete: means any concrete used in the construction of bridges, culverts, tunnels, retaining walls, wharfs or guideways.

OPSS.MUNI 1350.04.01 is amended by the addition of the following:

TS 1350.04.01 **Submission Requirements**

Concrete mix design shall be one of the following alternatives chosen by the City:

- 1) Performance specification alternative
- 2) Prescriptive specification alternative

The Contractor shall submit a mix design for each type of concrete specified in the contract. A complete mix design should consist of the following:

- 1) Either a completed City of Toronto concrete mix design submission Form A; or
- 2) A completed City of Toronto Concrete mix design submission Form B; and
- 3) Supporting documentation including all material quality test data for the mix design and component materials required by the contract.

Concrete mix design submission Forms A or B shall identify all materials to be used in the concrete. No material shall be used in the concrete without the knowledge of the City.

Under the performance specification alternative, the Contractor shall provide a complete mix design submission on Form A to the City, for each specific concrete mix.

At the sole discretion of the City, the City of Toronto and the concrete supplier may enter to execute a confidentiality agreement to cover the protection of proprietary mix proportion information which is to be released as part of the mix design submission process on Form B.

OPSS.MUNI 1350.04.01.01.01 is amended by the addition of the following:

TS 1350.04.01.01.01 **Performance Based Concrete Mix Data**

Form A

Form A shall be completed by the concrete supplier based on the requirements of the contract. The Contractor shall confirm with the concrete supplier and the City the performance characteristics of the concrete through the submission of Form A for each type of concrete as specified in the contract. The form shall be signed by the Contractor to certify that performance characteristics of the concrete have met their respective requirements under the contract.

The performance based mix design as detailed in Form A will be checked by the Contract Administrator to verify that the materials and sources are in compliance with the contract requirements. Concrete placement cannot proceed until the Contract Administrator has verified that the form meets the project requirements. The form shall then form the basis of the detailed mix design.

The Contractor shall provide the following to the City on Submission of Form A:

- 1) Concrete exposure requirements as per CSA A23.1, Table 2.
- 2) Primary and secondary back-up concrete plant(s) supplying concrete.
- 3) Specified strength of concrete (24-hour, 7-day, 28-day, or other specified ages).
- 4) Identification of all materials to be used in the concrete.
- 5) Concrete supplier and sources of all materials to be used.
- 6) Intended use and location of the concrete on the contract.
- 7) Target air content of the mix and slump range for quality control purposes.
- 8) Nominal maximum size of coarse aggregate and fine aggregate, and inventory numbers for the aggregates.
- 9) Unique mix design code for each mix.
- 10) Declarations from the concrete supplier that the concrete they supply will meet all concrete requirements as stated in the contract document.
- 11) The percentage of all supplementary cementing materials meet the contract requirements.
- 12) The dosage ranges of all chemical admixtures meet the requirements shown in TS 1350.05.01
- 13) Form A shall be accompanied by material quality test data of all materials used in the mix design.

Form B

Upon the execution of a confidentiality agreement between the City of Toronto and the concrete supplier to cover the protection of proprietary mix proportion information which is to be released as part of the mix design submission process, the concrete supplier shall forward a completed Form B to the City.

The detailed mix design in Form B shall, in addition to material source information, contain the material quantities for cement, supplementary cementing materials, water and admixtures ranges, consistent with the specified Designated Sources for Materials List, and the requirements shown in TS 1350.05.01.

The concrete supplier shall provide the following to the City on Submission of Form B:

- 1) The information provided on Form A.
- 2) Quantity of cement and supplementary cementing materials to be used in the mix.
- 3) Dosage range of chemical admixtures to be used in the mix shall meet the requirements given in TS 1350.05.01.
- 4) Quantity range of water to be used in the mix (total water).

Form B shall be signed by the concrete supplier to certify that performance characteristics of the concrete meet their respective requirements under the contract.

Form B shall be checked by the City to verify that the materials and sources are in compliance with the contract requirements. Concrete placement cannot proceed until the City has verified that the form meets the contract requirements.

OPSS.MUNI 1350.04.02 is amended by the addition of the following:

TS 1350.04.02 Design Requirements

A complete mix design submission shall be provided for concrete of each specified compressive strength as per CSA A23.1. A separate mix design submission is also required within each strength level, for:

- 1) Mixes where material proportions vary outside the tolerance identified below in this clause.
- 2) Cast-in-place and slip-formed concrete.
- 3) Mixes with different sources of materials.
- 4) Mixes with different admixtures.
- 5) Special purpose or unique mixes.

Submission of separate mix designs and separate supporting documentation is not required if concrete with the same mix design is to be supplied by multiple plants with the same sources of materials in the same proportions, however it must be supported in writing prior to use.

A new, complete mix design submission shall be provided prior to:

- 1) Changing sources of materials used in the concrete.
- 2) Substituting a material or product for another from the same source.
- 3) Adding a material to the concrete that was not on the original mix design (except retarder).
- 4) Adjusting the quantities of the stated materials in the concrete, outside of the following tolerances stated on Form B:
 - a. Cement: +/- 5% of quantity.
 - b. Supplementary cementing materials: 95% to 100% of quantity.
 - c. Admixtures: Dosage or range of dosage.
 - d. Water: Range.

Material quantities may be varied within the tolerances identified above, without submission of a new mix design.

Removal of a material from the mix requires submission of a new mix design, but does not require submission of supporting test data.

The submission process for new or modified mix designs is the same as for the original mix design.

OPSS.MUNI 1350.05 is amended by the addition of the following:

TS 1350.05 MATERIALS

As required by the City, concrete materials submission shall provide at least the following information:

- 1) The source of each material to be incorporated in the concrete and the name of the concrete supplier.
- 2) Certification that all materials to be incorporated into the concrete mix are compatible in the mix and meet or exceed the requirements given in TS 1350.05.01 of this specification.
- 3) The proportions of materials for each class of concrete to be incorporated into the work as per the confidentiality agreement in a confidential manner by the City of Toronto.
- 4) The results of slump, total air content and compressive strength testing at 7-day, 28-day, and other ages if required in the contract, for each class of concrete supplied.
- 5) If blended hydraulic cements or supplementary cementing materials are proposed, the City may request for documentation demonstrating satisfactory performance of similar concrete mixes incorporating the proposed cementing materials and proportions used in similar applications (e.g. bridge deck, sidewalk, etc.), and the current condition. The satisfactory performance may be shown through the documented visual assessment of at least 5 projects, each at least 3 years old, for each mix incorporating blended hydraulic cement or supplementary cementing materials.
- 6) If supplementary cementing materials are to be incorporated into the concrete mix, the City may request certification and documentation, stating that the quality and durability of the concrete with supplementary cementing materials will equal or exceed the quality and durability of the concrete without supplementary cementing materials. Specific documentation relating to de-icer chemical scaling resistance and rate of strength gain, if required, shall also be submitted.
- 7) At the request of the City or as specified in the contract, the results of testing of the quality of the air voids system of the hardened concrete mix(es) shall be incorporated into the work, as determined by ASTM C 457, documenting conformance to CSA A23.1, clause 4.3.3.

OPSS.MUNI 1350.05.01 is amended by the addition of the following:

TS 1350.05.01 Materials for Concrete

Specification	TS 3.40 TS 3.45	TS 3.50	TS 3.70	TS 3.75
Concrete for	Road Base	Curb & Gutter	Sidewalk & Median	Streetcar Track
Cement type	Normal Portland GU	Normal Portland GU	Normal Portland GU	Normal Portland GU
Min. 28 day compressive strength	32 MPa	32 MPa	32 MPa	32 Mpa
Class of exposure	C-2	C-2	C-2	C-2
Max. size of aggregate	37.5 mm or 19 mm	19 mm	19 mm	19 mm
Slump at plant				Max. 50 mm
Slump at discharge no plasticizer	80±30 mm	80±30 mm	80±30 mm	Max. 20 mm
Slump at discharge with plasticizer				150±30 mm
Air content for Max. size of aggregate	5.5±1.5% (37.5 mm) 6.5±1.5 % (19 mm)	6.5±1.5%	6.5±1.5%	6.5±1.5 %
Water/cement ratio	Max. 0.45	Max. 0.45	Max. 0.45	Max. 0.45
Lot size	Per day or as specified	Per day or as specified	Per day or as specified	Per day or as specified

Unless otherwise specified in the contract, the Contractor shall supply all materials necessary for the execution and completion of the work.

OPSS.MUNI 1350.05.01.01 is amended by the addition of the following:

TS 1350.05.01.01 Cementing Materials

Unless otherwise specified, all cement shall be normal Portland Cement (GU) according to CSA A3000 or high-early-strength Portland cement (HE) meeting the requirements of CSA A3001.

High-early-strength Portland Cement (HE) may be used only with the prior approval of the City.

Portland Cement (GU) may not be used as a means of obtaining high early strength in the concrete unless prior approval has been obtained from the City.

Blended hydraulic cements shall meet the requirements of CSA A3001. Blended hydraulic cements may be used only with the prior approval of the City.

Unless otherwise specified in the contract, supplementary cementing materials (fly ash, silica fume and/or slag cement) may be used by meeting the requirements of this specification.

The supplementary cementing materials shall be restricted to the following proportions by mass of the total cementing materials:

- 1) Slag cement (ground granulated blast furnace slag) up to 25 percent.
- 2) Fly ash up to 10 percent.
- 3) Silica fume up to 10 percent.
- 4) A mixture of slag cement and fly ash up to 25 percent except that the amount of fly ash shall not exceed 10 percent by mass of the total cementing materials

Except when the Portland Cement and supplementary cementing materials are supplied blended, the supplementary cementing material shall be weighed separately from the Portland Cement. In the concrete materials weighing process the Portland Cement shall be weighed prior to the supplementary cementing material. Supplementary cementing materials may be weighed on the same scale with the Portland Cement.

OPSS.MUNI 1350.05.01.02 is amended by the deletion of the following:

TS 1350.05.01.02 Aggregates

The second paragraph is deleted.

OPSS.MUNI 1350.05.02.04 is amended by the addition of the following:

TS 1350.05.02.04 Air Content

Air content on the job site shall be controlled as per CSA A23.1, clause 5.2.4.3.4.

OPSS.MUNI 1350.05.02.05 is amended by the addition of the following:

TS 1350.05.02.05 **Slump or Slump Flow**

Under the performance specification alternative, addition of water on the job site as per CSA A23.1, clause 5.2.4.3.2 is at the discretion of the Contractor.

Under the prescriptive specification alternative, addition of water on the job site as per CSA A23.1, clause 5.2.4.3.2 is at the discretion of the City.

OPSS.MUNI 1350.05 is amended by the addition of the following new section:

TS 1350.05.03 **Other Materials**

TS 1350.05.03.01 **Steel Reinforcement for Concrete**

Steel Reinforcement for Concrete shall be according to OPSS 1440.

Submissions required by the City from the Contractor shall provide at least the following information:

- 1) The source of all reinforcing steel products, name of the reinforcing steel fabricator.
- 2) Three copies of the mill certificate and three copies of the stress-strain curves representative of each lot of material to be used for reinforcing steel.

TS 1350.05.03.02 **Curing Media**

Submissions required by the City from the Contractor shall provide at least the following information:

- 1) Curing plan requirements.
- 2) Allowable curing regimes as per CSA A23.1, Table 20.
- 3) Three copies of the manufacturer's product installation and certification data.

All exposed concrete surfaces shall have the curing process commence as soon as possible and not more than 30 minutes after surface finishing or within one hour of form removal. Acceptable methods of curing include one or more of the following:

- 1) Burlap cloth shall be made from jute or kenaf, and shall meet the requirements of OPSS 1306.
- 2) Geotextile fabric shall be a synthetic, permeable textile meeting the requirements of TS 1860. A minimum thickness of 0.9 mm is required Geotextile fabric and water.
- 3) White opaque polyethylene film shall meet the requirements of ASTM C 171. A minimum thickness of 6 mils is required.
- 4) White pigmented curing compound shall meet the requirements of ASTM C 309 and OPSS 1315.

Each curing method may be used at ambient temperatures up to 28°C. At temperatures above 28°C, only the geotextile fabric and water procedure is recommended. At temperature below 5°C, curing compound is not recommended.

Concrete shall not be placed if rain is sufficiently intense to separate cement (paste) from the surface of the concrete mix or to hinder finishing operations. The surface of the concrete shall not be finished when water is present on the surface. Concrete already placed shall be protected against the effects of rain until the concrete has sufficiently hardened to resist damage.

The section of newly constructed concrete shall be closed to all vehicular traffic, including construction equipment, until such time as the concrete has attained at least 75 percent of the design compressive strength. Pedestrian traffic shall be kept off the newly constructed concrete for at least 8 hours. The Contractor shall provide adequate measures to protect the newly constructed concrete section from damage by vehicular or pedestrian traffic.

TS 1350.05.03.03 Joint Filler

Unless otherwise specified or shown on the standard drawings, Expansion Joint Filler material shall conform to ASTM D 1751.

Submissions required by the City from the Contractor shall provide at least the following information:

- 1) The source of the expansion filler material.
- 2) Three copies of the manufacturer's product installation and certification data.

TS 1350.05.03.04 Concrete Sealer

Unless otherwise specified, the sealer shall be a two-coat colourless solution of methyl methacrylate copolymer resins, a penetrating agent and fast evaporating solvent with a minimum solids content of 20 percent and containing no fillers. Application rates and solids content shall be in accordance with certified test results on the NCHRP 244 test series to be submitted prior to construction for approval. Acceptable materials shall meet the following NCHRP 244 performance criteria:

- 1) Four Inch Cube Tests: 75 percent effective in reducing water absorption when compared to an untreated control sample.
- 2) Southern Exposure Tests: 90 percent effective in reducing chloride ion content when compared to an untreated control sample.

Submissions required by the City from the Contractor shall provide at least the following information:

- 1) The source of the expansion concrete sealer.
- 2) Three copies of the manufacturer's product installation and certification data.
- 3) Certification that the sealer meets or exceeds the requirements of NCHRP 244.

OPSS.MUNI 1350.07.02 is amended by the addition of the following:

TS 1350.07.02 Temperature Control

When the air temperature is below 5°C or likely to fall below this limit, or when the air temperature is at or above 28°C or is likely to rise above this limit during concrete placing, the Contractor shall comply with the requirements of TS 904.

OPSS.MUNI 1350.08.02.01 is amended by the addition of the following:

TS 1350.08.02.01 General

Concrete compressive strength and proper curing, as specified in this specification, shall be the criteria for acceptance of non-structural concrete.

As requested by the City, the Contractor shall submit to the owner prior to the start of the project verification that the foreman, lead hand or the supervisor of the placing crew has ACI Flatwork Certification or equivalent.

OPSS.MUNI 1350.08.02.01.02 is amended by the addition of the following:

TS 1350.08.02.01.02 Quality Assurance Test Reporting

The concrete mix shall be sampled in accordance with CSA A23.2–1C; the slump of the concrete shall be tested in accordance with CSA A23.2–5C; the air content of the concrete shall be tested in accordance with CSA A23.2–4C; and the temperature of the concrete shall be tested in accordance with ASTM C 1064. The slump, air content and temperature of the concrete shall be tested each time a concrete is sampled for compressive strength test.

Concrete test reports shall be distributed immediately to the Owner, Contractor and concrete supplier by electronic files when available.

OPSS.MUNI 1350.08.02.04.01 is amended by the addition of the following:

TS 1350.08.02.04.01 Compressive Strength

The compressive strength requirements for standard-cured cylinders shall follow CSA A23.1 clause 4.4.6.7.1. The strength determination of test result shall follow CSA A23.1 clause 4.4.6.4.1.

OPSS.MUNI 1350.08 is amended by the addition of the following new sections:

TS 1350.08.03 Field Sampling and Testing of Concrete

Concrete field sampling and testing of slump, air content and temperature of plastic concrete shall be obtained directly from the load of concrete and tested in accordance with CSA A23.2.

TS 1350.08.03.01 Frequency of Field Sampling and Testing

Unless otherwise specified in the contract, the concrete supplied shall be sampled for acceptance tests in accordance with the following table. Field testing on air, slump and temperature shall also be done whenever compressive cylinders are cast.

Concrete for	Quantity (m ³)	28-Day Cylinder	Field Testing
Abutments, catchbasins and maintenance holes, columns, culverts, slabs, footings, foundations, piers, walls, curb and gutter, sidewalk, and fixed forms.	< 100 100 - 500 > 500	3 sets /day 2 sets/100m ³ 1 set/100m ³	One test for each load of concrete until satisfactory control is established; then 1 test for each 5 loads of concrete.
Decks	< 100 100 - 500 > 500	3 sets /day 2 sets/100m ³ 1 set/100m ³	One test for each load of concrete until satisfactory control is established; then 1 test for each 3 loads of concrete.
Decks Overlays		3 sets/day	One test for each load of concrete
Non-structural volume batching		1 set /load	One test for each load of concrete

OPSS.MUNI 1350.09 is amended by the addition of the following new sections:

TS 1350.09 ACCEPTANCE

TS 1350.09.01 Visibly Defective or Damaged Acceptance

Concrete that is visibly defective or damaged is not acceptable and shall be removed and replaced as directed by the City at the Contractor's expense.

Concrete is visibly defective or damaged when:

- 1) The concrete is honeycombed.
- 2) The concrete contains embedded debris.
- 3) The concrete has been damaged by freezing.
- 4) The concrete temperature at the time of placement exceeded the requirements of this Specification.
- 5) The concrete surface has been damaged by rain.
- 6) The concrete contains footprints or other undesirable impressions.
- 7) The concrete has been subjected to traffic before the concrete achieved 75 percent of the specified 28 day compressive strength.
- 8) The concrete has cracked or separated.
- 9) The concrete surface has spalled as defined in the General Condition that the Contract Administrator will be the sole judge to the determination.
- 10) Expansion and isolation joints are not vertical.
- 11) The concrete sections have heaved or sunk, from their original position.

TS 1350.09.02 Compressive Strength Acceptance

Acceptance of concrete strength for a lot shall be based on the compressive strength test results of all sublots contained in the lot. The compressive strength test result of a subplot will be the average of the two cylinders made for the subplot rounded to one decimal place.

CONCRETE MIX DESIGN SUBMISSION (FORM A)

Project: _____ Date: _____

Contract No.: _____ Contractor: _____

Location: _____ Concrete Supplier: _____

Primary Plant Back-up Plant

Name & Address : _____ Name & Address: _____

	Mix Code			
	Application / Element / Location			
SPECIFICATIONS	Structural Requirements			
	- CSA Exposure Class			
	- Maximum W/CM Ratio			
	- Minimum Specified Strength, Mpa @ Days			
	- Nominal Maximum Aggregate Size, mm			
	- HVSCM Type 1 or 2			
	- Maximum Slag Replacement, %			
	- Maximum Fly Ash Replacement, %			
	- Plastic Air Content, %			
	- Slump Range, mm			
	Durability Requirements			
	- Exposure to Sulphate Attack			
- Alkali Aggregate Reactivity				
Architectural Requirements				
- Colour / Texture				
- Other				
CONTRACTOR REQUIREMENTS	Rate (m³/h)			
	Quantity (m³)			
	Slump Range (mm)			
	Strength @ Age (MPa)			
	Other			
	Specialty Information			
	- Concrete Set (Delay, Normal, Accelerated)			
Method of Placement				
MATERIALS SECTION	Material	Quantity	Type / Name & Source	Inventory No.
	Cement (kg/m ³)	-----		-----
	SCM - Slag (kg/m ³)	-----		-----
	SCM - Fly Ash (kg/m ³)	-----		-----
	Water (l/m ³)	-----		-----
	Fine Aggregate	-----		
	Coarse Aggregate	-----		
	A.E.A. (mL/100 kg)	-----		-----
	W.R. (mL/100 kg)	-----		-----
	S.P. (mL/100 kg)	-----		-----

Contractor's Representative submitting Form A:

Print Name: _____ Signature: _____ Date: _____

Concrete Supplier's declaration to meet the above contract requirements:

Print Name: _____ Signature: _____ Date: _____

Form A Reviewed by Contract Administrator:

Print Name: _____ Signature: _____ Date: _____

Notes:

- 1) The "Concrete Supplier" provides to the contractor, a valid "Certificate of Concrete Production Facilities" as issued by the RMCAO (copy available upon request).
Check www.rmcao.org for an updated list of certified concrete plants
- 2) The "Concrete Supplier" certifies that all materials incorporated in the mix designs meet current CSA A23.1 requirements.
- 3) Concrete tests not done according to CSA Standards shall not be accepted for any basis of measurement.
- 4) The Owner shall be responsible for performance "off the chute" if the owner specifies any material proportion(s).

CONFIDENTIAL

CONCRETE MIX DESIGN SUBMISSION (FORM B)

Project: _____ Date: _____

Contract No.: _____ Contractor: _____

Location: _____ Concrete Supplier: _____

Primary Plant Name & Address: _____ Back-up Plant Name & Address: _____

	Mix Code			
	Application / Element / Location			
SPECIFICATIONS	Structural Requirements			
	- CSA Exposure Class			
	- Maximum W/CM Ratio			
	- Minimum Specified Strength, Mpa @ Days			
	- Nominal Maximum Aggregate Size, mm			
	- HVSCM Type 1 or 2			
	- Maximum Slag Replacement, %			
	- Maximum Fly Ash Replacement, %			
	- Plastic Air Content, %			
	- Slump Range, mm			
	Durability Requirements			
	- Exposure to Sulphate Attack			
	- Alkali Aggregate Reactivity			
	Architectural Requirements			
	- Colour / Texture			
	- Other			
CONTRACTOR REQUIREMENTS	Rate, m³/h			
	Quantity, m³			
	Slump Range, mm			
	Strength @ Age, MPa @ Days			
	Other			
	Specialty Information			
	- Concrete Set (Delay, Normal, Accelerated)			
	Method of Placement			
MATERIALS SECTION <small>(Material quantity information is confidential and is for internal use only)</small>	Material	Quantity	Type / Name & Source	Inventory No.
	Cement (kg/m ³)			-----
	SCM - Slag (kg/m ³)			-----
	SCM - Fly Ash (kg/m ³)			-----
	Water (l/m ³)			-----
	Fine Aggregate			
	Coarse Aggregate			
	A.E.A. (mL/100 kg)			-----
	W.R. (mL/100 kg)			-----
	S.P. (mL/100 kg)			-----

Form B submitted by: _____

Print Name: _____ Signature: _____ Date: _____

Form Reviewed by Contract Administrator:

Print Name: _____ Signature: _____ Date: _____

Notes:

- 1) The "Concrete Supplier" provides to the contractor, a valid "Certificate of Concrete Production Facilities" as issued by the RMCAO (copy available upon request). Check www.rmcao.org for an updated list of certified concrete plants.
- 2) The "Concrete Supplier" certifies that all materials incorporated in the mix designs meet current CSA A23.1 requirements.
- 3) Concrete tests not done according to CSA Standards shall not be accepted for any basis of measurement.
- 4) The Owner shall be responsible for performance "off the chute" if the owner specifies any material proportion(s).