



Concrete Mix Submittal Process

With this Bulletin, the Concrete BC Technical Committee looks to provide guidance to members, specifiers and engineers with regards to the mix design submittal process for the ready mix concrete industry in the province of British Columbia. The information presented below is aligned with CSA A23.1/A23.2:24 *Concrete materials and methods of concrete construction/Test Methods and Standard Practices for concrete*, and is heavily based on Concrete Alberta's [Technical Bulletin #5](#).

It is important to note that many members are not able to issue a submittal stamped by a Professional Engineer. The production of high quality, durable concrete for all project depends on all involved parties following the requirements of the specifications and the provisions of CSA A23.1:24 in addition to adequate review and inspection during construction. It should be noted that the ready-mix concrete producer cannot act as the Engineer reviewing and inspecting the construction, fabrication and/or installation of the concrete, as they have no command of the placing, finishing and curing of the concrete being supplied. Requesting Schedule S-Bs or S-Cs from a ready-mix supplier upon completion of construction is likely to end in conflict of interest, and should be avoided.

PROJECT SPECIFICATIONS & DRAWINGS:

1. Ensure that all project specifications and drawings are reviewed during preparation of the concrete mix submittal. During this process, the performance, prescriptive and submittal requirements for the concrete mix(es) to be supplied should be identified (See CSA A23.1 Annex J *Guide for Selecting alternatives when ordering concrete using Table 5* for in-depth guidance)
2. Once the concrete producer's specification review has been completed, ensure to build a submittal meeting the requirements of the project specifications and CSA A23.2-24C *Standard Practice for sampling, testing and inspection of concrete for qualification purposes*. Should any discrepancies be identified, they should be clearly identified in the mix design submittal.
3. It may be beneficial for the producer to retain an experienced engineering consultant to review the concrete mix submittal for conformance to the specified performance requirements. This allows the producer's consultant to understand the project requirements and to assess that the mix submittals meet the minimum standards of the design control as outlined in the specifications.

MIX SUBMITTAL TYPE:

1. **Concrete Performance:** The Concrete Performance Submittal only furnishes the contractor with an acceptance of the specified performance requirements for each mix design. See CSA A23.1 Annex J for an example for a concrete mix submittal form. The performance submittal should list each specification requirement and indicate compliance. No details of the concrete mix proportioning (kg/m^3) are provided in the performance submission. If required by the project specification, the submittal may include test reports for all concrete materials confirming compliance with the relevant CSA standards. This submittal type is in line with the Performance Alternative (1) for specifying concrete from Table 5 of CSA A23.1:24.
2. **Concrete Design (proportioned):** The Concrete Mix Design Submittal furnishes the reviewing engineer consultant with all the design quantities and test reports for each constituent. The quantities are required to allow the consulting engineer (preferably hired by the producer) to evaluate the mix design proportioning to ensure that it meets the project owner's specifications and performance requirements. Depending on the reviewing engineer's capacity, this submittal type can either fall in line with the Performance Alternative (1), or the Prescription Alternative (2) for specifying concrete from Table 5 of CSA A23.1:24.

The responsibilities of each party outlined in Table 5 should be taken into account when requesting a mix submittal type. As per Table 5, the performance alternative is *“When the owner requires the concrete supplier to assume responsibility for the performance of the concrete as delivered and the contractor to assume responsibility of the concrete as placed, finished, and cured”*, and the prescription alternative is *“When the owner assumes responsibility for the concrete”*.

CONCRETE MATERIALS

CEMENTITIOUS MATERIALS:

The manufacturer and source of each cement and supplementary cementitious material must be listed on the mix design submittal. These products must meet the guidelines in the Project Specifications, or the discrepancy clearly identified. This may include, but may not be limited to, cement type, cement chemical attributes such as low-alkali, supplementary cementitious material type, minimum quantities per cubic meter, etc. Any change of the cement and/or supplementary cementitious type or source during the submittal and/or production, may warrant a new mix submission with all related documents to qualify the product.

FINE & COARSE AGGREGATES:

The source location (pit or wash plant) must be listed on the mix design submittal. Aggregate must meet the minimum quality standards as outlined in CSA A23.1:24. Sieve analysis, F.M., Colour Plate (organic impurities), Relative Density, Petrographic analysis, Alkali-silica reactivity testing, ironstone content, etc. are some of the tests that may need to be performed on aggregates. CSA A23.2-30A *Standard Practice for sampling, testing, and inspection of aggregate products for use in concrete for qualification and acceptance* purposes outlines the requirements for different aggregate types. If the tests are performed on a stockpile, then refresh tests on certain criteria may be performed to reconfirm the material quality. However, if new aggregate is produced, or the source changes, full testing to confirm compliance with standards will need to be completed.

CONCRETE ADMIXTURES:

The admixture brand name should be listed on the performance submittal. The proportioned design submittal will often include approximate dosage rate, while the prescriptive design submittal will generally not. Dosage rates will vary depending on concrete temperature, raw materials during the time of production, etc. Admixture must meet the specifications as outlined by the project, or the discrepancy clearly identified. This applies to air entrainment, water reducers, superplasticizers and other admixtures such as hydration stabilizing agents (HSA's), workability/slump retention admixtures, retarders, shrinkage reducing admixtures (SRA's), corrosion inhibitors, etc. Keep in mind that these admixtures are all required to meet the Project Specifications, and occasionally a specific manufacturer's product will be specified. In some cases, the use of HSA or SRA may require trial batching to demonstrate performance.

It should be noted that not all raw material types are available in all regions. There are also substantial costs associated with changes in the supply of raw materials available to the ready-mix supplier (Silos, bins, dispensing equipment, Durability testing of mix designs...) For these reasons, concrete producers may not be able to economically source project specific materials in their operations.

SUBMITTAL ITEMS AND CERTIFICATES as required:

As per section 6.2 *Submittals* of CSA A23.2-24C:

The concrete supplier shall submit the documentation specified in the contract documents, which may include the following:

- a) Cementitious materials reports in accordance with CSA A3004-A1 (commonly referred to as mill test reports or mill certificates).
- b) In cases where alkali silica reactivity may be present or sulphate resistance may be required, an additional compliance report from the cementitious materials supplier may be required.
- c) Aggregate reports in accordance with CSA A23.2-30A. (This generally includes the requirements from CSA A23.1:24 tables 10 through 12, petrographic analysis, alkali-silica reactivity testing, etc.).
- d) Admixture and fiber technical data sheets (This may include a special admixture performance report for specific admixtures)
- e) Water quality test data in accordance with Clause 4.2.2 (When using non-potable water).
- f) Under Alternative 1 of Table 5 of CSA A23.1: Submit documentation demonstrating that the proposed mix design will achieve the required plastic properties, strength, durability and performance requirements (slump, air,

strengths, RCP, shrinkage, etc).

- g) Under Alternative 2 of Table 5 of CSA A23.1: Submit documentation, demonstrating that the concrete complies with the prescriptive criteria as specified by the owner (Generally includes raw material proportions).
- h) Environmental Product Declarations (All members of Concrete BC can use the [Industry-Wide regional EPD for Ready-Mixed Concrete](#), and may also have published Product Specific Type III EPDs).

HAVE QUESTIONS?

If you have any questions regarding this or other technical bulletins, please contact Jason Saunderson, Executive Director, Concrete BC at 604-626-4141 or jsaunderson@concretebc.ca.

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