TECHNICAL BULLETIN # 5

Concrete Mix Submittal Process

This Bulletin provides a brief overview of the mix design submittal process for the ready mix concrete industry.

Here are some guidelines to follow when preparing a concrete mix submittal for review and/or approval by the professional of record (typically an Engineering Consultant). Most members are not able to issue a submittal stamped by a Professional Engineer.

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 and submittal requirements for the concrete mix(es) to be supplied should be identified (See CSA A23.1 Annex J)
2. Once the concrete producer's specification review has been completed, 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.
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.

CONCRETE MATERIALS

CEMENTING MATERIALS:

1. ***Cement:*** The manufacturer and source of each cement must be listed on the mix design submittal. These products must meet the guidelines in the Project Specifications. This may include, but may not be limited to, cement type, cement chemical attributes such as low-alkali, minimum quantities per cubic meter, etc. Any change of the cement source during the submittal and/or production, may warrant a new mix submission with all related documents to qualify the product.
2. ***Fly Ash:*** The fly ash supplier and source must be listed on the mix design submittal. These products must meet the guidelines in the Project Specifications. Once again, this may include Type of Fly Ash, minimum or maximum fly ash content, chemical criteria, etc. Any change of the fly ash source during the submittal and/or production, may warrant a new mix submission with all related documents to qualify the product.
3. ***Silica Fume:*** The source and location must be listed on the mix design submittal. These products must also meet the guidelines in the Project Specifications. Once again, this may include minimum or maximum quantities, chemical criteria,

etc. Any change of the silica fume source during the submittal and/or production, may warrant a new mix submission with all related documents to qualify the product.

FINE & COARSE AGGREGATES:

1. ***Fine Aggregates:*** The source location (pit or wash plant) must be listed on the mix design submittal. Fine aggregate must meet the minimum quality standards as outlined in CSA A23.1 – Current Version. Sieve analysis, F.M., Colour Plate (organic impurities), Relative Density, ironstone content, etc. are some of the tests that may need to be performed on the fine aggregate. 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 fine aggregate is produced, or the source changes, full testing to confirm compliance with standards will need to be completed.
2. ***Coarse Aggregates:*** The source location (pit or wash plant) must be listed on the mix design submittal. Coarse aggregate must meet the minimum quality standards as outlined in CSA A23.1 – Current Version. Sieve analysis, Relative Density, Petrographic analysis, Specific Gravity, etc. are some of the tests that are performed on the coarse aggregate. Similar to the fine aggregates, 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 coarse aggregate is produced, or the source changes, full testing to confirm compliance with standards will need to be completed.

CONCRETE ADMIXTURES:

1. ***Air Entrainment:*** If air entrainment is required, the admixture brand name should be listed on the performance submittal. The proportioned design submittal will often include approximate dosage rate. Dosage rates will vary depending on concrete temperature, raw materials during the time of production, etc. The air entrainment admixture must meet the specifications as outlined by the project.
2. ***Water Reducer:*** If a water reducer is required, the brand name and type (low-range, mid-range, high-range, etc.) must be listed on the performance submittal. The proportioned design submittal will often include approximate dosage rates. These dosage rates will vary depending on concrete temperature, raw materials during the time of production, etc. The water reducing admixture must meet the specifications as outlined by the project.
3. ***Superplasticizers:*** If a superplasticizer (or high range water reducer) is required, the brand name(s) must be listed on the performance submittal. The proportioned design submittal will often include approximate dosage rates. These dosage rates will vary depending on concrete temperature, raw materials during the time of production, etc. Frequently, the use of superplasticizer must be approved by the Owner. It should also meet the specifications as outlined by the project.
4. ***Other Admixtures:*** Admixtures such as hydration stabilizing agents (HSA's), workability/slump retention admixtures, retarders, shrinkage reducing admixtures (SRA's), corrosion inhibitors, etc. may be used. 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.

SUBMITTAL ITEMS AND CERTIFICATES as required:

1. ***Cement Mill Certificates:*** Attach the most recent mill certificate from the supplier.
2. ***Fly Ash Mill Certificates:*** Attach the most recent certificate of analyses from the supplier.
3. ***Silica fume Test Certificates:*** Attach the most current certificate of analyses from the supplier.
4. ***SCM Sulphate Attack Mitigation Reports:*** Attach most current standards compliance report.
5. ***Fine Aggregate Testing:*** Attach the most recent fine aggregate testing reports.
6. ***Coarse Aggregate Testing:*** Attach the most recent coarse aggregate testing reports.
7. ***ASR Reports for Aggregates:*** Attach most recent report for each aggregate source and combination if available.
8. ***SCM ASR Mitigation Reports:*** Attach most current standards compliance report.
9. ***Admixture Data Sheets:*** Attach manufacturer's data sheets for all admixture which will be used in the concrete supply.
10. ***Special Admix Performance:*** Attach a report demonstrating the anticipated benefit/performance i.e. HSA's.
11. ***RCP Test Reports:*** Attach most recent test report of proposed mix using materials proposed for the project.
12. ***Air Void System analysis "(Linear traverse"),*** Attach most recent test report of proposed mix using materials proposed for the project.
13. ***Project Specifications/Drawings:*** Attach all specifications, drawings, and addendums for engineer's review.