



TECHNICAL BULLETIN # 4

Alternate Methods for Specifying Concrete

CSA A23.1 allows two different methods for specifying concrete; **by Performance and by Prescription.**

What do we mean by a Performance Specification?

CSA A23.1 Annex J.4.2 defines a **Performance Concrete Specification** as “a method of specifying a construction product in which the final outcome is given in mandatory language, in a manner that the performance requirements can be measured by accepted industry standards and methods. The processes, materials, or activities used by the contractors, subcontractors, manufacturers, and materials suppliers are then left to their discretion.” In simpler terms, if a project owner decides to specify his concrete by the Performance method, he will limit the wording of his specification to performance characteristics that can be measured in the field and the lab by recognized standard testing methods and procedures. He'll leave the actual concrete mix designs, methods of placing, finishing and curing the concrete to the contractor to decide. In turn the contractor will leave the actual recipe of the mix design to the producer to decide; with some guidance as to what aggregate size he might need to be able to realize proper concrete consolidation and finish.

What sort of performance characteristics are we looking for in concrete under a performance spec?

Concrete plastic state characteristics often listed when specifying concrete by performance include, but may not be limited to **consistent, workable, placeable, type of finish, and set time.**

Harden state criteria could include but may not be limited to **compressive, flexural and tensile strengths, strengths at specific ages, ability to withstand exposure to environments like sulphates, freeze thaw, chlorides, shrinkage resistance, types of architectural finishes, surface textures like stamped or exposed aggregate, flatness/levelness etc.**

How will the performance be measured?

Performance criteria and tests used to confirm that the performance of the concrete supplied, placed, finished and cured was realized, need to be made clear in the specification. **Recognized standard test methods** should be used that can be **conducted early in the life cycle of the concrete poured** that confirm the achievement of both short and long term performance requirements (See Table J.1 in Appendix J of CSA A23.1 for a list of potential performance measurement tests).

The owner will usually hire a reputable engineering consulting firm to develop a **relevant performance specification** and to assemble and arrange an adequate **quality assurance program to confirm** that all of the performance requirements have been met.

What are the stakeholders' roles and responsibilities under a Performance Specification?

The contractor will tender a concrete supply for the project and will assemble a crew to place, finish and cure the concrete in a manner that will meet the customer's expectations. Contractors will also be responsible for hiring a concrete testing firm to provide quality control testing to demonstrate that the concrete supplied to the project meets the performance expectations of the owner.

The concrete producer will be responsible for supplying concrete that meets the project performance criteria to the end of the chute. A concrete producer's liability for performance criteria in hardened state is limited to the mix design, materials, batching, mixing and conveying of concrete to the project site off the end of the chute. The producer will need to establish with the contractor, before the job starts, that quality control testing of the concrete will be conducted by a certified field technician and a certified test laboratory and in a way that demonstrates that the performance of the concrete delivered from the end of the chute has met the project owner's performance specifications.

What do we mean by a Prescriptive Specification?

CSA A23.1 Annex J.4.3 defines a **Prescriptive Concrete Specification** as "a method of specifying a construction product in which all processes, activities, materials, proportions, and methods used to achieve the intended final outcome are specified in mandatory language contained in the project specifications. The contractors, subcontractors, materials suppliers, and manufacturers should then follow a prescribed process and use prescribed materials and proportions to deliver the product." In other words, the prescriptive approach transfers the responsibility from the contractor and concrete supplier to the owner and his consulting engineer, for all the materials selected and any processes followed in the supply of concrete to a given job. The contractor and concrete supplier are obligated to follow all of the details of the "prescription".

An example of a prescriptive mix design would be when a contractor states that no fly ash is to be used in a particular mix just because they don't like or don't trust fly ash in concrete.

What are the stakeholders' roles and responsibilities under a Prescriptive Specification?

The contractor is responsible for the supply of prescribed materials and conducting the work in precisely the manner stated in the specification by the owner.

The concrete producer is responsible for supplying concrete using the exact mix design provided by the owner or his contracted consulting engineer. The producer is also responsible for conducting quality control testing to demonstrate that the mix supplied meets the project specification.

Specifying concrete for a project using either the performance or the prescriptive method

Each method comes with advantages and disadvantages from the standpoints of all parties involved. The decision is often influenced by the owner's and the owner's consultant's familiarity with a given project application and their confidence in potential project bidders to successfully meet their expectations. The performance approach is likely the most favorable from most stakeholders' standpoints. But it requires a strong owner/design partnership to be able to write a performance specification that everyone involved can understand and support.

A strong and clearly written prescriptive spec leaves little room for misunderstanding but requires that the owner and design engineer have a good grasp of the intended outcome. In some cases the prescriptive approach may require additional workers and monitoring equipment to keep a closer watch at various levels which could prove less cost effective for all parties than a well-organized well communicated performance based alternative.

For more detailed information on these two alternative approaches to specifying concrete, please consult **CSA A23.1-14 Table 5 and Annex J**.

Reference

The CSA Group (2014). *CSA A23.1-14/23.2-14: Concrete materials and methods of concrete construction/Test methods and standard practices for concrete*. CSA Group, Mississauga, ON.