

SERIES 2, ISSUE 11 – CEMENT MILL CERTIFICATES

What is a Mill Certificate?

A mill certificate is a quality assurance document used to verify/certify the material's chemical and physical attributes for the customer. The data represented on the mill certificate are typically averages of the tests performed by the manufacturer in the month reported. A mill certificate should be retained for each stockpile from which your plant receives deliveries (usually a lot, silo, or production number, as shown on the bill of lading).

Cement is manufactured by combining raw materials such as limestone, clay, sand, and iron, which are mixed and heated in a kiln at temperatures around 2700°F. Fluctuations in the amounts and chemistries of these raw materials can cause varying degrees of fluctuations in the physical and chemical properties of the cement. Because of these variables, it's important to understand that all cements are not the same. One cement isn't necessarily better or worse than the other, but different cements will perform differently, so they shouldn't be used interchangeably.

It is the job of the cement manufacturer to monitor the materials and processes and make changes in their processes to limit these fluctuations. Just like your plant wants to produce consistent concrete, a cement supplier wants to produce consistently performing cement.

What to Do With It

Mill certificate information is important for monitoring the physical and chemical trends over time. Below are examples of a few things to watch for and their potential effects on your concrete's performance:

- **Blaine fineness:** This is an indication of how finely ground the cement is. The higher the number, the finer the particle size. Finer cements exhibit higher early strengths, higher water demand, faster set times, and higher required air-entraining admixture dosages.
- **Minus(-) 325 mesh:** This is another indication of the fineness of cement. It's a measurement of how much of the cement will be retained on a #325 sieve. In conjunction with the Blaine, this value can give you a better indication of the particle size distribution. If the Blaine is very high (such as 4800) and 325 mesh is low (such as 82), it's an indication that there is a large amount of "super-fines," which have a tendency to easily hydrate with atmospheric humidity. Because they have already reacted, their presence is detrimental to concrete.
- **Vicat set time:** This is a measure of how quickly the cement will reach initial set (500 psi). It's reported on the mill certificate in minutes. The result reported on the mill certificate will not directly correlate to the concrete set time, but a change in cement set time will predict a change in concrete set time. A faster set time will likely result in a need to start finishing the concrete faster.
- **C₃A and C₃S contents:** Changes in these two compounds can affect early strength development, as higher contents will result in higher early strength. Higher C₃A-content cements will require a higher dosage of high-range water-reducing admixture than an equal amount of a lower C₃A-content cement.
- **Total alkalis:** The total alkalis impact the effectiveness of chemical admixtures and any supplementary cementitious materials (SCMs) such as fly ash or slag. Alkalis are typically reported as Na₂O equivalent. Changes in Na₂O equivalent on the mill certificate may indicate a change in how the admixtures and SCMs perform. Also, higher alkali content increases the potential for alkali-aggregate reactivity if reactive aggregates are in use.
- **One-day and 28-day strength:** Cement strength gives no indication of potential concrete strength, but can be used to troubleshoot concrete strength fluctuations. If the one-day strength drops on the mill certificate, you may see a drop in the concrete strength.

If the processes in your batch plant are optimized and monitored closely and you're still having issues, contact your cement supplier for guidance.

PCI Plant Quality Talk Quality Enhancement Committee



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Note: Please complete this form and return to the Quality Control Manager. All crew members should be observant and report to their foreman anything out of the ordinary on a project. *See something, say something.*

NOTES	ATTENDEE SIGNATURES
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