

CONCRETE BASICS

Air – The Producer’s Responsibility

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ENTRAPPED AIR

“Entrapped air” is air that is naturally entrapped in all concrete, occurring without the use of an air entraining agent. These bubbles/voids are larger than entrained air and contribute nothing to durability. Entrapped air is also unstable and can be lost during mixing or certain placement operations, i.e. pumping, vibration. Depending on the mix, the amount of entrapped air generally ranges between 1 ½% and 2 ½%; it can be slightly higher. When an air test is taken the amount of entrapped air is part of the result. Entrapped air has no consequential positive or negative effect on the performance of the concrete.

ENTRAINED AIR

“Entrained air” is purposely put into the concrete by the addition of an air entraining agent, AEA. These bubbles are microscopic in size and more stable than entrapped air. Although, slump, mixing time, concrete temperature, pumping, vibration, and the physical and chemical characteristics of all mix ingredients, can have an altering effect on the total air content.

The total specified air content for a mix using 1” aggregate is normally 5%-7%. As the top size of the aggregate gets smaller the total specified air increases, eg. 3/8” = 6%-8%. This increase is a reflection of the amount of entrapped air in a mix containing a small top size aggregate.

Entrained air has many positive contributions to the concrete, most importantly is durability. It also improves placeability, workability, and pumpability, as well as increases slump and reduces bleeding.

Too much entrained air will have serious negative effects on the performance of the concrete, eg. loss of strength, stickiness during finishing. Air entrainment should not be used in interior concrete that is going to be steel troweled especially machine troweled. The result can be slower bleeding, premature finishing, blisters, or surface delamination.

QUALITY CONTROL

The producer must be aware of the proper dosage rates and, if necessary, make the appropriate adjustments when a change in slump, material source, delivery time, concrete temperature, or placement methods occur. A change in the amount or type of admixture can also have a significant effect on the air content. If this occurs get the admixture company involved. You cannot, however, rely on the admixture supplier to do all of your testing.

The producer also cannot rely on tests conducted on the job. You do not know the circumstances under which the concrete was sampled and tested, and you don’t know if the meter used is properly calibrated. Relying on job tests to determine what your air really is, is a dangerous practice.

Owning and using an air meter is part of basic quality control and the responsibility of all ready mix producers. Air tests should be taken when a material source changes, a new mix design or admixture is used, when you begin or stop using hot water, or you make a change in your plant that changes the loading sequence.

If nothing changes you should check your mixes at least weekly. You need only check each “kind” of mix and apply the results to other similar mixes. For example: if you test a mix containing only cement, say a 5 bag, you can assume that the same dosage rate per bag, or 100 lbs., of AEA would apply to all mixes containing only cement. Other “kinds” of mixes to which this would apply would be: cement + water reducer, cement + fly ash, cement + fly ash + water reducer (If you use slag you would have another “kind” of mix to test).

Remember your concrete is your responsibility and no one else’s. If you have any questions or need help call IRMCA.



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