

Damage to concrete from reactions between
aggregates and alkalies

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SUMMARY

The authors describe some significant features of alkali-silica reactions as experienced in structural concrete in the USA, to illuminate that »either the specifications covering its production were defective or these specifications were not complied with.»

It is concluded that »new research, or a re-interpretation of the results of previous research, is needed to better characterize the relevant parameters:

- a. Degree and rate of aggregate reactivity.
- b. Influence of concrete mixture proportions, especially unit cement content.
- c. Influence of environment of service of the concrete.
- d. Influence of dimensions of structures.

If these parameters were better understood, one could develop the sort of prescription for safe structural behavior that would serve efficiently to prevent damage to concrete from reactions between aggregates and alkalies. This prescription might be a sort of nomograph where one selected a point on a scale of low to high aggregate reactivity, a point on a scale of cement content, a point on a scale of structural dimensions, a point on a scale of environmental exposure (temperature, moisture), and by connecting these one could be directed to a point on a scale of degree of precaution to take. Then one could work from the other side of the coin, taking the type and amount of slag or pozzolan in the cementitious medium, the $\text{Na}_2\text{O}:\text{K}_2\text{O}$ ratio in the cement, the water-soluble to total alkali ratio, and finally establish the limit on alkali in the cement appropriate for the concrete to be used in a given structure, in a given location, to be constructed with aggregate from a given source.»