



TECHNICAL BULLETIN # 1

ALKALI AGGREGATE REACTIVITY

Sampling and evaluation of Alberta aggregates conducted over the past several decades have indicated that the majority of aggregate sources in this province, are potentially reactive in the presence of an alkali source – namely the alkalis from cements and some supplementary cementing materials. The majority of local aggregate sources tested to date have shown to be at least moderately reactive. As resources are depleted and new ones developed, an increasing number have been found to be highly reactive.

In order for unwanted concrete expansion to occur as a result of Alkali Aggregate Reaction – and more specifically – Alkali Silica Reaction- ASR – there has to be a reactive source of silica in the aggregate; there has to be a source of alkali in the concrete for it to react with; and there has to be a source of moisture present in the concrete. The rate of reaction is also influenced by temperature. In a very few instances in areas outside of Alberta, the reaction has occurred relatively quickly (1-5 years). In most cases, the expansion to the point of failure occurs over several decades.

Field evidence of deleterious expansion issues in concrete in Alberta directly attributable to ASR has been limited. For the most part, documented cases of ASR in Alberta have been associated with concrete subjected to a continuous source of moisture and where inadequate proportions of cement and SCM's were employed to mitigate the potential for the reaction.

As we continue to witness unprecedented demand for cement in concrete construction in Alberta, suppliers in the Alberta market are sourcing materials from markets further afield. Some of the cements available in the Alberta market have a higher Total Sodium Equivalent Alkali content ($\text{Na}_2\text{O}_{\text{eq}}$) than the cements that have been used traditionally in this area. Although these cements meet all of the requirements of the Canadian Standards Association for Portland cement or for Portland Limestone cement, the difference in their Total Alkali contents must be taken into consideration when designing concrete to mitigate the potential for alkali silica reaction.

For further information on proper proportioning of concrete materials when developing mixes to mitigate the potential for ASR, please contact your local concrete design and test firm.