Strict regulations on emission of undesirable gases (SO$_X$ and NO$_X$) into the atmosphere is expected to result in increasing amounts of low-quality coal combustion by-products (such as clean-coal ash) from power plants. Maximum recycling of such by-products is very important for sustainable developments in energy and construction industries. This paper presents the results of a laboratory investigation for the use of high-volume clean-coal ash on mitigating alkali-silica reaction expansion. Up to 80% cement was replaced with a combination of clean-coal ash and Class C or Class F fly ash. A proprietary activator was used to activate the hydration of the blends. The potential alkali-silica reaction of the blends was determined according to modified ASTM C 227 mortar bar method. Test results indicated that all the blends with coal ash had lower expansion than the control mixture with Type I cement at test ages up to 91 days. ASR expansion decreased with the increasing amount of clean-coal ash. The addition of chemical activator increased ASR expansion.