

SCORE CARD: ASR-MITIGATING SCMs

	COST VALUE¹	EASE OF USE/ PLACEMENT²	CONSISTENT MAKE-UP & PERFORMANCE³	CLEAN & GREEN⁴	PROVEN TO MITIGATE ASR⁵
Pumice Pozzolan	■	■	■	■	■
Lithium Compounds					■
Fly Ash (Type F)	■	■			■
Metakaolin		■	■		■
Silica Fume	■				■
Blast Furnace Slag	■	■			■

- 1 • Priced near the cost of Portland cement; percent of replacement and concrete enhancement economically feasible for large-quantity use.
- 2 • Concrete placement and methods not adversely affected by inclusion of SCM
- 3 • Predictable, repeatable performance results per concrete mix design; consistent particle size distribution, density and chemical properties.
- 4 • Free of junk and hazardous contaminants; will not leach toxins into the soil; requires no energy-intensive calcination (heating)
- 5 • At least at some acceptable level of effectiveness.

PUMICE POZZOLAN (HESS POZZ)

COST VALUE: priced at or below the cost of Portland cement; effective against ASR at 20% of cement replacement, no matter the reactivity level of aggregate; sustainable source. **EASE OF USE/PLACEMENT:** use of pumice as SCM increases water requirements; easily brought back into desired W/C ranges with water reducer admixture. **CONSISTENT MAKE-UP & PERFORMANCE:** Quantifiable chemical make-up bag after bag; predictable performance in concrete mix design load after load; makes additional and significant contributions to concrete durability beyond mitigating ASR; compatible with most concrete admixtures. **CLEAN AND GREEN:** white pumice from a naturally pure deposit; contains no hazardous compounds, safe to use, no leachate concerns; naturally calcined; requires minimal processing to grade; consistent spec. **PROVEN TO MITIGATE ASR:** Effectiveness quantified in university-level research studies, including a two-year study commissioned by the Texas DOT.

LITHIUM COMPOUNDS

COST VALUE: words; effective dosage levels depend on several factors, including compound type which greatly complicates the prescription; Lithium nitrate (LiNO₃) most commonly used for ASR suppression; typically used in combination with a stabilizing pozzolan; **EASE OF USE/PLACEMENT:** causes widely-variable effects on wet concrete characteristics, depending on compound type, other present admixtures, and cement types; research studies on concrete behavior produce contradictory data. **CONSISTENT MAKE-UP & PERFORMANCE:** extremely complex cause-and-effect relationships with other concrete materials: requires extensive testing to dial in correct dosage for a given project/application; **CLEAN AND GREEN:** Leachate concerns; **PROVEN TO MITIGATE ASR:** increasingly specified for constructs where de-icing chemicals are used, most often in conjunction with fly ash (the use of both provides better ASR mitigation than either alone).

CONTINUES

FLY ASH (TYPE F)

COST VALUE: waste product, historically inexpensive or free, but declining availability of Type F causing price fluctuations. **EASE OF USE/PLACEMENT:** been in wide use for decades so well understood; some fly ash decreases water need, some increases it; generally improves workability of concrete. **CONSISTENT MAKE-UP & PERFORMANCE:** different coal sources produce different ash chemistry and contaminant concentrations, as do evolving ash filtration requirements; particle sizes vary greatly; on-going testing necessary to ensure desired performance; fly ash color can be anywhere from light grey to dark brown; makes additional and significant contributions to concrete durability beyond mitigating ASR; **CLEAN AND GREEN:** As a waste product (scrubbed from coal-burning furnace smoke) fly ash is loaded with hazardous chemistry and other junk particulates; heavy metal leachate possible; use in concrete reduces amount of fly ash that must be landfilled or stored in ash-ponds. **PROVEN TO MITIGATE ASR:** Not as effective as some other pozzolans—fly ash mix design often require a second SCM to achieve acceptable ASR mitigation levels.

METAKAOLIN

Made from heating (calcining) high-purity kaolin clay to create amorphous aluminosilicate. **COST VALUE:** production costs dictate specialized project usage; effective against ASR at 10 to 15% of replacement, depending on reactivity level of aggregate. **EASE OF USE/PLACEMENT:** variable effect on water demand depending on grade; smooth, creamy finishability; generally improves workability of concrete. **CONSISTENT MAKE-UP & PERFORMANCE:** consistent white color, carefully controlled selection and firing processes equal predictable chemical make-up; makes additional and significant contributions to concrete durability beyond mitigating ASR; compatible with most concrete admixtures. **CLEAN AND GREEN:** requires calcining; modern flash-heating processes avoid introducing impurities.

SILICA FUME

COST VALUE: waste product, price varies from half to twice cost of Portland cement. **EASE OF USE/PLACEMENT:** extreme fineness of particles increases water demand, use of water reducer admixture necessary; extreme fineness creates handling problems so typically densified or slurried for transport; can contribute to stickiness and reduce workability; **CONSISTENT MAKE-UP & PERFORMANCE:** Chemical composition varies according to the type of alloy or metal being produced; prone to clumping, which causes it to act more like a fine reactive aggregate and contribute to ASR formation; extensive mixing necessary to facilitate proper dispersion; can be used with superplasticizers to design ultra-high-strength concrete. **CLEAN AND GREEN:** Waste byproduct filtered from quartz+coal furnace exhaust gases; use in concrete reduces amount of fume that must be landfilled.

GROUND GRANULATED BLAST FURNACE SLAG

Made from rapidly chilled iron blast-furnace slag. **COST VALUE:** grade-variable; **EASE OF USE/PLACEMENT:** can decrease concrete water demand; generally improves workability of concrete. **CONSISTENT MAKE-UP & PERFORMANCE:** uniform composition from source to source; generally improves finishability; lightens concrete color; makes additional and significant contributions to concrete durability beyond mitigating ASR. **CLEAN AND GREEN:** use in concrete reduces amount of slag that must be landfilled.



More Info: hesspozz.com

1.800.767.4701 x 111 • pozzinfo@hesspumice.com