Hess Pumice Products, Inc.

Mining and refining the world’s purest commercial deposit of white pumice.
The pumice mine is 23 miles northwest of Malad, Idaho, located on the shoreline of the ancient Lake Bonneville, a freshwater lake that was the predecessor of the Great Salt Lake.

The volcano that produced the pumice is about a mile to the north of the mine. The volcanic ash (pumice) fell on the lake and wave action deposited the pumice on the shoreline as the pumice became saturated and sank. This process helped cleanse the pumice of the undesirable heavy minerals that are often found in other pumice deposits around the world.
Our production facilities are located in Malad City Industrial Park and include pumice and perlite processing plants as well as a large warehouse and maintenance shop. Pumice and perlite ore is inventoried on site and shipped worldwide.
Hess Pumice:

— The purest natural pozzolan available anywhere on earth.
— Nearly 70% of our pumice products are shipped into Europe and Asia due to advantages in purity and color.
— Our pumice in naturally white, 99% pure, non-toxic and non-hazardous.
— Pumice and pumice-pozzolan based concrete is the only concrete proven to last over 2000 years in excellent condition.
Hess Pumice Natural Pozzolans

Categories of Hess Natural Pozzolans (HessPozz)

I. Standard Pozzolans
   a. DS-200
   b. DS-325
   c. IM-325 (perlite)

II. High Performance Pozzolan
    3µ ‘UltraPozz’
I. Standard Pozzolan Grades

**DS-200**: 70-75% passing -325 mesh
   APS: 18-22µ

**DS-325**: 80%+ passing -325 mesh
   APA: 13-17µ

**IM-325**: 80%+ passing -325 mesh
   APA: 13-17µ
II: High Reactivity Pozzolan

**Hess ‘UltraPozz’ (APS - 3µ)**

This product, used in conjunction with admixtures that reduce water demand, is a key component in producing a pozzolan-enhanced, highly durable concrete that exhibits high-strength and low permeability with very effective ASR and Sulfate resistance.
The Pantheon in Rome, constructed approximately A.D. 125, is an enduring example of Roman pumice concrete construction.
The interiors of Roman cisterns were covered with a hydraulic mortar consisting of a mixture of lime and pozzolan. Pozzolan, or as the Romans called it Pozzolana, is a finely ground pumice, which, when mixed with lime, hardened in the presence of water and effectively sealed the cisterns, many of which have been in use for over 2000 years.
Benefits of Pumice Pozzolan

**Reduces Heat of Hydration:** Research shows that Hess Pumice Natural Pozzolans (HessPozz) reduced the heat of hydration anywhere from 10 - 40% during the first 100 hours, depending on the ultimate mix design, thus lowering the threat of thermal cracking and allowing for a cooler, controlled set.

After 100 hours the cement-water hydration process wanes while the pumice pozzolan mixes continue to hydrate until one of the two remaining hydration agents, Calcium Hydroxide or Pumice Pozzolan, have been consumed. This slow pozzolanic hydration process can continue for months and even years, bringing the long-terms strength of the pumice based concrete well beyond the OPC control.
Benefits of Pumice Pozzolan

**Enhanced Compressive Strength:** At the early stage of curing, compressive strengths will be lower than reference OPC. Over time, the natural pozzolan continues to react with the calcium hydroxide produced by cement hydration and increases the compressive strength by producing additional C-S-H. Sometime between 28 - 40 curing days, the HessPozz/OPC mixture begins to exceed reference OPC in compressive strength. After 56 days, strengths may exceed reference OPC by 15% or more. The pozzolanic reaction continues until there is no free calcium hydroxide available in the mass. Long term compressive strengths may exceed the reference OPC by up to 50%, depending on mix design.
Benefits of Pumice Pozzolan

**Resistance to Chloride Attack:** Concrete deterioration caused by the penetration of chloride occurs when chloride ions react with calcium. The expansion of hydrated calcium oxychloride enlarges micro-cracks and further increases permeability, which in turn causes even greater chloride penetration and related damage from freeze-thaw cycles. When 20-30% natural pozzolan is added to cement, it will react with almost all the free calcium hydroxide and form a denser less permeable paste, and thus a higher strength. With the addition of Hess UltraPozz (3µ) the concrete becomes nearly impermeable. Thus, the penetration of chloride can be greatly reduced and the few penetrating chloride ions cannot find any free calcium hydroxide with which to react.
Benefits of Pumice Pozzolan

**Resistance to Sulfate Attack:** There are three chemical reactions involved in sulfate attack on concrete:

1) Free calcium hydroxide and sulfate combine and expand to form gypsum (CaSO4-2H2O).

2) Gypsum and calcium aluminate hydrate (C-A-H) combine to create a late-forming, damaging ettringite (C3A-3CaSO-32H2O).

3) Gypsum and calcium carbonate combine with C-S-H to form a destructive thaumasite (CaCO3-CaSiO3-CaSO4-15H2O).

All three of these reactions result in the expansion and disruption of concrete.
Benefits of Pumice Pozzolan

**Resistance to Sulfate Attack:** (continued)

Thaumasite, in particular, is accompanied by a severe damaging effect which may transform hardened concrete into a soft, pulpy mass.

As in the case of chloride attack, the natural pozzolan will:

1) decrease permeability and thereby reduce or eliminate chemical permeation into the concrete,

2) lock up free calcium hydroxide into C-S-H, virtually eliminating the threat.
Benefits of Pumice Pozzolan

**Mitigates Alkali Silica Reaction (ASR):** HessPozz is crushed to a fine particle size resulting in dramatically increased reactive surface area. The HessPozz is able to readily react with calcium hydroxide as it becomes available, and thereby traps any present alkali inside the densified cement paste. The addition of Hess ‘UltraPozz’ (3µ) speeds this reaction due to its extra ‘high reactivity’ index. The dense paste and the resultant alleviation of capillary action virtually eliminates alkali-silica reactions and efflorescence.
Benefits of Pumice Pozzolan

Protect Steel Reinforcement from Corrosion: As the preceding data indicates, concrete made with a ‘Natural Pozzolan/Portland Cement’ mixture can protect steel reinforcement by creating a matrix so densely packed that liquids and/or gases cannot penetrate to cause the steel to corrode. Where very high strength and superior durability are key, the addition of Hess ‘UltraPozz’ (3µ) can enhance both strength and the protection of rebar much like a silica fume (without the hassle). Also, the environmental friendly UltraPozz does not carry the carbon footprint of a Metakaolin as it has been naturally calcined by Mother Nature.
Increases Abrasion Resistance: Natural pozzolan increases the compressive strength of concrete and makes the concrete mass much less permeable and resistant to chemical attack. A clean, hard, and durable surface provides the best possible abrasion resistance.

Heals Autogenously: A unique characteristic of pozzolan is its inherent ability to actually heal or re-cement cracks within the first 30-60 days after hydration by means of continuous pozzolanic reactions with the excess calcium hydroxide produced during the reaction between water and cement. This results in the filling up of many of the micro-cracks inside the hardened concrete matrix.
Benefits of Pumice Pozzolan

**Reduces Permeability:** The leaching of water-soluble calcium hydroxide produced by the hydration of Portland cement can be a significant contributor to the formation of efflorescence and overall porosity in the concrete. The amount of “water of convenience” used to make the concrete workable during the placing process creates permeable voids in the hardened mass. Additional porosity (and efflorescence) is created as the calcium hydroxide, a by-product of the hydration reaction, migrates to the surface of the concrete via capillary action. A pozzolan will effectively eliminate this by reacting with the calcium hydroxide to form C-S-H before it migrates to the surface of the concrete.
What is old is new again. Welcome to the renaissance of pumice pozzolan. The only pozzolan and aggregate with over 2000 years of successful history in concrete.

Nothing else comes close!