National Park Service
U.S. Department of the Interior

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DSC TECHNICAL BULLETIN 04-01

Subject: Use of Non-Portland Cement Lime Mortar for Structural Applications

Discussion:

Natural Hydraulic Lime (NHL) mortars consist of lime, sand and water; they do not include portland cement. NHL is a product produced by burning argillaceous or siliceous limestone followed by reduction to powder by slaking, with or without grinding. Hydraulic lime has an initial set with water, and a secondary set by absorption of CO_2.

Hydraulic hydrated lime is produced by calcining a limestone containing silica and alumina (or a synthetic mixture of a similar composition) to temperature short of incipient fusion to form sufficient free lime to permit hydration, leaving unhydrated calcium silicates. Hydrated lime sets only by absorption of CO_2. This limits the thickness of the material.

Non-Portland cement NHL mortars have many desirable properties, including elasticity, permeability, and resistance to salts, weather, bacteria and vegetation growth. In addition, NHL mortars are self healing.

When compared to traditional portland-cement based mortars such as Types M, S and N, the NHL mortars have some limitations that should be considered by the designer. The 28 day compressive strength of Type S mortar is approximately 6 times that of NHL 3.5 with a 1:2 (lime to sand) mix ratio. NHL mortars take considerably longer to cure than portland-cement mortars, and in many cases do not reach comparable strengths even after 24 months of cure time. The 24 month compressive strength of NHL 3.5 mortar is 1251 psi, compared to the 28 day strength of Type S mortar which is 1800 psi.

Structural walls, such as CMU bearing walls or retaining walls constructed with NHL mortars, may need to cure for 24 months before a reasonable, although low, strength can be achieved. The low strengths can result in thicker, more expensive walls. In addition, the extended curing times can have a significant effect on construction schedules.

For more information, go to www.limes.us

Recommendation:

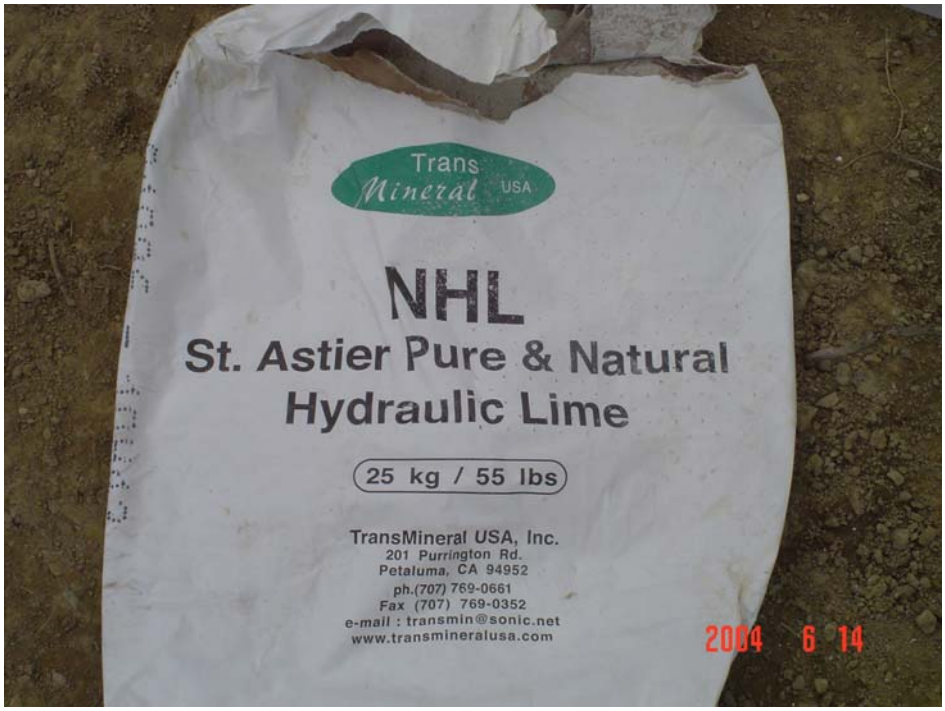
Engineers and Architects contemplating the use of NHL mortars for structural applications should carefully consider the unique properties of this material before specifying its use. A partial list of considerations includes:

- Strength
- Load demand on the wall
- Cure time
- Composition of backup material (for veneer walls)
- Composition of material being mortared (stone, brick, CME, etc.)

In addition, the use of hydraulic hydrated lime is not recommended for structural applications.

Images:

NHL mortar was used in this CMU retaining wall, as well as the stone veneer. Backfill heights were limited until the NHL mortar reached adequate strength.



Typical NHL product container.