

EARTH PLASTER

Summary:

Virtually all straw bale constructions are stuccoed with a cement, lime, or earth based plaster for moisture control, thermal resistance and storage, fire and pest protection, and to increase structural performance. Plasters are made up of a binding agent, the main component of the plaster, a structural filler such as sand, rock or aggregates, and water. Typically, they also contain a fiber such as straw, hemp, plastic, or mesh as an additive.

Binding Agents:

The binding agent in earth plasters is clay. Clay, unlike cement and lime, does not chemically change during curing and does not release carbon during production. Because the embodied energy in earth plasters is minimal due to not needing to be fired, minimal processing, and local availability, earth mixtures are considered to be the most sustainable of all plasters. The plaster can also be returned to the ground at demolition.

Clay acts as a very good, and very clean, water barrier. Clay attracts and absorbs large amounts of water causing the clay to expand and form a water-resistant barrier. Clays store moisture rather than wicking it through like with cement and lime. Also, clays absorb any moisture that is present inside the wall keeping the straw very dry. Earth plasters protect straw (and wood in the case of a post and beam construction) from decay by removing moisture that is present at construction and by preventing moisture from entering the wall.¹

Structural Fillers:

Sand is the most common filler for most plasters. Like reinforced concrete, it is best to use sharp and well-graded sand to encourage strength for compressive structural loads. Generally, it is best to use mixtures with little silt, as it will weaken the plaster.²

Fiber:

Fiber materials as an additive reduce cracking and increase ductility. Straw (or other fibers including manure or other plant fibers such as hemp) used in the mix can reduce erosion of the earth plaster by dispersing the water at the wall surface. Testing shows that using fibers can help an earth plaster last six times longer than a plaster without fibers. Earth plasters can be reworked indefinitely but must be recoated every 2-10 years, depending on the climate, to minimize erosion. Utilizing large overhangs can almost eliminate erosion altogether.³

Application:

A top coat of lime plaster can protect earth plasters. The scratch coat of earth plaster needs a deep texture and a coat of limewash will improve adhesion to the lime mixture.

1 Bruce King, Design of Straw Bale Buildings (San Rafael, CA: Green Building Press, 2006), 31-33.

2 King, 23.

3 King, 34.