# Safe and Sound Housing: Lime/Fly Ash Papercrete as a Substitute for Adobe in Seismically-Active Regions in Developing Nations

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My project involves developing a sustainable, affordable, and environmentally sound building material for seismically active regions in the developing world to use in place of adobe. This material utilizes the pozzolanic reaction of hydrated lime and Class C fly ash combined with pulped paper to make an 80% recycled building material that is strong enough to be a load-bearing wall. The formulas of lime/fly ash/ paper (16.5%/38.5%/45 % and 21.6%/50.4%/28% respectively) were tested for compressive strength, weight, fire resistance, and insulation value, then analyzed for cost These results were compared to papercrete made with Portland cement and to adobe. The testing revealed that the compressive strength was comparable to adobe; the insulating R value was up to 12 times that of adobe; the weight was 54% to 77% less than an equal-sized adobe; the material smoldered but did not flame. The cost could be as low as 12 cents (US) per New Mexican Adobe Standard-sized block. This lime/fly ash papercrete would cut carbon dioxide emission by 75% compared to cement blocks and 33% compared to Portland cement papercrete. Due to its light weight, the block width could be increased while still decreasing the mass, which is directly proportional to shear force. Lower shear force and reduced height to width ratios gives this material a better chance of withstanding an earthquake.

**Awards Won:**