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From Volcanic Ash Come Houses

by Peter Newton

Throughout the world, volcanic activity is feared as an awesome, destructive force. To researchers in Latin America, Africa, and Canada, however, volcanoes provide volcanic ash, a basic material for low-cost housing. Javier Quinones at the Centro de Investigaciones de Ingenieria at the Universidad de San Carlos de Guatemala and Ugandan officials are teaming up with materials - engineers at the University of Calgary and University of Toronto to build affordable housing using volcanic ash instead of Portland cement.

Portland cement, the most common building material, is expensive because of the large amount of energy involved in producing it. It must be fired at high temperatures and the transportation costs are high. The need for a viable alternative is immense, since much of the population in developing countries lives in inadequate housing. The prospect of reducing the cost hinges on reducing the price of building materials. Pozzolan cement made from volcanic ash is proving to be one answer. Javier Quinones' idea was to improve pozzolan cement with the hope of future large-scale production, following further research. He received funding for the project from IDRC, which put him in touch with Dr Robert Day at the University of Calgary.

Dr Day and the department of civil engineering are leaders in the development of pozzolan cement because of their work with "fly-ashes" (manufactured pozzolan). Alberta produces most of its electricity from coal-fired generating stations that produce fly ash as a by-product. Dr Day and his department have successfully promoted the use of fly ash in construction applications in Alberta. The use of pozzolan in construction projects is not a new idea. Farmers in Latin America have used volcanic ash to build dwellings and fences for decades. Early American studies in the use of pozzolan showed that cements made with pozzolan improved water resistance.

Pozzolan was used to build the San Francisco and Golden Gate Bridges. In all of these projects large quantities of pozzolan were discovered near the construction sites. Transportation and material costs were greatly reduced by using the local pozzolan deposits.

In the Guatemalan project, Quinones proposed making blocks for one and two storey dwellings. In a mixture containing about one quarter lime, natural pozzolan behaves like Portland cement. The two ingredients can be mixed by hand, then placed in block forms and cured by solar heat. The blocks must remain moist for the chemical reaction to occur and thus create a strong bond. Dr Day says houses built with these blocks will cost 50% less than ones using Portland cement blocks. About half of Guatemala's population, for example, lives in inadequate housing because of the high cost of building materials. The Guatemalans now plan to build four demonstration homes.

The project also encourages the use of alternative building techniques such as bamboo-reinforced walls and improved methods for securing the roof to the walls. Another IDRC-funded project to exploit pozzolan is under way in Uganda. Dr Day is involved in similar projects in Bolivia, Chile and Ecuador.

"Small-scale production is occurring in all of these countries. A few towns know about the technology and are putting it to use," says Dr Day. He says the biggest obstacle is trying to publicize the technology on a large scale and to establish a quality-control standard for building codes.

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