

WHEN THE FLOW OF OIL STOPPED: CUBAN EXPERIENCES

How the crisis called the “special period” affected Cubans after the collapse of Socialism in Eastern Europe is the focus of reflections upon those times by Cuban engineer Fernando Martirena, a founder of CIDEM, with Swiss architect Kurt Rhyner, a founder of Grupo Sofonias, both key players and motors of The EcoSouth Network.

In celebration of its 20th anniversary EcoSur will publish their reflections as a series on their website.

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The shortages had a great impact on the ongoing social housing programs and, as housing is a constitutional right for the Cubans, the government had declared that the housing program would continue to be a priority. The dramatic reduction in availability of materials like cement and steel and the closing of prefabrication prompted a local movement for the production of “low energy consumption materials”.

The MINFAR (Ministry of the Armed Forces) was the first sector to react. In 1991 it launched the “option 0” program, which bore in mind the local production of materials, aiming at building houses locally even when there was absolutely no oil or energy available. The Union for Military

Constructions shifted from building trenches and bunkers to the construction of social houses. They managed to gather together a group of enthusiastic advisers, many of them academics, who were given immense support to develop their ideas around the local manufacture of building materials. During these intense years, technologies like the Microconcrete Roofing Tiles (MCR), and Pozzolanic Cement CP-40 were transferred from abroad and further developed and disseminated throughout the land. In 1992 the main infrastructure for the manufacture of building materials at MINFAR had already shifted to a local, decentralized production. These programs were later abandoned, when the economy somewhat recovered.

The Ministry for the Sugar Industry, MINAZ soon embraced these ideas; however, their approach changed from “option 0” to “low energy consumption materials”. This term did reflect the needs of those times: to continue to produce with as little energy as possible. In 1993 CIDEM was asked to provide technical assistance to this ministry and an intensive program of technology transfer began, with the committed participation of other actors like the Center for Studies of Tropical Architecture and Construction, CECAT (*Centro de Estudios de Construcción y Arquitectura Tropical*) and the NGO “Habitat Cuba”.

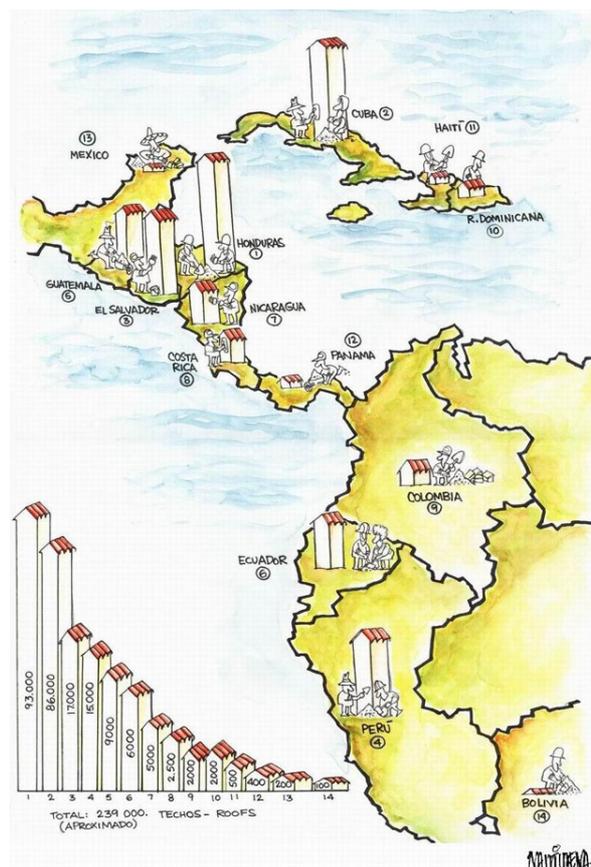
Micro Concrete Roofing tiles

MINAZ also assimilated the MCR tiles. The technology was introduced to Cuba in 1991 by Kurt Rhyner, the President of grupo sofonias and CECAT set up a national coordination center. Faced with high costs for the production equipment and inflexibility by John Parry, the only producer of quality equipment, they undertook re-engineering; improve it – above all to make it cheaper-



Tevi equipment

A group of academics in Havana, led by Dr. Jorge Acevedo undertook the task, and in 1992 the TEVI (*Teja Vibrada*, Vibrated tile) emerged as a product. During 1992-1994 the tiles workshops multiplied throughout the island and also in Latin America. Cuba had in 1995 some 220 tile machines in operation, with a nominal capacity of producing 500,000 m² of roofing per year. The boom of the technology also expanded outside Cuba; the manufacturing capacity grew fast. In 1993 the total reported production in the continent was 1,560,000 m² of roofs, this grew to 28,720,000 m² in 2003 when the last reliable statistics were collected. It can safely be assumed that by 2010 more than 40 million square meters have been roofed, that amounts to some 500,000 roofs. This production is achieved by some 600 workshops in 15 countries of the continent.



Developing Lime -Pozzolanic cement

The idea was very logical. MINAZ was the major sugar producer in the country; they used bagasse and straw to fire the boilers in the industry. The ashes of both materials had proven to be a very good pozzolanic material, which could eventually replace Portland cement in certain applications. Fernando Martirena studied and assimilated the experiences from academics and practitioners in Asia, and a local technology emerged: CP-40, which stands for Cal (lime) Puzolana (Pozzolan), should develop a compressive strength higher than 40 kg/cm² to comply with the Indian Standard IS 4098. CIDEM demonstrated that some of the material was really good; simultaneously the technology for locally grinding the cement was developed and massively produced; 160 workshops throughout the country were equipped and set into operation. During 1994-1995 MINAZ was able to produce 100,000 tons of pozzolanic cement.



Mill for CP-40 production

“Do it yourself”

It assimilated other technologies as well. Earth, viewed as a “noble” and quality material, inspired technicians and practitioners to profit from the heritage of Hassan Fathy who had described in his famous book “architecture for the poor” the great potential of sun-dried earth brick construction. A family of “do it yourself” booklets suddenly appeared and people began to build houses with earth, either stabilized with cement or not. Organic fibers like sisal and jute interested many curious builders, but their low durability in the presence of alkaline materials like cement was a real set back for their application.

Despite the reduced production of industrial materials, and the cut in programs of social constructions such as schools and hospitals, record figures were attained in the construction of houses. In 1996 the National Institute of Housing reported the construction of 57,000 houses. The decentralization reflected a change in the relationship between the houses built from state enterprises (14,000 houses) and those built through self-help with the participation of the population (43,000). The “microbrigadas” movement revived, and became a major player in the new programs. Certain that the problems could be tackled, the leadership remained optimistic that the future would allow the country to launch massive housing programs to build 100,000 houses a year.

Orlando Espinosa: two decades of MCR technology transfer

Kathryn Pozak



Orlando Espinosa recently sat down to lunch with us in the Jardín del Oriente in Old Havana, an ideal place to look back on some of the EcoSur experiences of the past two decades. Orlando is perhaps the person with the widest technology transfer experience in the EcoSouth Network, leaving behind functioning workshops and adroit tile-makers throughout Latin America, Africa and Asia.

Orlando is something of a wandering minstrel for the technology of micro-concrete roofing tiles (MCR) and has set foot on most continents. Not only does he know tile-making inside-out, he was closely involved in the development of tevi equipment and moulds. His teaching skills and organizational talents facilitate the launching of workshops as well as updating and polishing the skills of project directors and professionals.

When we asked Orlando about his most outstanding experience there was no hesitation. Tajikistan! He spent close to two years there in reconstruction projects after the civil war. During this time he was able to polish up the Russian he learned during his studies in Odessa.

In Tajikistan he set up 6 micro-concrete tile workshops to roof houses for refugees returning from Afghanistan. “The conditions were difficult, but the people were wonderful,” he enthusiastically declared. And, he discovered that women were the

better tile makers. Their diligence and attention to detail resulted in excellent tiles.



A mechanical engineer at CECAT (Center for Studies in Construction and Tropical Architecture), in the early nineties of the past century, Orlando was selected to be on the team that undertook the challenging endeavor to develop tile-making equipment.

It is to be remembered that this occurred during the "special period" in Cuba when resources were scarce. However, CECAT's visionary director, Dr. Ruben Bancrofft, recognized MCR to be a roofing solution for the housing deficit in the country.

Orlando continues his dedication to the technology and continues to inspire the upcoming generation of young engineers, architects and other professionals. Some of these young professionals have been part of the EcoSur team participating in reconstruction after last year's earthquake in Haiti.

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