

Source: La Prensa Grafica. El Salvador

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Seeking earthquake resistant housing

After the 2001 earthquakes, Japan has contributed to the country's development. Among its programs is the TAISHIN Project to support for the improvement of traditional adobe housing. In recent years we performed tests on a tilting table to improve the method of construction.

"With this manual, people can, with support of the community, build their own houses, with its human resources". Minoru Kobayashi, Deputy Director of JICA.

El Salvador is one of the countries that have suffered by the earthquakes. The earthquakes have damaged much of the infrastructure of the smallest nation in Central America, it shows the earthquakes of 2001, when it was observed that in rural areas and in several urban areas of the country, 80% of the housings were built with traditional adobe system, so many houses collapsed.

One of the reasons for earthquakes have made a tremendous impact on our country, independent of the magnitude, it is due to the materials that have been built housings. Housing infrastructure made with adobe system has been traditionally throughout the country, but many of these have been lethal to human life, as their seniority and weight have causing many deaths.

The adobe construction of popular usage, does not have an adequate reinforcement, and fall easily to the ground by a seism. However, others houses left with some damage than can being repaired, but often not properly.

These characteristics and needs led the country to seek foreign help to work on the issue of safe housing in 2001.

One of the organizations required was the Japan International Cooperation Agency (JICA), which began developing various projects in El Salvador, as the TAISHIN Project.

This aims to strengthen government management of the housing sector and promote the spread of the "Vivienda social" improved and earthquake resistant.

"After the earthquake of 2001, we received the request of El Salvador, for support with technical cooperation in the field of earthquake-resistant. We started this project with phase 1 in four constructive system for earthquake-resistant social housing: the enhanced adobe, concrete block, soil-cement and technical manual prefabricated system block panel, those have been investigated from 2003 to 2008", says Minoru Kobayashi, JICA Resident Representative Assistant in El Salvador.

Actually, in phase 2 the activities are complemented with different institution of society to strengthen, especially the Vice Minister of Housing and Urban Development, and standardize building systems.

This is compounded by the collaboration of partners such as the Central America University Jose Simeon Cañas (UCA), University of El Salvador (UES), the NGO Minimum Housing Salvadorian Foundation (FUNDASAL) and the Salvadoran Institute of Building (ISC), also collaborate with TAISHIN Project.

Manuals ready

From within the Vice Ministry of Housing and Urban Development, VMVDU, JICA carries out

its function through the TAISHIN Project. "I work in advising of the institutional strengthening, in the dissemination of knowledge of the resistant-earthquake. Now I study the construction approval system", says Naomi Honda, who arrived to the country in June, 2010 to help with the project.

Due to the studies and investigations that have been conducted in the country, in collaboration with architects and engineers scholars by JICA in last years, there is already housing manuals for four systems investigated.

"With this manual, people can, with support from the community, build their own houses, with their human resources", repeat Kobayashi.

Safe Homes

Trials for improved housing have been conducted in the Structures Laboratory of the University of El Salvador, UES, analyzing the seismic behavior of traditional adobe housing, the behavior of the wall in its perpendicular plane and the resistance in joints between walls.

This laboratory has built a tilting table that it's on a steel and concrete platform, which stands at one end so that there is a tendency to flip. This turning force generated perpendicular forces to its plane, according to its own weight and the angle of inclination of the platform.

Its outcome is essential to evaluate the proposal of strengthening of those houses that have been damaged by earthquakes and can be repairable.

Jorge Cea, Vice President of the Ex-Grantee Salvadoran Association of Japan (ASEJA), gives much importance to "the studies made in El Salvador by Salvadoran experts trained in Japan as ex-grantee". He adds "they have returned, have been prepared and work in the investigation of these systems for earthquake resistant social housing".

Cea adds that on "the seismic social housing developed here (in El Salvador), all investigations are at the service of the general population (at regional level), but as we are in the same region, conditions are almost the same".

New technologies

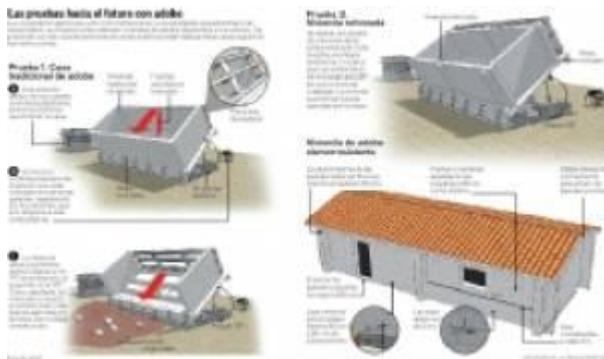
In the rural area is where you can find a lot of homes that have been made generally without any criteria or standard of construction, but always following the adobe houses.

"This is the second in a series of five models that will research and experiment to evaluate the behavior by using an additional boost to this structure. This reinforcement is known as welded wire mesh", says Carlos Escobar, Engineering and Professor at the UES and he is a Master formed at JICA.

Welded wire mesh

"This (welded wire mesh) is located in the corners, which are the most vulnerable and fragile (in the test performed) and generate a sudden detachment on the wall. They carry an array, in the midst of adobe are tied. All of this will allow a reduction in the damage or at least is going to allow that you have a reasonable time to leave out the house", reiterates the Engineer Escobar.

Kobayashi explains that although for the moment it have diffusion components such as housing systems, "is also important to normalize these building systems in a legally way."



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Taking examples

The work and tests carried out in the country by JICA and universities are taken as parameters for other countries like Honduras.

Seventeen Honduran (from the government, private and NGO) visited the country to follow the example of the work and research being done here.

They have a plan to deploy the system in Marales, an affected community in Honduras two years ago, which is near to the border with El Salvador.

27.8% of the houses in the country have adobe walls, wood, “bahareque” (constructive system made with vertical reinforcement with a local material called “vara de castilla” mixed with soil and water) and others, as the Sixth Housing Census.

The tilting table

Experiments started in 2003 with the beginning of the TAISHIN Project, and finished in 2008. Hence, to date, Phase II consisted of several experimental tests on the tilting table, that is in the Structures Laboratory at the University of El Salvador (UES). There we evaluate the behavior of the wall in the perpendicular plane and the resistance of the joints between the walls.

The iron platform measures eight meters long and 4.5 meters wide. An adobe house is the object of test.

A special mechanism is raised and the platform movement begins simulating an earthquake. The wall falls after a moment.

In a second test is experimenting with the side wall cracking with movement induced in the platform.

The wall falls due the constant movement simulated a earthquake. According to the type of material, are the characteristics of destruction.

The information obtained in the test is used to make an analysis of the type of materials needed for obtain stronger structures.