Quincha: A Peruvian Design-Build Experiment

Some projects have long histories. The story of this project begins in 1987 when a Canadian school of architecture together with a Peruvian school of engineering decided to construct a series of Design-Build projects funded in part by the Canadian federal government. The central focus of the project was the reinterpretation of quincha, an earthquake-resistant vernacular way of building in the coastal region of Peru. The result of this inter-disciplinary project was a series of schoolhouses constructed in a marginal settlement on the outskirts of Lima.

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THE PROJECT: RESEARCH THROUGH DESIGN-BUILD

In 1987 the Technical University of Nova Scotia School of Architecture (TUNS merged with Dalhousie University in 1997) and the Pontificia Universidad Católica del Perú (PUCP) embarked on a project to design an architectural system of seismically engineered quincha panels that would be deployed for the construction of a series of schoolhouses in Villa El Salvador, an informal settlement southeast of Lima. The project was funded by the International Development and Research Center (IDRC) of the Canadian federal government. The principal researchers of the project were Dr. Essy Baniassad 1, Dean of TUNS Architecture from 1981-1994 and Dr. Juan Bariola of PUCP School of Engineering. Although completed over twenty-five years ago the project still resonates today, as an international development project comprised of an interdisciplinary research team focused on sustainable Design-Build strategies using vernacular ways of building as an initial point of departure.

Although it happened almost two decades previous, the project, in a sense, was a response to the devastating Ancash earthquake that hit Peru at the end of May in 1970. It was the worst disaster ever recorded in Peru and resulted in 100,000 fatalities. As a result of this event, there was a greater emphasis to construct more earthquake resistant structures and seek alternatives to shoddily built concrete and brick buildings. As part of this mandate the School of Engineering at the Pontificia Universidad Católica del Perú created its Laboratory for Earthquake-Resistant Structures complete with a large format shaking table designed to test wall and roof panels. The Villa El Salvador project provided an opportunity for the lab to investigate the intrinsic earthquake-resistant properties of quincha, a traditional way of building on the Peruvian coast in which a lightweight wood frame with a cane infill is plastered with mud and concrete. Given that the local culture, in a sense, had 'forgotten' how to build in quincha, the project was a means to re-introduce quincha to the various communities and to codify an architectural language that was

traditionally a tacit knowledge – a vernacular way of building handed down through generations of builders and families on the coastal area of Peru.

Although the project could have easily have ended with the development of an engineered seismic panel and the development of an architectural language, the true value of the project was that it was tested through the design and construction of a schoolhouse in VES. It was vital that the research had concrete application and not end with the production of a report to a government agency [2] or an academic paper. Instead the project was vested in the engagement of a local community – an under-educated and economically disadvantaged one not accustomed to dealing with academics, engineers and a group of young architects from Canada. The project was challenged with the difficult task of gaining the trust of a community that had been ignored by official government agencies and as a result operated within a network of grassroots social support groups and an informal black economy.

Two years in its initial planning, the project was officially launched in February 1987 when Michael Carroll (the author of this paper) and Terrance Galvin boarded a plane for Lima, Peru. As recent architectural graduates of TUNS, they were to provide the architectural design for the project and interact directly with the Department of Engineering at PUCP and later with the various communities of VES. They were met in Lima by Dr. Bariola and his wife Doris Gonzales de Bariola. Although it was Dr. Bariola that led the project, it was Doris, an engineer that was a key player as the project co-coordinator and the main liaison between the university and the various communities in Villa El Salvador.

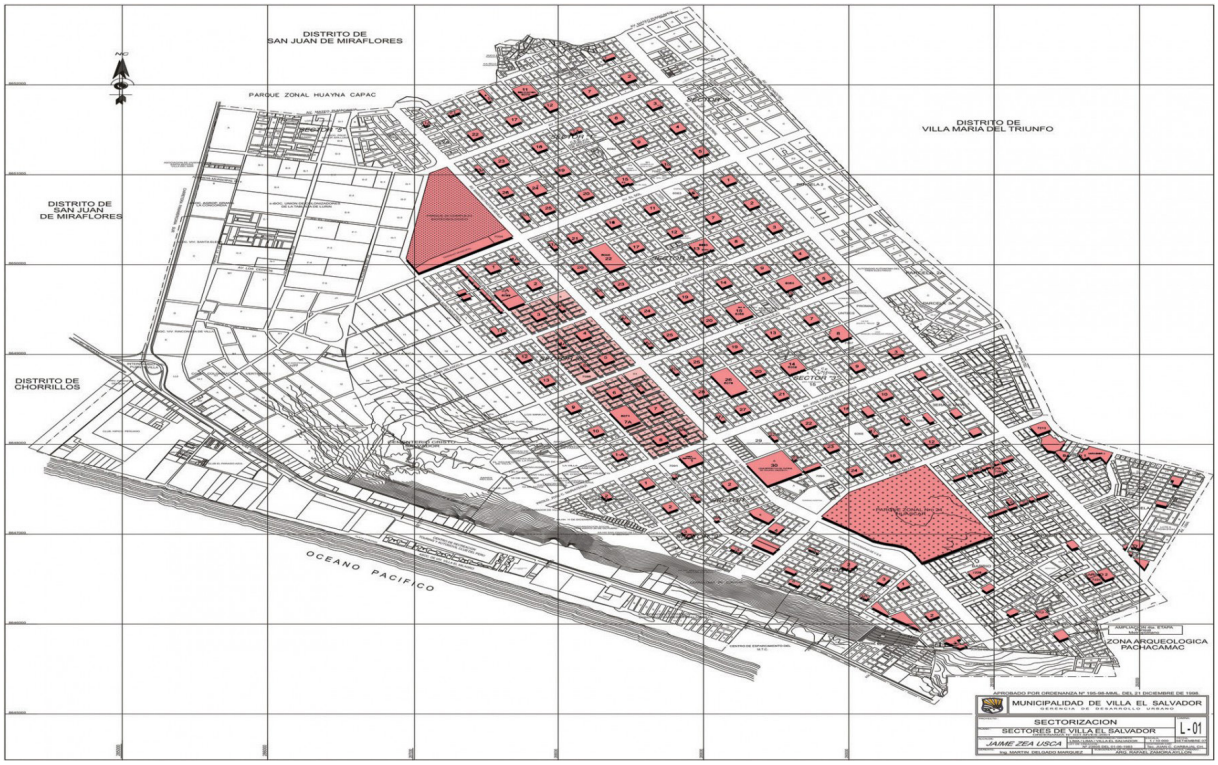
In the late 1980s, Peru and Lima, in particular, was a volatile place, on a daily basis the city was threatened by the activities of the Maoist-based terrorism regime, the Sendero Luminoso. For this reason, it was decided that Canadian team live in one of the most stable areas of the city, Miraflores – a prosperous area of Lima in high contrast to the settlement of Villa El Salvador some twenty miles to the south.

VILLA EL SALVADOR: PUEBLO JOVEN IN THE DESERT

Villa El Salvador (VES) with a population of approximately 382,000 (2007) began as a pueblo joven (shantytown) in the vast, empty sand flats south of Lima in 1970 because of the urgent housing needs of immigrant families who had left the sierra of Peru after events such as the debilitating Ancash Earthquake. VES is one of many informal settlements that have developed around the perimeter of Lima and like other South American cities is a prime indication of the urbanization of its once rural population. In the case of Peru, since the 1940s the urban population has increased from approximately 35% to a current figure that is in the range of 70%, with Lima and its 9,700,000 (2014) inhabitants as the major metropolis. Although an informal settlement, VES is actually a very ordered place in terms of its overall urban pattern. Its gridded urban plan proposed by the architect Miguel Romero in 1971, features a clearly articulated block pattern with wide boulevards and a series of main public squares surrounded by residential blocks. In the case of the project, one of the reasons why VES was chosen was because it had in place a well-organized community organization C.U.A.V.E.S. (Communidad Urbania Autogestionaria Villa El Salvador). This organization proved to be vital in establishing a relationship with the community – an essential aspect of the project, given it was the community itself who actually built the schoolhouses.

GROUP 8 SCHOOLHOUSE

As a start to Design-Build project, the first community to be chosen was the Group 8 community of VES, this was followed in later months by Group 5 and Group 1.



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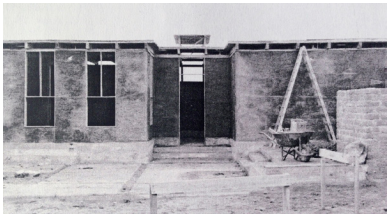
The Group 8 area in 1988 was one of the youngest sections of VES overlooking vast stretches of desert and comprised of shelters mainly constructed from straw mats. The existing schoolhouse was a one-room gable roof structure that measured 28'-0" by 20'-0" and although it was in relatively poor condition it was immediately decided that it should be kept as a component of the overall design of the new schoolhouse compound.

There were three initial meetings with the Group 8 community; the first in late February 1988 followed by the second the latter part of March and the third at the beginning of April. These meetings were very challenging given that the Canadian contingent of the team had acquired only a rudimentary ability to speak Spanish and was dependent on models and drawing to communicate to the Group 8 community. In this context, Doris Bariola was a true facilitator and managed to establish a very grounded relationship with the local community – conversing and joking with them as the team drank Inca Cola with the local store vendors and their families. It was also Doris who managed in the early days to connect to individuals within the informal economy of VES. This connection would prove to be essential in sourcing local building materials and having them securely delivered to the site.



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VILLA EL SALVADOR: PUEBLO JOVEN IN THE DESERT

In terms of the overall process, the community was involved in every stage of the process from the design to the actual construction. In fact, several residents were trained in construction techniques and headed the construction process that involved volunteer members of the community. For the initial schematic design of the Group 8 schoolhouse, various proposals were presented to the community. The residents responded with a sketch plan of a walled-in compound that included a new schoolhouse and a courtyard complete with a detached shelter for the toilets and a central hard surfaced area populated by a tree, a light and a flagpole. For the second meeting with the community, a physical model of a developed scheme was

Figure 1: Map of Villa El Salvador, Southeast of Lima, Peru. The gridded urban plan follows Miguel Romero's 1971 proposal. http://www.etruxes.com/architecture/wpcontent/uploads/2011/08/VillaElSalvador.

Figure 2: Group 8 Schoolhouse, Under Construction, September 1988 (Photo: Michael Carroll)

presented together with architectural plans and sections. The schoolhouse was now a symmetrical arrangement, two small classrooms flanking a central sky lit entry area. A new addition was a water holding tank that was in turn connected to washrooms. Given that the Group 8 sector of the VES did not have a water and sewer system, it was necessary that the project address water and waste management issues and provide an intermediate solution with the hope that one day the proper infrastructure would be built for this part of VES. Given that flush toilets were not an option a design was developed for the schoolhouse latrines with tiled stalls that could be cleaned with a water hose. A 'pozo negro' was constructed next to the washroom area.

AFFIRMATION OF VES: A LINE IN THE SAND

Perhaps the most exciting day for the initial stages of the project was the laying out of the foundation. In April 1988, Terrance Galvin and Michael Carroll marked the outline of the schoolhouse's footprint in the middle of the desert with pegs and string in order that community could begin excavation and pour the concrete footings. Within the Design-Build process, this primal, architectural act meant that the community was not only getting a new school, but more importantly, the future development of Group 8, a young, marginal settlement on the edge of the desert was affirmed.

COMMUNITY BUILDING

From its start in April 1988, the construction process lasted several months with the schoolhouse ready to be occupied at the beginning of December 1988. From the beginning of project, the community was involved in its construction with a paid core team as well as a group of volunteers. The first sign of the building was the brick water tank that marked the corner of the compound. This was followed by the excavation for the strip footings and the pouring of the concrete foundations and the slabs (interior and exterior). This work was completed in May 1988.

In June 1988, thirty-seven wood panels were constructed. The reinforced corner panels were erected first on the site followed by the remaining panels. It was not until the following month that the window panels were put in place. Due to the desert climate and relative lack of precipitation, the windows did not have glass, but instead were covered in a simple wire mesh. The windows were designed with low sills so that the elementary students could view outside. High clerestory windows provided privacy and helped in venting warm air to the exterior and ensured good cross-ventilation.

With the wood frames in place the next step was the installation of the top plate and the wood joists. This was followed by the laying of bamboo for the first layer of the roof construction as well as the application of the cane mat to both the exterior and interior surfaces of the schoolhouse. To ensure the structural stability of the structure, the corner panels were filled with concrete. This step of the construction met with some resistance from the architectural team given that traditional quincha construction is essentially a light construction, however, the engineers insisted that it was necessary within the parameters of their calculations.

In August 1988, the clay roof tiles were delivered to the site and the interior plastering of walls with cement/sand mix was completed by the end of September. This coincided with the last site visit to the VES Group 8 Schoolhouse by the TUNS architecture team comprised of Michael Carroll and David Benevides (who replaced Terrance Galvin in July 1988). In November 1988 the wooden windows were installed and the remaining exterior work was finished. By December 5th, 1988 the Group 8 Schoolhouse was ready to be occupied.

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Figure 3: Group 8 Schoolhouse, Excavation and Formwork for the Perimeter Footing and Foundation. May 1988 (Photo: Pontificia Universidad Católica del Perú)

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TRAVEL IN PERU: DESERT/MOUNTAIN/JUNGLE

Although the quincha schoolhouse could be seen as solely a Design-Build project, it was also centered on the notion of architectural research. The objective of which was to provide an architectural language for the assembly of the 2'-6" by 7'-9" seismically-engineered quincha panels that were developed at PUCPs seismic lab. In terms of developing an architectural language, it was essential that it resonated with the traditional quincha structures that could be found in the older neighborhoods of Lima, particularly in Barranco as well as the many towns that dot the Peruvian coastline such as Trujillo to the north and Pisco to the south. In order to develop an architecture that corresponded to its place, it was decided that travel throughout the country was essential, not only to experience, draw and photograph quincha buildings on the coast but also to become aware of the range of landscapes and ways of building in Peru from the tropical rainforests of the Amazon to the mountainous terrain of Cusco and Machu Picchu. As basic ways of building there are three types of earthen construction indigenous to Peru: adobe, tapial (rammed earth) and quincha. The latter is particular to the coast due to the absence of rain while the others are typical of colder and more mountainous terrain. The Inca civilization also perfected dry-stone construction in which large, irregular cut stones were meticulously fitted together to create not only buildings but also massive retaining walls.

The heavy construction techniques in the Andes provided a contrast and a heightened appreciation of the elegant and thin quincha buildings of coastal Peru. It was also noted that rooms and openings of traditional quincha structures were vertically proportioned making them conducive to natural ventilation. The travels throughout Peru were documented in drawings and photographs. Observations made such as the compound/courtyard typologies found in both the ruins of Chincha and the rural mountain settlements informed the plan development of the various schoolhouses. The proportion, detailing, color and textures of traditional quincha buildings also directly influenced the design and finish of the VES projects. Tempered with these observations was also a desire to create an architectural language that was not

Figure 4: Group 8 Schoolhouse, Erection of Wood Frames on Strip Concrete Foundation. Note: Michael Carroll in Conversation with Members of the Construction Team. June 1988

(Photo: Pontificia Universidad Católica del Perú)

overtly nostalgic but inherently critical, contemporary and highly responsive to the given situation of the project.

PROJECT INTERRUPTED

The story of the Quincha Schoolhouse Project would not be complete without mentioning an event that literally brought the entire project to a standstill and reinforced the team's resolve to forge ahead, complete the Group 8 Schoolhouse and ensure the continued operation of the project.

In August 1988, Dean Essy Baniassad, one of the principle researchers of the project was visiting Lima and staying with Michael Carroll and David Benevides at Hostal El Patio in Miraflores at 341 Ernesto Diez Canseco. It was the weekend and around noon all three were returning to the hostel from a nearby market where they had purchased fish and produce for dinner. In front of the five-star Miraflores Caesar Hotel, while in conversation with Michael Carroll, Dr. Baniassad was accidentally shot through the upper shoulder by a security guard of a nearby jewelry shop. The guard's target was not Dr. Baniassad but an alleged robber who had escaped through the streets of Miraflores on a bicycle. Still conscious, Essy was escorted by Michael and David to the gated courtyard of the nearby hostel. He was quickly brought to the British American Hospital where the bullet was removed (inches away from his heart) and he remained for several days in recovery.

Although a traumatic event, the entire team came together to ensure Dr. Baniassad received the best treatment and he was able to leave Peru in good form. After his departure both Michael Carroll and David Benevides, although shaken by the event, continued on with the project until the end of September. The shooting exposed the team to the violence and corruption that happened as an everyday occurrence in Lima and other Peruvian cities. Throughout the project, Doris Bariloa would inform the team of a number of public officials (including mayors) would have been maimed or assassinated by the Sendero Luminoso. It was unfortunate that our project was also touched directly by violence that had infiltrated every level of Peruvian society.

OTHER PROJECTS IN VES

After the departure of the TUNS architecture team from Peru in September 1988, Victor Yanez Aspilcueta, a local Peruvian architecture graduate was hired to continue the project. His tenure on the project lasted until January 1990. Although not thoroughly documented he continued to work on projects some of which were initiated by the TUNS architecture team.

In parallel with the Group 8 Schoolhouse, several other projects were designed for VES. This included a design for Group 5 Schoolhouse. The school had two teachers and about eighty students. The design included a new roof for the existing schoolhouse, as well as, an expansion that consisted of a new classroom, bathrooms and a storage area. Another project was for Group 1 central square that included a plan for a central park, a multi-purpose room and a pharmacy. The design of this project was initiated in July 1988 and was accepted by the community in late September 1988. The architectural design services included not only public buildings but also the design of private houses, usually for families who had contacted the architectural team while they were working in VES. These houses were exciting opportunities to expand the use of quincha in the community. The first house was for Oswaldo who lived in Group 8, the other for Antonio who was a member of our construction team and worked as an assistant surveyor.

AFTERMATH_ GROUP 8 SCHOOLHOUSE

Unfortunately, no post-occupancy report was done on the Group 8 Quincha

Schoolhouse – this is usually the case with short-term projects on limited budgets. One of the reasons to write this paper was to investigate what actually happened to the school some twenty-five years later. Although it was difficult to contact the various people involved in the project some people did respond. Dr. Terrance Galvin reported that friends of his tried to find the schoolhouse several years ago but were unsuccessful. He attributed this to the expansion of VES over the years and the many changes incurred within the Group 8 neighborhood.

From the site plan drawn as part of the design of the schoolhouse in 1988, it was possible to locate on Google Earth the Group 8 area with its typical central square configuration. Although some elements did correspond, the outline of the schoolhouse with its slight angle was not consistent with the footprint of current building. However, the resolution of the Google Earth image was low and vegetation and shadows further added to the image's lack of clarity.

In an effort to determine the current status of Group 8 Schoolhouse there was an effort to contact the project team in Lima. Fortunately, one of the secretaries for the project who worked at PUCP in 1988 did respond with an e-mail in which she relayed the following about the Group 8 Schoolhouse:

> "Alfredo (remember him? The driver of the CIID project?), well he is still working at the Catholic University and in the same place: The Structures Laboratory. He told me that 10 years ago, approximately, he had to go to Villa El Salvador (VES) and decided to visit one of the schoolhouses but he didn´t find it (probably they were brought down by the people who lived there). He thinks (out of the record) that people did not appreciate the type of construction and preferred to build with brick that is stronger than quincha because when the lattice is exposed to rain it causes that the mud to be less consistent, and therefore less safe." [3]

From this e-mail together with the Google Earth image and Dr. Galvin's comments, it seems reasonable to conclude that the Group 8 Quincha Schoolhouse was probably demolished around 2004 and was replaced by a brick structure. It would seem that in the end, the quincha construction, although more resilient to earthquakes, was not accepted as a viable alternative to the typical brick and concrete construction. Perhaps because it was seen as being imposed by 'outsiders', the quincha schoolhouse was not properly maintained and reached a point in which it was more expedient to demolish it and erect a brick structure. In the end, it would seem that cultures, as stated earlier can forget how to build and dismiss the inherent qualities of the local vernacular.

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Figure 5: Google Earth 2014, Image of Group 8 Central Square. Unfortunately, it does not correspond to the original site plan of the Group 8 Schoolhouse.

CONCLUSIONS_ LEARNING FROM VES

Twenty-five years later, it is difficult to write a conclusion to the project. However the following are some observations and lessons of the project that hopefully will be insightful for future Design-Build projects located in developing countries:

Firstly, the translation of the tactic knowledge of the vernacular way of building into a well-articulated system of design takes careful observation of the built environment and in-depth conversation with the local culture. In the case of VES, this process was probably too fast and some basic qualities of quincha construction were overlooked. In the end, the quincha panels in order to satisfy the engineering criteria were filled with concrete and inherent lightness of the quincha construction was missed – more pressure should have been placed on the engineers and the architects to achieve a quincha panel system that tested the limits of the given materials and not default to an over-engineered and an over-designed system of construction. An optimized system in the end would also mean doing more with less – a worthy objective given the project's context.

Secondly, although the international collaboration was a success, there were also some inherent tensions within the team make-up, particularly in regards to fluency in Spanish and the lack of Peruvians on the architectural design side of the project. For the first year of the project, Canadians who were recent graduates of TUNS carried out the architectural research. They were: Dr. Terrance Galvin, February-June 1988, Michael Carroll, February-September 1988 and David Benevides, July-October 1988. However, this changed in 1989 when a local Peruvian architectural graduate was hired. Victor Yanez Aspilcueta headed the architectural team from October 1988 to January 1990.

One of the most positive aspects of the Canadian involvement in the project was the keen sense of observation that comes from being an outsider to the local culture. Those familiar with the landscape and the traditional ways of building may take them for granted and miss their inherent potential to inform future design strategies and processes. Also, sometimes 'misunderstanding' may lead to insightful understandings of a given situation – this can be as simple as elementary explanation of a Spanish word that leads to a deeper appreciation of its meaning – by both the local and the outsider.

Thirdly, the tensions that developed in the project between theory and practice, the university and the community, the lab and the field are a good thing. Given the project's structure there was a continuous system of checks and balances between the university lab and the fieldwork in VES. This back and forth process was highlighted by Doris Bariola in her paper entitled *Imagination and Urban Development in Villa El Salvador, Lima*: " As a general methodological approach the empiric-practical, trail and error method was chosen, going from practice and theory and then back to practice, which would gradually adapt the solutions to the actual conditions." [4]

Fourthly, the follow up on projects like the project in Peru is sadly lacking. Given this was a research project there should have been a more systemized method of accessing the success of the project. In this case once the project was finished, there was very little documentation of the project in the years that followed – particularly on the architectural side. Twenty-five years later, it was very difficult to trace the development of the project after it has been occupied by the community and absorbed into their neighborhood and the development of the Group 8 community. More funding should be made available by the research centers for post-occupancy evaluation so lessons can be learnt in the wake of the project's completion. If follow up has been made to the Group 8 community perhaps the alleged demolition of the schoolhouse may have been avoided. However, it must be stated that the project's intentions were laudable ones and the response to the quincha projects in VES were very positive in the years immediately following their construction.

ENDNOTES

1. After his departure from Technical University of Nova Scotia, Professor Baniassad was Chair and Professor of Department of Architecture, Chinese University of Hong Kong.

2. An annual report entitled Investigations into Quincha Construction on the project was submitted to IDRC in 1989. It was written and designed by Michael Carroll and was published by Technical University of Nova Scotia, Halifax, N.S.

3. E-mail from one of the secretaries who was part of the project team was received in August 2014 together with images of Group 8 Schoolhouse construction.

4. *Imagination and Urban Development in Villa El Salvador, Lima*, Hortensia Ferrand De Piazza and Doris Gonzales de Bariola in Moral Imagination and Character Development, Volume II, edited by George F. McLean