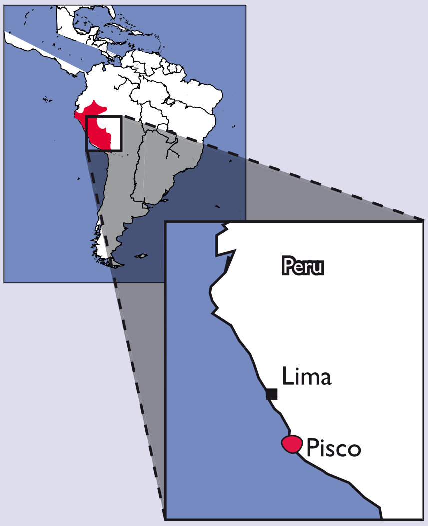
C.2 Peru - 2007- Earthquake

Overview of the response

Summary

On 15 August 2007 there were two major earthquakes separated by nearly one minute. This was followed by a three-metre tsunami that caused some damage along the coastline. The earthquake killed nearly 600 people and injured more than 1,800. Some 48,000 houses were destroyed and a further 45,000 were rendered uninhabitable. In total, 140,000 households were affected. The majority of the affected population lived in towns.

The three case studies included here are responses by non-governmental organisations. One rapidly distributed construction materials using existing community structures, one built shelters providing some cash for work on the shelters and one used contractors to build shelters with the shelter owners. All of these projects worked with those who already had land.



Earthquake location

The area that was most affected is situated in a desert area with high temperature variations and little or no rainfall. In the more mountainous areas that were affected, cold is a severe problem.

Access was significantly easier in the towns in the coastal area, and responses were correspondingly swifter and larger. Much of the response in the first weeks was from people within the country itself.

Response

The major focus of most responses was to support people to build on their own land. This left gaps for the landless who did not qualify for many assistance programmes. Some programmes provided shelter materials for those without land that could be later transported as land became available.

The shelter responses included:

- distribution of blankets, plastic sheeting, cooksets and other shelter items;
- distribution of tents (one organisation purchased over 13,000 tents);
- support for the construction of standard shelters through cash for work, training and carpenters; and
- support with rubble clearance, in coordination with the local authorities.

Government response

The government of Peru based their response on a plan developed by the Colombian government. Actions were divided into four stages (emergency, transition, reconstruction, termination), each with its own set-up and responsibilities. After eight months, the transition stage gave way to the reconstruction stage.

Fifteen days after the earthquake, the Central Peruvian Government created a reconstruction agency called FORSUR, which had a mandate to rebuild houses and infrastructure.

Five months after the earthquake, the Peruvian Ministry of Housing began distributing bonds for approximately US$ 2,000 to affected families who had land titles to their properties. These bonds were to help people purchase materials to rebuild homes. Families without land titles did not have access to this state programme.

Rubble

By January 2008, only one quarter of the rubble (nearly 2.1 million cubic metres of the total 7.8 million cubic metres) had been removed. Rubble removal did not advance as quickly in rural regions further inland.

Some programmes supported people to build lightweight shelters so that landless people could benefit from assistance programmes.

Some people with no other options found short-term shelter immediately after the earthquake in tents and camps.

C.3 Peru - 2007 - Earthquake

Case study: Community mobilisation

Project type:
- Community mobilisation
- Flexible package of shelter construction materials
- Self-build
- Training manual distributed

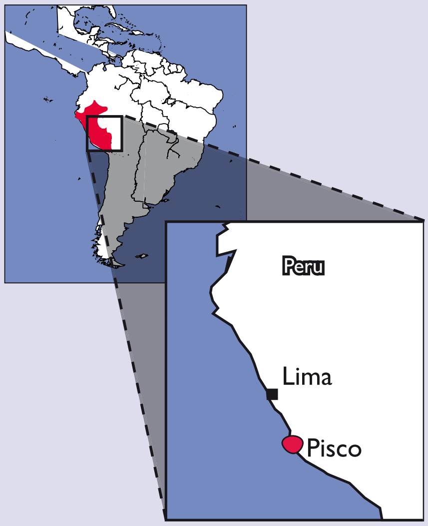
Disaster:
Peru earthquake, 15 August 2007

No. of houses damaged:
Over 48,000 houses destroyed; 45,000 uninhabitable

Project target population:
726 families
Just under 1% of the earthquake-affected population

Occupancy rate on handover:
Very high

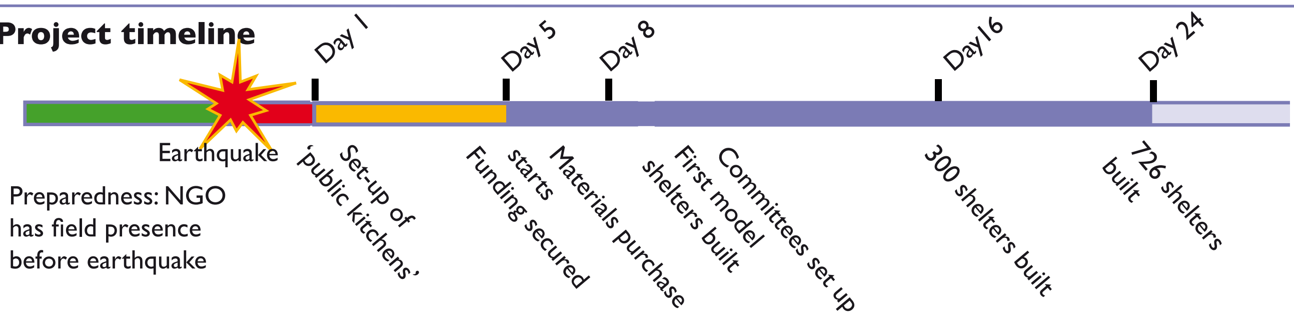
Shelter size
Materials distributed to create 9m² of covered space per family (to be supplemented by reclaimed materials)



Summary

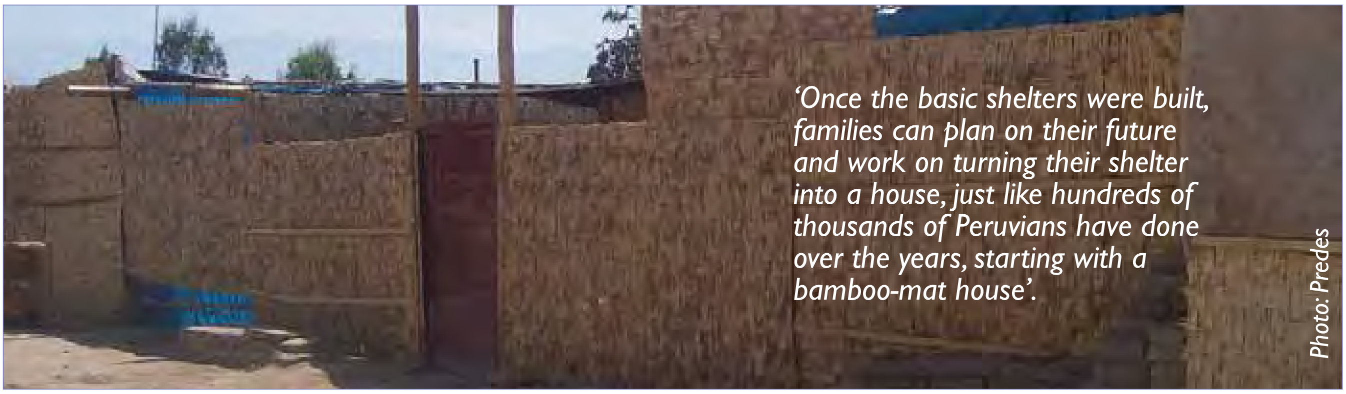
Following the earthquake of 15 August 2007 near Pisco (Peru) a local NGO set up 40 neighbourhood 'public kitchens'. These became a means to mobilise communities to distribute reusable construction materials for those most in need. Materials were selected that would have a longer lifetime than just the emergency phase. Technical support was provided in the form of a manual that had been written before the earthquake, and a carpenter who provided technical support where it was most needed. The speed of the response was possible due to the presence of the implementing NGO on the ground prior to the emergency.

Project timeline



Strengths and weaknesses

X Very quick response appropriate to the context allowed people to soon return to income-generating activities.
X By creating more solid shelters, there was greater safety against burglars than would have been provided by lighter-weight shelters.
X The project sucessfully used materials that kept funds in the local economy.
X Using community structures that were not initially designed to manage a shelter project can lead to a fast and effective response (Note: Collective feeding centres may not be advisable in all circumstances.)
W Bulk local purchase of materials can lead to them becoming scarce and cause price rises. The project stopped when mats became scarce in the market.
W Technical support provided to families was limited.



Selection of beneficiaries

A public kitchen was the basis of the project management. In the first stage it had 40 groups, each with a designated responsible person. Most of the groups were led by women. They became the centre of all project activities and organised frequent assemblies to discuss all aspects of the project and take decisions. The whole project was conducted in close coordination with the municipality.

Within days of the earthquake, the NGO was able to present the project ideas to the communities via the 'kitchen group'. Most opted into the project, while some decided to wait for better offers. Some of those who opted out were still waiting for support eight months later.

The beneficiaries were chosen based on a list of criteria, including: loss of shelter, family situation, vulnerability, poverty, residency in the area, and willingness to build the structure.

Every selection was to be approved by the assembly of the kitchen group, which was something like a 'block committee'.

Technical solutions

In the coastal regions of Peru there is a long tradition of constructing semi-permanent shelters using bamboo. In the past, immigrants to Lima and other cities have established themselves with simple structures, leading to the step-by-step construction of a formal house.

While the bamboo mats are not considered a formal construction material, the climate allows people to live in such structures. Many of the disaster-affected people had lived in structures made from bamboo at some time in their lives.

The project was based on community soup kitchens as a starting point for social mobilisation.

Materials distributed

Materials	Quantity
Bamboo mats 6 walls, 3 ceiling, 1 door	10 mats
Round poles (for columns) 3" diameter, 3m long	12 poles
Round poles for beams and roof joists 2.5" diameter, 3m long	11 poles
Timber for fixing the mats	7 beams
Reinforced plastic sheet	3m x 15m
Nails 2", 3" and 4"	2.2 kg
Wire	1 kg
Hinges	3 units
Lock	1 units

Implementation

Every family was responsible for the construction of their shelter. This allowed them to make adaptations dependent on available space, using materials that they had rescued.

The preselected beneficiaries were visited by the coordinators of the community kitchens together with somebody from the NGO or the municipality to check whether they complied with the following criteria:

- People had to be occupiers of a house on a plot of a land before the earthquake.
- Their plot had to be cleared of debris in order to place the shelter on it.
- One family member had received instructions on how to build and had participated in the construction of a model structure.

Beneficiaries were first given wooden poles and received the mats only when the structure was properly assembled. Materials were distributed by the block coordinators. Most families ended up digging a new latrine on their property.

Transporting the mats for a shelter to site

Logistics and materials

The wooden poles and woven bamboo mats were purchased from local production in the informal market. Plastic sheeting and hardware elements (nails, hinges, etc.) were centrally purchased.

The materials were shipped to San José, where the municipality provided the football stadium and another building as storage areas.

The trucks were unloaded by the potential beneficiaries. The implementing NGO organized and was responsible for the warehouse management.

The materials were given to the beneficiaries when they presented vouchers issued by the coordinators.

Building with these materials costs about 25% of what some other local organisations spent on their provisional shelters made of timber or low-grade galvanized sheeting. However, the local market had a limited capacity to deliver bamboo mats - an issue which, in the end, led to the ending of the project.

Family shelter built during the project

Making a basic shelter

C.4 Peru - 2007 - Earthquake

Case study: Self-build transitional shelters

Project type:
Transitional shelter construction
Self-build
Rubble removal

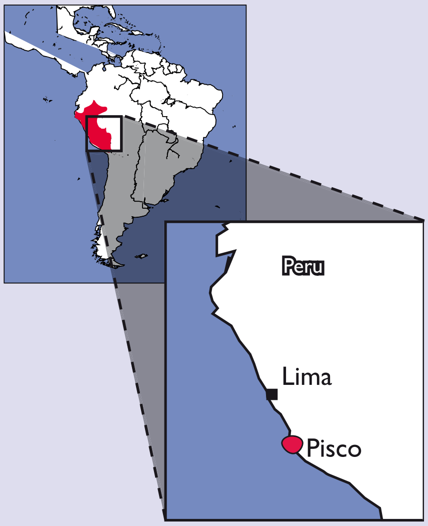
Disaster:
Peru earthquake, 15 August 2007

No. of houses damaged:
Over 48,000 houses destroyed; 45,000 uninhabitable

Project target population:
706 families (3500 people)
Just under 1% of the earthquake-affected population

Occupancy rate on handover:
Very high

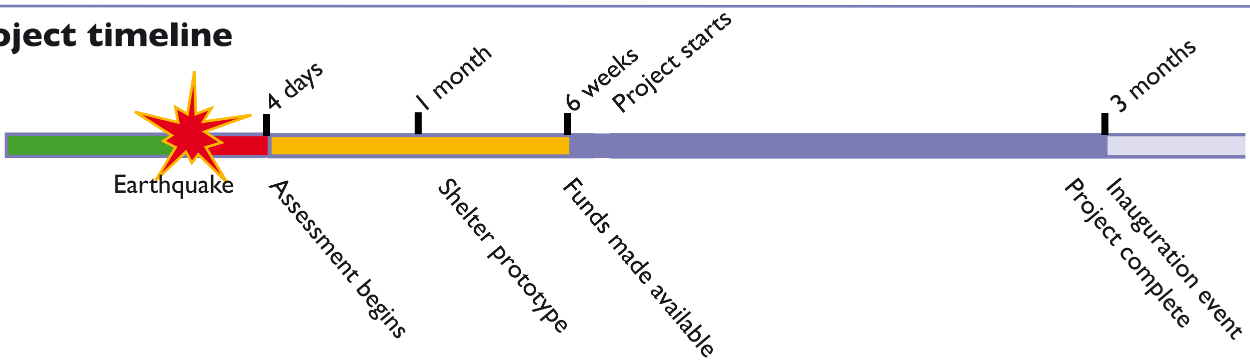
Shelter size
18m² covered space per family



Summary

An international NGO with no pre-disaster presence in the area implemented a programme to build emergency shelters made from reed mats, plastic sheeting, cement and wooden poles. The project was part of a larger programme that put particular emphasis on livelihoods for the affected population. In addition, it integrated water and sanitation interventions into the shelter programme.

Project timeline



Strengths and weaknesses

X The project paid special attention to the potential of shelter-related cash-for-work activities to speed up livelihoods recovery.

X Materials were procured through local suppliers, ensuring that cash remainied in the regional economy.

X Families were able to preserve materials for reconstruction and were given materials that they would be able to reuse.

X The project was integrated with sanitation and water supply projects.

- By directly implementing the project, significant amounts of time were required to manage the project and its logisitcs.

W It was difficult to procure the materials (woven mats and timber poles) locally. They had to be imported by suppliers from other parts of the country. The competition in the market from the demand and from organisations aiming to assist led to local price rises that affected the disaster-affected communities.

Rubble clearance

Fabricating doors

Selection of beneficiaries

Community leaders were initially requested to identify beneficiaries. These beneficiary lists were validated by the field assessment team, including interviews to validate the selection of each family. Lastly, a community meeting was held to establish who was to be included in the programme.

Most families had no formal land title, so shelters had to be easy to dismantle and remove if required.

Technical solutions

The shelter provided had an area of 18 m^2, enough to host a family of five. The shelter area was chosen based on Sphere indicators. The shelter itself consisted of a timber pole-framed structure with a soil-cement mix as flooring. Plastic sheeting covered the timber structure and woven reed mats were placed on top of the plastic sheeting to increase insulation and durability. Some shelters incorporated reclaimed materials, particularly mud blocks and doors. However, higher-value reclaimed materials, such as timber beams, were often stored by families to be used in the future construction of permanent housing.

The basic shelter design was arrived at by asking three carpenters in an affected community to build a sample shelter. Members of the community vetted the shelter design and a pilot project was then implemented. The shelter design was modified during the pilot to improve labour productivity and efficiency in the use of construction materials. It was expected that the shelter materials would be later reused in the construction of adobe houses (e.g. plastic sheeting used as a water barrier in the clay roof) or that the shelter as a whole would be reused as a kitchen.

Implementation

This shelter project was part of a programme that included shelter, cash for work, sanitation (where destroyed), small grants for businesses and transitional classrooms for schools. The cash-for-work project included debris removal (employing 100 women for two months) and payment for families who could not build for themselves. The sanitation project included the repair of destroyed latrines.

The project was implemented by a team consisting of one project manager and a team of ten final-year engineering student volunteers, each responsible for the shelters of around 65 families.

The project was conducted in close consultation with the local authorities. Before distribution of materials could take place, each family had to clear the debris from their damaged house into the street.

Making the concrete floor slab

The mayor had the responsibility of removing the debris from the streets in trucks. The programmes supported the authorities through cash for work for debris clearance.

Logistics and materials

As the project continued, the supply of timber poles and mats increasingly became a problem, as a result of large-scale purchasing by organisations and local purchasing by affected communities. This led to local price increases. All purchasing took place through local suppliers, who brought timber in from elsewhere in the country.

Timber poles proved easier to procure than sawn timber and the local population was accustomed to building with them.

Distributing cement

Round poles, not sawn timber, were used

The materials were delivered to a central location; homeowners were responsible for transporting the materials for the shorter distances to their plots. The community was responsible for providing support to those members of the community unable to transport their materials.

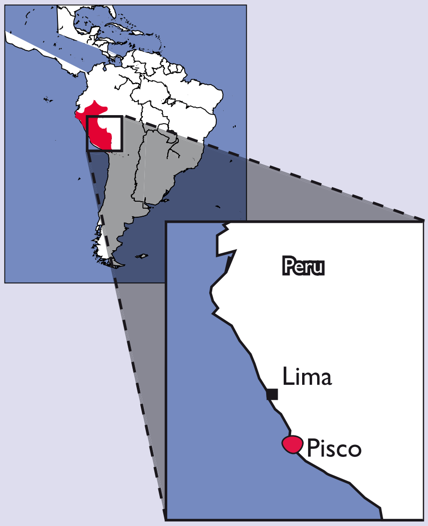
Materials for one shelter

Material	Quantity
Wooden round poles 10cm x 2.5m	7
Wooden round poles 4cm x 6m	15
Plastic sheeting (m^2)	60
Woven reed mats 3m x 2m	9
Portland I cement 42.5kg bag	2
Construction wire	5kg
Hinges 1.5”	3
Nails 1.5”	0.5kg
Skilled labour (hours)	2.6
Unskilled labour (hours)	4

Shelters under construction

C.5 Peru - 2007 - Earthquake

Case study: Prefabricated transitional shelters



Project type:
Transitional shelter construction
Shelter components prefabricated by contractors
Shelters assembled by homeowners

Disaster:
Peru earthquake, 15 August 2007

No. of houses damaged:
Over 48,000 houses destroyed; 45,000 uninhabitable

Project target population:
1,900 families in five selected communities
On project completion, an additional 120 shelters were requested by the government to help house those left landless by the earthquake.

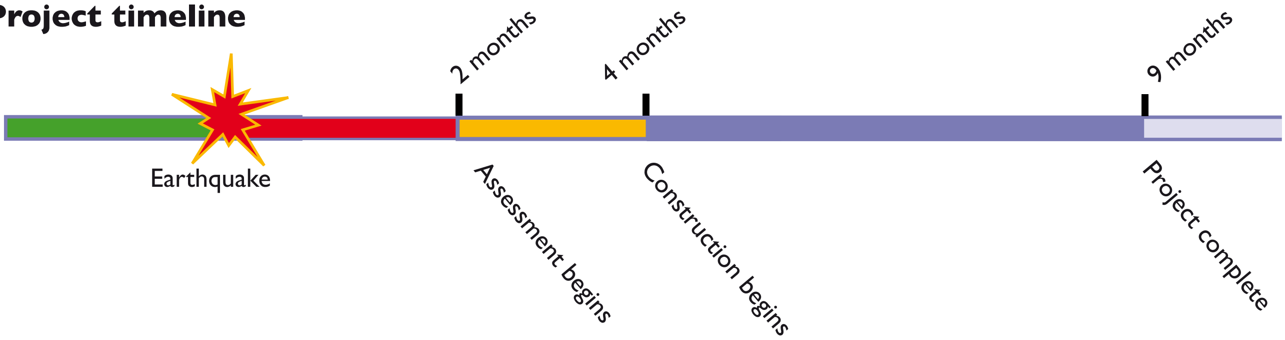
Occupancy rate on handover:
Very high

Shelter size
Materials distributed to create 18m^2 covered space per family.

Summary

As part of a larger post-earthquake programme, an international organisation hired a contractor to provide materials, equipment, tools and skilled tradesmen for the prefabrication of 1900 shelters. The contractor was also responsible for training all volunteer labour as needed, but was not responsible for providing land. By prefabricating wall panels and window frames and cutting timber on site, the supplier was able to cut costs. Homeowners themselves assembled the shelters.

Project timeline



Strengths and weaknesses

X This project successfully used a contractor to build semi-permanent shelters for families, thereby passing on the challenges of procurement and logistics, as well as many of the risks of a construction project.

X Setting up local 'factories' to prefabricate components, reduced logistics and supply challenges, and the ensuing costs.

X The project was able to adapt to suggestions made for structural improvements to the shelter design, following an evaluation early on in the project.

\- The construction approach required significant capacity on behalf of the contractor and constant monitoring by the humanitarian organisation. An ongoing dialogue between the humanitarian organisation and the contractor was essential.

\- The project initially prepared all materials for a village before construction could begin. This was later adapted so that materials were prepared for only 20 houses at a time before construction began. This was more efficient and kept the community more motivated.

W This project took four months to begin.

Completed shelter built on the roof of a damaged house

Selection of beneficiaries

Communities were selected by analysing the gaps and noting that no other organisations were working in the areas. Families within communities were prioritised based on need and individual vulnerability.

Beneficiaries needed to prove ownership of land before qualifying for the project. The criteria were later relaxed so that those awaiting ownership certificates as the result of wills of deceased family members could qualify for the project without holding the formal land ownership certificates.

Families who were at risk and relocated from the 'no return zone' had to wait in temporary shelter on squatted allocated land for over nine months before they could be allocated land and qualify for a shelter.

Technical solutions

The shelter design was a rectangular, single-storey, 18m^2 (3m x 6m), wood-framed, shed-roofed building. The side covering was vertical, tongue-and-groove wood. Each panel was approximately 1cm thick and approximately 10cm wide. The shelter had one door and a large window on one long wall (at the front). The roof was a shed style made with lightweight, corrugated cement panels approximately 1m wide and about cm thick. The roof panels were long enough to run the full width of the roof. The flooring used pre-existing concrete slabs.

Each house took approximately eight hours to construct once the prefabricated materials were transported to the site. The idea was that all materials could be later reused.

All tools needed by the homeowner to build his/her shelter were supplied by the contractor and were left with the homeowner at the conclusion of the programme as a home maintenance tool kit.

Implementation

The initial contract was for 500 shelters. Costs rose 25% for subsequent shelters, due to local cost escalations.

The contractor set up a materials manufacturing 'factory' in each project area. At this site, the contractor's employees (using some local labour) cut, planed and finished the wall frame units. Only the contractor's employees used power tools.

Families were responsible for rubble removal, site cleaning and marking out the shelter location. If the old floor

The raw materials were prepared in workshops set up in the communities where shelters were to be built.

Completed shelter built on the roof of a damaged house

slab could not be reused, or there was no existing slab, the homeowner was required to pour one. In some cases homeowners made their floors after construction. Employees of the contractor and trained community members provided guidance and oversight for the mixing and pouring of concrete.

Homeowners transported the materials from the 'factory' to their home. They then installed the tongue-and-groove wall sheeting onto the six wall-framing panels. Company employees and trained community members then assembled the sided frames (two for the side walls and four for the front and back walls) with assistance from company advisors. Families nailed the structures together and added the doors and windows.

Quality Control

Supervision and quality control were done by the contractor's staff. The contractor had one engineer and one project manager (who supervised), and five skilled workers who cut the timber. The homeowners transported the prefabricated shelter materials and assembled them on site. The only carpentry skill that homeowners required was the ability to hammer a nail and follow connection directions.

Monitoring took place through a team of approximately 30 volunteers, of whom 15 were active in the field on a daily basis. Of these, five or six worked with the contractor on a daily basis and mobilised community volunteers. The rest worked in the community, helping with registration, land rights and other emerging issues.

Safety and Liability

The contractor maintained control of the cutting and assembly yard and its employees, and controlled access to hazardous places. Since the contractor owned, controlled and supervised the operation they were the main liable entity.

Each community established a safety committee that controlled access to the cutting and framing site, as well as the assembly sites. In general, community activities were provided for youth and children to keep them entertained while their families were building their shelters.

Logistics

By delivering basic raw materials (rough timber, tongue-and-groove wall sheeting and corrugated iron, cement panels, nails, etc.) to the building site, logistics requirements were reduced. Warehousing was also reduced, since non-value-added raw materials took up less space than fabricated material components. Component costs were reduced by directly employing people on site to fabricate them. These people did this work as only a part of their salary. Everything was fabricated as needed on site and according to specification. This approach also provided a 'just-in-time' inventory system, but required the hiring of additional skilled staff by the contractor.

Bill of quantities

Item	Quantity
Wood (tongue and groove) 2.48m	68
Wood (tongue and groove) 2.3m	43
Wood (tongue and groove) 42cm	10
Wood (tongue and groove) 32cm	16
Wood (tongue and groove) 1.01m	16
Wood (tongue and groove) 2.48m to 2.30m	70
Nails	1kg
Wood strips 3cm x 6cm x 3m	2
Wall plates 6cm x 6cm x 2.5m	3
Hinge, steel 2.5"	7
Corrugated roofing 3m x 1m	6 sheets
Instructional manual	1
Plastic tape 1cm x 15cm	8
Screws	3

One toolkit was distributed per group of workers.

One of the project's shelters (background) and a shelter walled with reed mats (foreground)