

VOLUNTEER CONSTRUCTION MANUAL



Habitat for Humanity El Salvador



MISSION

“Habitat for Humanity El Salvador works in association with God and with diverse people from all over the world to develop communities with people in need through the construction and renovation of houses, ensuring that all people have adequate housing in their communities and experience the love of God living and growing in all that God does.”

Purpose of this Manual:

This manual is a general guide for all volunteers who collaborate with Habitat for Humanity El Salvador in the construction of adequate housing for low-income families.

Get to know El Salvador!

Spanish

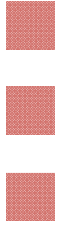
<http://www.elsalvadorturismo.gob.sv/departamentos.htm>

English

<http://www.elsalvadorturismo.gob.sv/ingles/departamentos.htm>



Construction Check List



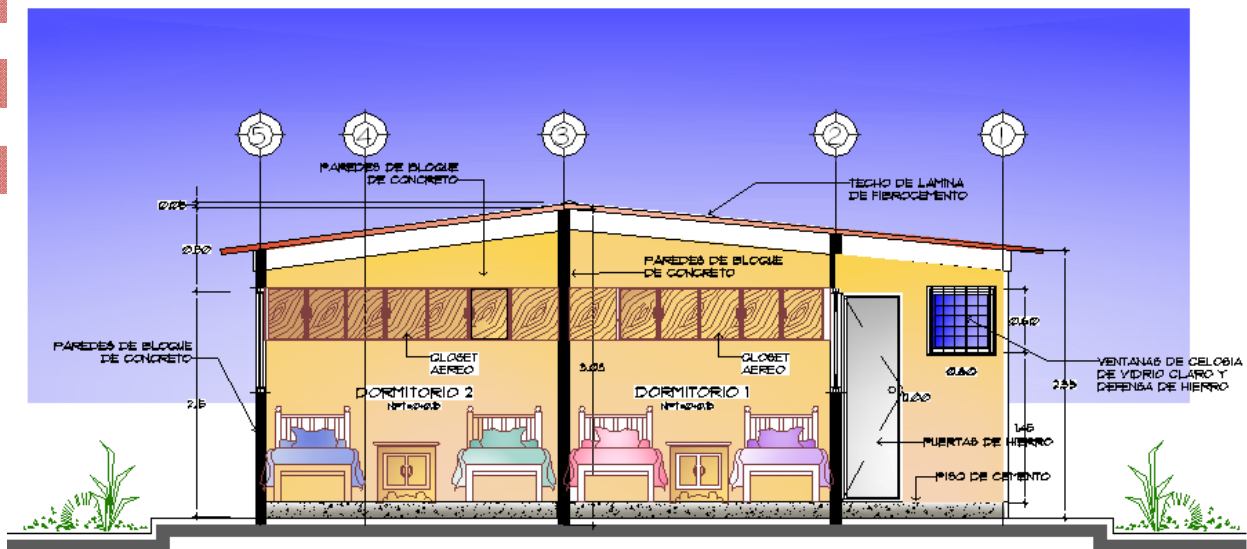
1. Read this manual carefully.
2. Visit your doctor and if possible, start an exercise program so that you will be in shape for construction work.
3. Review the climate in El Salvador.
4. On the construction site
 - Wear work gloves, long pants, and closed-toe, hard-soled shoes with good traction
 - Put on sunscreen
 - Wear sunglasses

Description of the Houses

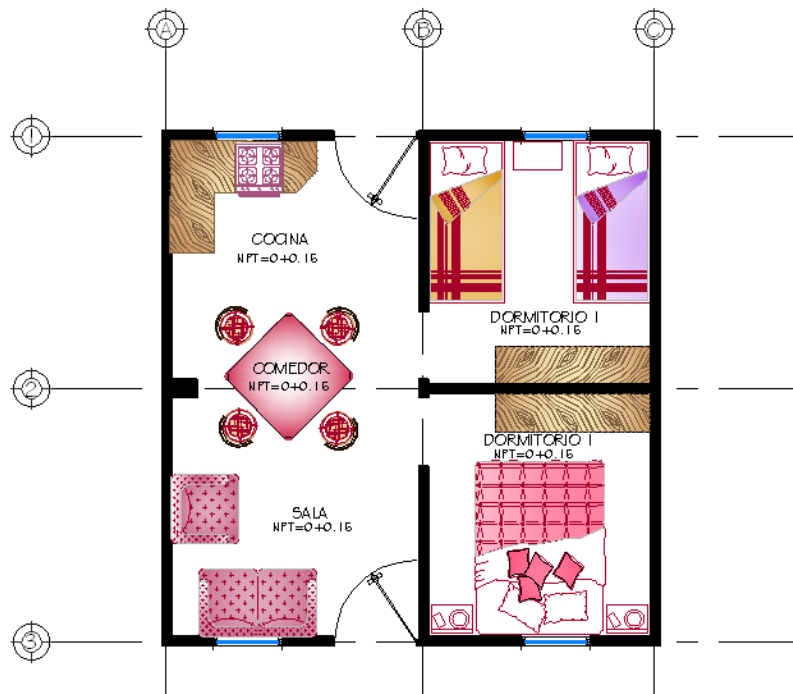


- The Habitat homes in El Salvador range in size from 22 to 34.8 square meters.
- The walls are made of concrete blocks and are reinforced with steel.
- The roof is made of fibro-cement or metal (zinc-aluminum).
- The floor is made of cement.
- Each house includes a bathroom or a latrine.

Architectural Details of the Houses

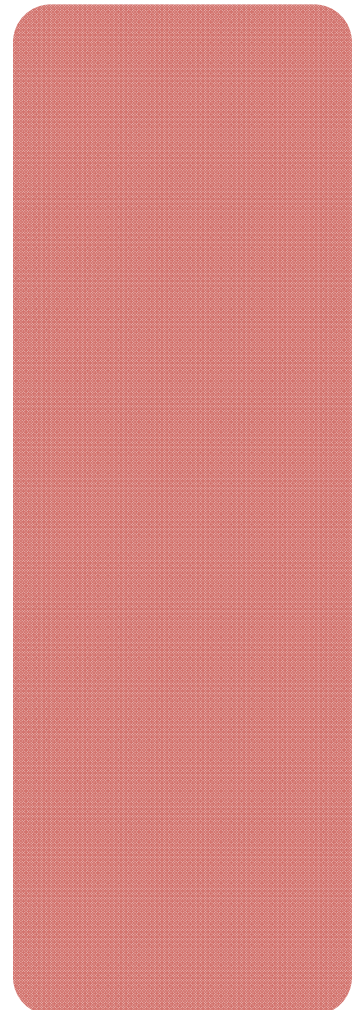
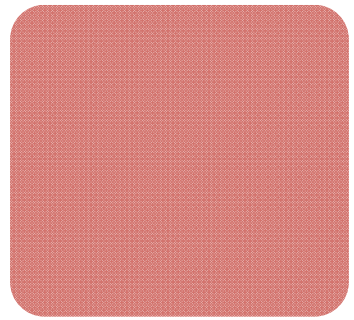


Cross-Section

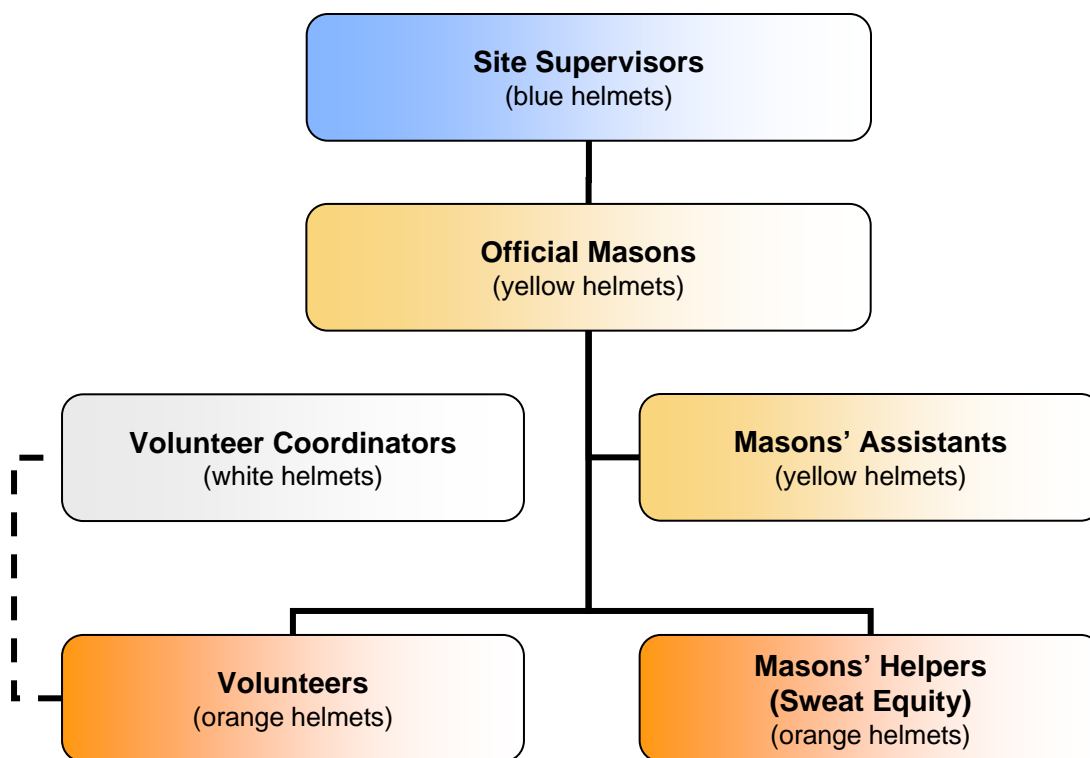


Typical Architectural Design

CONSTRUCTION TASKS



Organization During the Construction



Site Supervisors: They are in charge of all technical aspects of the construction project. Their principal functions are to monitor the quality of the construction and the safety at the site and to coordinate the masons.

Official Masons: They are the qualified workers responsible for building the houses.

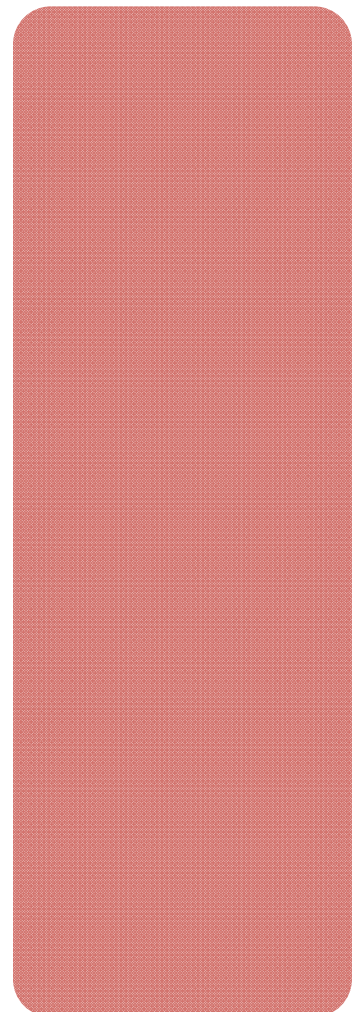
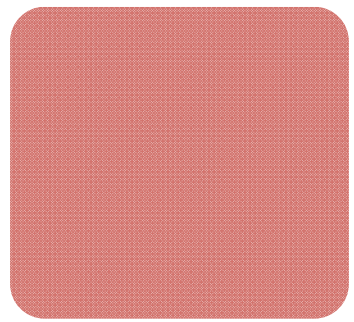
Masons' Assistants: They are the qualified workers who help the official masons.

Volunteers: They are all people who work on the construction site under the supervision of the technical staff, according to the norms and politics of Habitat for Humanity El Salvador.

Masons' Helpers (Sweat Equity): They are the representatives of the partner families who follow the instructions of the official masons to support them in the construction.

Safety

Norms



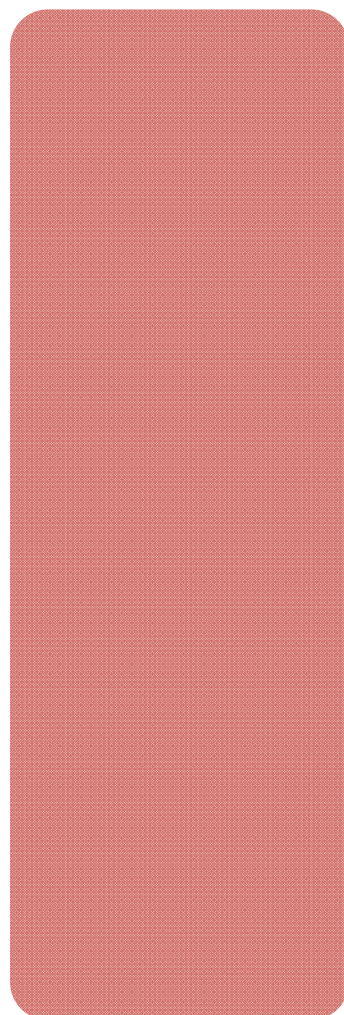
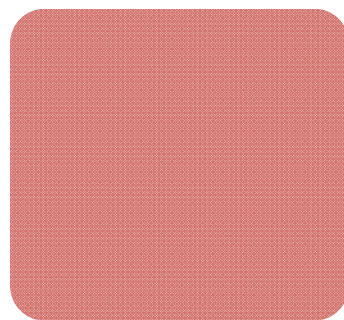
Safety Norms on the Construction Site

1. Wear closed-toe, hard-soled shoes with good traction (not athletic shoes).
2. Wear long pants.
3. Do not wear baggy clothing.
4. Pull back long hair.
5. Use the helmets, which will be provided on site.
 - Site Supervisors will use blue helmets.
 - Masons will use yellow helmets.
 - Volunteer Coordinators will use white helmet.
 - International and national volunteers as well as additional HFHES staff will use orange helmets.
6. Use gloves when picking up materials and for all general construction work.
7. Use protective glasses and a face mask when in the presence of dust particles.
8. Use the ladders to get up and down the scaffolding.
9. Do not work on the scaffolding if you do not feel that it is safe, and especially if it is raining or if there are strong winds.
10. Only walk on even surfaces.
11. Do not pick up objects heavier than 50 lbs. (approximately 2 blocks).
12. Do not stand next to the walls being built, especially if masons or volunteers are above you working and lifting blocks.
13. Only authorized staff may use power tools and work on the roof.
14. In case of an accident, communicate with one of the volunteer coordinators.
15. Children younger than 14 years old may not work on the construction site.
16. Pregnant women may not work on the construction site.
17. Smoking is prohibited on the construction site.
18. In case of emergency, whether an earthquake, hurricane, heavy rain, or whatever other situation declared as an emergency, all volunteers must evacuate the construction site and meet at the designated group meeting spot.

Habitat for Humanity El Salvador reserves the right of admission in case of failure to comply with the safety norms.

Construction

Processes



Construction Activities for the Volunteers

1. Review the mason's construction plan on a daily basis.
2. Clean up the construction site before beginning work.
3. Move materials closer to the house.
4. Clean the ground in order to make mortar and concrete mix.
5. Sift sand.
6. Make mortar for the blocks: 1 cement + 3 sand + 1 water.
7. Make concrete mix : 1 cement + 2 sand + 2 gravel 3/8" +1 water
8. Make mortar for the floor: 1 cement + 5 sand + 1 water
9. Deliver mortar or concrete mix to the masons.
10. Clean up the mortar joints.
11. Fill in the holes (halfway) where steel rods are positioned.
12. Clean the walls.
13. Carry roof sheets
14. Compact the floor.
15. Clean the floor.
16. Whitewash the walls.
17. Paint the house.
18. Clean up the construction site and store tools that are not needed in order to reduce risks of injury.













Construction Schedule

From 8.00 a.m. to 12:00 p.m.

From 1.00 p.m. to 4:00 p.m.

Guide for Preparing the Concrete Mixtures

During the construction process, the following proportions must always be used when preparing the concrete mixtures.

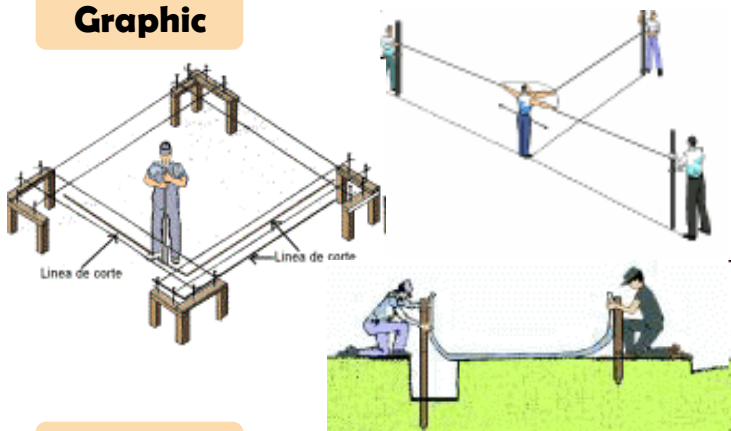
Mixture	Cement	Sand	Gravel	Water
Concrete 3/8" ("chispa")	1 	2 	2 	1 
Mortar for the blocks ("mezcla")	1 	3 	0	1 
Mortar for the floor ("mezcla")	1 	5 	0	1 

- Always use the white buckets to measure the materials.
- At least 2 people must make the cement mixtures. You must mix the dry parts together twice before adding water and mixing again twice.
- After preparing the mixture, cover it with moist paper to protect it from the sun. Do not use the mixture if it has set in the sun for more than 90 minutes.
- Do not add water without the permission from the site supervisors.



Marking the Foundation

Graphic



Tools and Equipment Needed

- Measuring tape
- Balls of string
- Wooden stakes
- 2" y 4" nails
- A level
- Carpentry square

Activity Objective

- To mark off the corners and the walls of the house in order to define the size and exact location of the house.
- To determine the level of the floor and to level the floor as well.

Volunteer Activities

MARKING THE FLOOR LEVEL

Once the mason has placed the cornerpieces, help him to determine the level of the floor using string. The construction blueprint indicates the floor level. Lay the hose on the ground and fill it with water to ensure that this demarcation is correct.

MARKING THE DITCHES

Outline where the ditches will be with chalk, using the string as a guideline.

LEVEL THE FLOOR

Level the area where the floor will be by 15 cm., and then level the area where the sidewalk surrounding the house will be.

Don't forget!

1. Avoid moving the string that serves as the initial reference mark.
2. Be careful not to leave nails on the ground or poking out of stakes, as people could step on them and get hurt.
3. When removing the string, do not move the stakes, as these will later be used to mark where the wall will be.

Time Needed:

1/2 day

Excavation

Graphic



Tools and Equipment Needed

- Measuring tape
- Shovel
- Pick
- Gloves

Activity Objective

- To excavate trenches where the foundation will be laid.
- To demarcate how much land will need to be compacted.

Volunteer Activities

ELIMINATE VEGETATION

Use the pick to remove all roots, grass, rocks, remains of earlier houses, etc. that effect the area where the house will be built.

EXCAVATION

Dig ditches with a width of 30 cms and a depth of 65 cm (at least). If the ground is not suitable for construction, then the ditches should be deeper. The exact profundity will depend on the measurements taken while marking the foundation.

Don't forget!

1. Avoid standing on the edges of the ditches as they might collapse. Protect the areas already excavated to prevent accidents.
2. Do not increase or decrease the dimensions of the ditch.
3. Volunteers will not dig ditches deeper than 1.20 mts without the permission of the Volunteer Coordinator.

Time Needed:

3-4 days

Compaction

Graphic



Tools and Equipment Needed

- Bucket
- Shovel
- Compactor

Activity Objective

- To make the ground stronger and more solid in order to ensure the quality of the floors and the foundation.

Volunteer Activities

MAKING THE CEMENT MIX

Make the cement mixture for the foundation with a soil:cement proportion of 20:1. Shovel the mixture into the ditches, 1 layer at a time. Each layer should cover the bottom of the ditches in a uniform way and be 15 cm thick.

COMPACTING

Use the compactor to compact the layers, adding water in a uniform way and letting it dry to achieve the optimum humidity. Press the compactor on the ground, without letting it fall through gravity as this could create air bubbles that could affect the foundation in the future.

Don't forget!

1. Make the mixture according to the established proportions, using the designated buckets rather than any other instrument that could alter the measurement.

Time Needed:

1 day

Steel Infrastructure

Graphic



Tools and Equipment Needed

- Table for bending the rebar
- Pliers

Activity Objective

- To create the rebar structures and ties that will be used to reinforce the foundation and the concrete walls.

Volunteer Activities

CUTTING AND BENDING THE REBAR

Cut and bend the rebar for various components of the steel framework in the foundation and the walls, always following the mason's instructions. You will may bend the rebar pieces into "staples" in the shape of a square, the letter U, and the letter L.

TYING THE STAPLES

Place and tie the staples on the rebar rods, always alternating them so that every other one or every other four staples (depending on the type of staple) faces a different direction, according to the mason's directions.

PLACE THE IRON FRAMEWORK

Help the mason fulfill this task.

Don't forget!

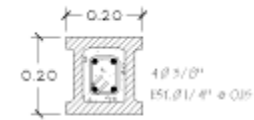
1. Use gloves when handling the steel and the pliers.
2. Bend the rebar properly to avoid the staples being more "closed" or more "open" than the mason's specifications.

Time Needed:

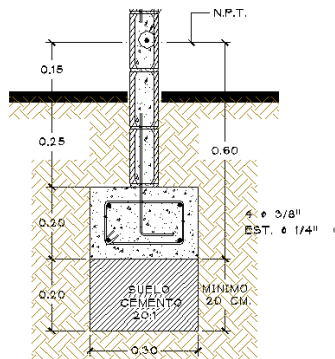
1-3 days

Foundation

Graphic



COLUMN C-2



Tools and Equipment Needed

- Wheelbarrows
- Shoves
- Small buckets

Activity Objective

- To build the foundation, which is the base of the house and will support the walls.

Volunteer Activities

LAYING THE STEEL FRAMEWORK

Position the steel framework in its correct place—2 in. or 5 cm. above the soil—in the ditches. Also position the vertical rebar, which will reinforce the walls.

PREPARING THE CEMENT MIXTURE

Make a batch of the appropriate cement mixture every 30 minutes, and transport it to the ditches using buckets or wheelbarrows.

Don't forget!

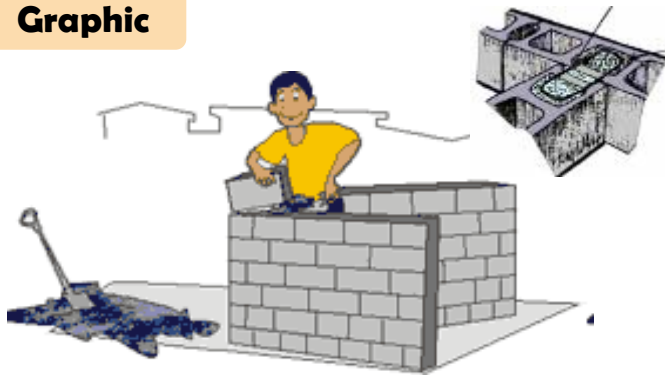
1. Do not use the concrete mixtures if they were prepared more than 30 minutes earlier.
2. Prepare the cement mixture according to the designated time frame and using the indicated proportions.

Time Needed:

1-3 days

Walls

Graphic



Tools and Equipment Needed

- Trowels
- Buckets
- Shovels
- Scaffolding
- S-shaped rebar tool ("sisador")
- Plumbline
- Level
- Gloves

Activity Objective

- To build the walls of the house, which will provide security to the homeowner.

Volunteer Activities

TRANSPORTING MATERIALS

Move blocks, sand, cement closer to the house. Hand up buckets full of the concrete mixtures when the masons request them, but be careful not to overload the scaffolding.

PREPARING CEMENT MIXTURES

Make mortar for laying blocks, cement mixture for filling the U-shaped blocks and cement mixture for filling the holes in the blocks where vertical rebar has been placed. The cement mixture should be runny.

FILLING HOLES IN THE BLOCKS

Fill the holes in the blocks where vertical rebar has been placed, pushing the cement mixture down into the crack with a small piece of rebar as you proceed to make sure that no air bubbles or empty spaces are created.

CLEANING THE MORTAR JOINTS

Use the S-shaped rebar tool to clean the mortar joints of excess cement before the mortar dries.

Don't forget!

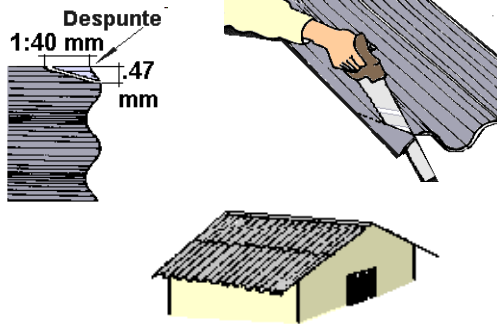
1. Do not spread the mortar across long sections of that wall. Otherwise it will dry before the blocks are laid.
2. The four walls will be built simultaneously, row by row
3. The blocks must be clean and completely dry.
4. Make sure that the vertical rebar stays correctly placed in the center of the blocks as they are filled with cement.
5. Wear gloves when carrying the blocks.

Time Needed:

8 days

Roofing

Graphic



Tools and Equipment Needed

- Scaffolding
- Drill
- Screwdriver

Activity Objective

- To put on the roof, which will protect the house interior against inclement weather. (Professional roofers will put on the roof.)

Volunteer Activities

FILLING THE GABLES

Make the appropriate concrete mixture for the gables and help the mason fill the U-shaped blocks with it.

TRANSPORTING MATERIALS

Carry the roof sheets closer to the house, working in pairs and holding them by the wavy part.

Don't forget!

1. Do not go up the scaffolding during strong winds or rain.
2. Hold the roof sheets by the wavy part so that the edges will not break.
3. Be careful when walking on the scaffolding once the gable has been filled with cement.

Time Needed:

1/2 day

Window Installation

Graphic



Tools and Equipment Needed

- Meter stick
- Drill

Activity Objective

- To help install the windows, which will provide ventilation and illumination in the house. (The mason will actually position and install the window in the window frame.)

Volunteer Activities

PREPARING THE CONCRETE MIXTURE

Make the appropriate cement mixture for the window installation and for later filling in any remaining cracks around the window frame.

INSERTING THE WINDOW PANES

Place the window panes in the window and install the window crank in accordance with the mason's instructions.

Don't forget!

1. Be careful with the glass panels because they could cut you, and do not insert them in the window in "traffic zones" in order to avoid accidents.
2. Make sure that each pane is securely inserted so that they will not fall when the window is opened.

Time Needed:

1/2 day

Floor Installation

Graphic



Tools and Equipment Needed

- Compactor
- Bucket
- Trowel
- Meterstick
- Angel grinder to cut blocks
- Sponge
- Level

Activity Objective

- To lay the floor tiles.

Volunteer Activities

PREPARING THE CONCRETE MIXTURE

Make the concrete mixture for the floor, using the indicated proportions.

TRANSPORTING MATERIALS

Carry the floor tiles into the house, moving no more than 8 tiles at a time. Move the cement and the concrete mixture as well.

CLEANING THE FLOOR ONCE THE TILES ARE SET

Use a moist sponge to clean the floor.

Don't forget!

1. Make sure that the floor has been properly compacted before the floor tiles are laid.
2. Do not step on recently-laid floor tiles.

Time Needed:

1-2 days

Whitewash and Paint

Graphic



Tools and Equipment Needed

- Brushes
- Buckets

Activity Objective

- To put the finishing touches on the house by whitewashing and then painting the walls.

Volunteer Activities

CLEANING THE WALL

Use a small piece of concrete block to sand the walls in a circular motion and clean them of all excess concrete.

WHITEWASHING

Make whitewash (cement + water) according to the proportions that the mason indicates and apply it to the walls using a brush.

PAINTING

Paint the walls once the mason indicates that the walls are ready.

Don't forget!

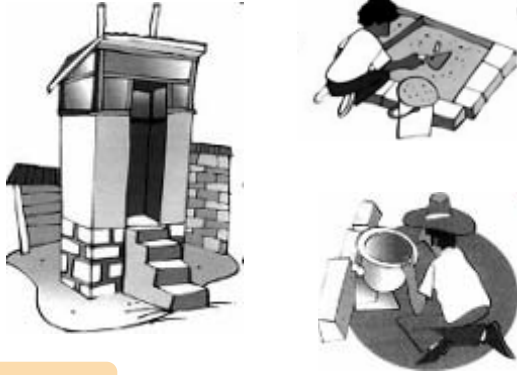
1. Make sure that the wall is clean of all excess cement before painting.
2. Hose down the wall before applying the whitewash.

Time Needed:

1 day

Sanitation Unit

Graphic



Tools and Equipment Needed

- Shovel
- Bucket
- Trowel

Activity Objective

- To provide the family who will reside in the house with a sanitation solution. (A latrine is often built before the volunteers arrive.)

Volunteer Activities

TRANSPORTING MATERIALS

Move blocks, sand, cement closer to the house. Hand up buckets full of the concrete mixtures when the masons request them, but be careful not to overload the scaffolding.

PREPARING CEMENT MIXTURES

Make mortar for laying blocks, cement mixture for filling the U-shaped blocks and cement mixture for filling the holes in the blocks where vertical rebar has been placed. The cement mixture should be runny.

FILLING HOLES IN THE BLOCKS

Fill the holes in the blocks where vertical rebar has been placed, pushing the cement mixture down into the crack with a small piece of rebar as you proceed to make sure that no air bubbles or empty spaces are created.

CLEANING THE MORTAR JOINTS

Use the S-shaped rebar tool to clean the mortar joints of excess cement before the mortar dries.

Don't forget!

1. Do not spread the mortar across long sections of the wall so that it will not dry before blocks are laid.
2. The blocks must be clean and completely dry.
3. Wear gloves when carrying blocks.
4. Do not use the mixtures if they were prepared more than an hour ago.

Time Needed:

3 days

Clean-up and Beautification

Graphic



Tools and Equipment Needed

- To be defined, depending on the specific activity

Activity Objective

- To clean up the construction site.
- To beautify the yard.

Volunteer Activities

CLEANING

Maintain pathways on the construction site clear of materials and trash in order to avoid accidents. Remove construction waste. Clean and/or wash tools at the end of each day.

BEAUTIFYING

Plant trees and plants around the house.

Don't forget!

1. Do not leave plant waste and other trash in public places or other areas where people and/or vehicles are circulating.

Time Needed:

1-2 days

Emergency Plan

This emergency plan seeks to define a procedure that all volunteers must follow in order to reduce the possibility of any accidents during an emergency. Understanding and following this plan is particularly important because of the concentration of people that will be on the construction sites.

The following events will be declared emergencies:

- Earthquake or tremors
- Fire
- Strong rain and wind storms
- Floods
- Land slides and other events that put the group at risk

Evacuation Plan

1. Each work team will have a group leader who will direct and guide the group in case of an evacuation of the work zone.
2. Each work team must identify a group meeting spot.
3. In case of emergency, everyone in the group must evacuate the construction site and go to the identified meeting spot.
4. Once the group leader verifies that all group members are present, everyone must go to the central meeting spot in order to join up with the other groups and wait for the evacuation to begin. Throughout the evacuation process, everyone must stay calm.
6. The Regional Office Coordinator and the Volunteer Coordinator must take on a leadership role and proceed with the evacuation plan.