step-by-step guide for the construction

16 THOUSAND LITRES

PLATES CISTERNS

IMPLEMENTATION: AsA Articulação Semiárido Brasileiro

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INTRODUCTION

Water is a common good. Its access must be universal and guaranteed for people from all places so they can use it for their needs and activities. Water is life. It is an essencial good to the guarantee of food and nutritional security.

Around the world, specially in arid, semiarid and dry sub-humid areas, people and popular organisations are in struggle to guarantee access to quality water in a decentralised way. They act for the proposal and implementation of access to water politics but also creating and adapting solutions based on local knowledge and the climate conditions of each region.

Nowadays, rain has been a source of water democratisation and has brought autonomy to many families, specially in arid, semiarid and dry sub-humid areas from the whole world through the development of several technologies, like the construction of cisterns, which are the most popular technology in Brazil.

We present here a step-by-step guide in detail about the construction process of a plates cistern with the capacity of storing 16 thousand litres, based on the model that collects water from the roof of the houses, implemented in Brazil by the Brazilian Semiarid Articulation (ASA). This water, after being treated, can be used with quality to drink and to cook, like it happens in Brazil. In regions where the water stored in the cistern doesn't have the quality to be consumed it can be used to other needs of the family.

PRESENTATION

Throughout the last decades, ASA and families from all the Brazilian Semiarid developed and improved the method of construction of plates cisterns. The purpose of this booklet is to share this experience on the construction of cisterns, enabling other peoples to benefit from this technology that changed the scenario and life of thousands of families in the Brazilian Semiarid.

So that other communities in arid, semiarid and dry sub-humid areas from the whole world have the autonomy of building their own cisterns, this booklet presents a step-by-step guide in detail of the construction process of a plates cistern with the capacity to store up to 16 thousand litres. This booklet also can be used as a support to the technical teams and funding institutions that work on the promotion of alternatives that allow rural families to have a better access to water.

SUMMARY

01 THE PLATES CISTERN

There are several types of cisterns of different sizes and that can be used to various purposes. We chose to present **the plates cistern** because it is a low-cost and easy maintenance option that offers autonomy for the management of potable water to the families.

We will learn about the benefits of storing rainwater. In addition, we will learn the main variables to be considered to build a cistern and the tools and materials we will need.

The shortage of water and the increasing problems related to climate change affect many regions from Brazil and around the world. One way of dealing with this situation is to harvest and store rainwater to be used in periods of drought.

We can utilize the stored water for many purposes, respecting the indications set to each usage (for example, consumption and personal hygiene or irrigation for food production and raising of animals).

To have a reservoir of rainwater can improve our families' daily life, as long as it is kept clean and in good condition and that a good administration of the equipment is made.

Through this booklet you can learn how to build your own 16 thousand litres plates cistern. Let's go!

02 PRECAUTIONS BEFORE STARTING THE CONSTRUCTION

A great amount of water available is necessary to build a plates cistern.

Make sure the water used is of good quality. In regions where the water is rich in sulphur, the use of pozzolanic cement is recommended, because the sulphur negatively reacts with usual cement.

The size of the plates cistern needs to be associated with the size of the harvesting area and the amount of rain in the region. It is very important to do this analysis before starting the construction. To do this analysis you have to know the amount of water that can run into the cistern and the size of the harvesting area, be it a roof or a big pavement. With these information in hand the count is simple: multiply the size of the harvesting area by the amount of rain (in millimetres). This way, you will know the ideal size for your reservoir.

HARVESTING AREA X **AMOUNT OF RAIN IN MILLIMETRES** = **IDEAL SIZE OF THE RESERVOIR**

Did you know?

It is possible to build the plates cistern with other measurements adapting the quantity of materials and the size of the moulds.

Important!

The World Health Organisation (WHO) recommends the consumption of 50 litres of water per day by person for personal hygiene and food consumption.

To collect rainwater we must implement a small harvesting system that includes:

1. One harvesting area, which are usually roofs.
2. One filter and prefilter system.
3. One system for the channeling of water through gutters and PVC pipes.
4. One storage area, like cisterns or tanks.
5. One extraction system.

To store rainwater we also need to know some data:

>> The annual precipitation value and its monthly distribution. These two values will allow us to analyse the annual value we will adopt for the project.

>> The surface of the available harvesting area, which are the measures of the roof where the water we'll collect will fall.

>> The family's average consumption of water and the usage we hope to make of the stored water. armazenada.

>> If the roofs are not in a good condition to receive the rain we can restore them to improve water harvesting.

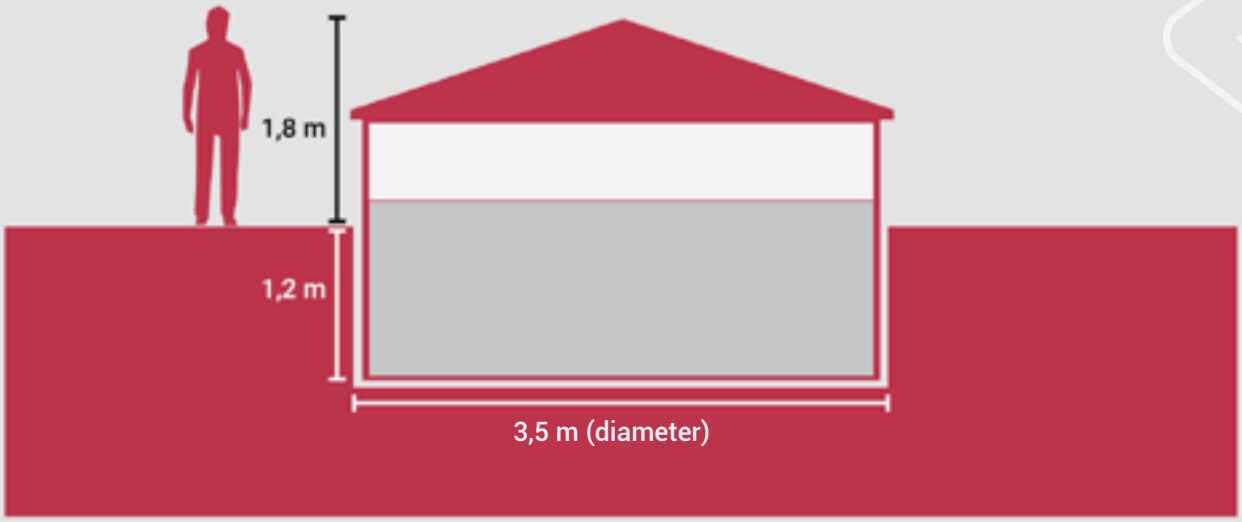
>> The capacity the cistern will have, in other words the amount of water the cistern will be able to store.

>> If the water is used for human consumption, it is necessary to do some treatment.

Useful information!

Research about filtering systems and rainwater treatment, specially if the water will be used for family consumption (see pages 47 and 48).

Assess if the technology is suitable for your region.



These measures were calculated for an annual average precipitation of 700 mm with eight months of dry season and a harvesting area of 30 m2. We consider the water will be used by a family of five people.

Here we will concentrate on the construction of a plates cistern, a system commonly used in the Brazilian semiarid where more than one million and two hundred thousand cisterns were already implemented.

The plates cistern we will build will be cylindrical, covered and semi-perforated. It is 3.5 metres in diameter x 1.8 metres in height and it has the capacity to store up to 16 thousand litres.

Reminder!

In a 1m² area with 1 millimetre of rainfall we collect 1 litre of water.

03 TOOLS AND MATERIALS

tools

materials

- Two cubic metres of fine sand;
- One cubic metre of coarse sand;
- Half a kilo of common wire, for the tying;
- 16 kilos of number 12 galvanised steel wire;
- One kilo of number 18 annealed wire;
- 20 kilos of CA 50 ¼” (6,35 MM) (a quarter of an inch) ribbed steel rod;
- Four kilos of concrete waterproofing;
- Sticks or twigs to the supporting of the plates;
- 12 metres of 75 millimitres PVC pipe;
- One 2.12 metres wood beam;
- 12 six metres 8 millimetres iron bars;
- Half a cubic metre of number one or 19 millimetres gravel;
- 16 sacks of cement;
- 10 kilos of hydrated lime for the painting;
- Water for the construction;
- 26 kilos of 30 GSG (0,399MM) flat galvanised sheet;
- Half a metre of nylon netting;
- One sieve filter;
- One manual pump.

04 THE SITE

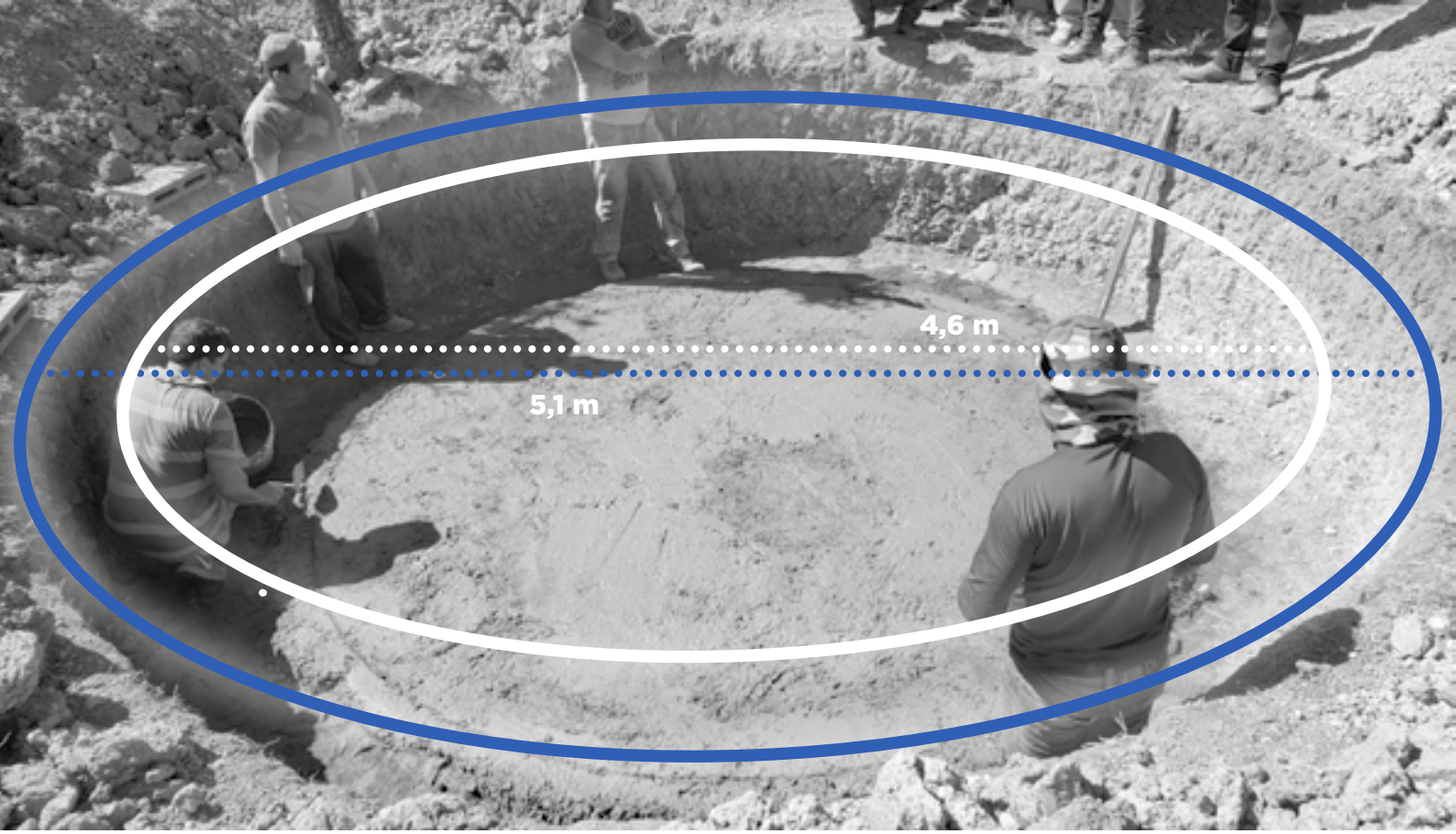
choosing the site for the construction

To choose the site for the plates cistern construction you must pay attention to some points:

- Avoid places with many rocks and stones because they may hinder the digging of the hole.
- The cistern must be built away from trees with deep roots that may cause its structure to crack.
- It is important the site is at a minimum distance of 15 metres from corrals, cesspits, trash deposits and other sources of water contamination.
- It's fundamental the cistern is built next to the rainwater harvesting area, like the roofs of the houses.
- If the water will be used for human consumption it is important to place the cistern next to the kitchen, this will facilitate the domestic use.

Important tip!

Check if the soil is compact and solid. If it's soft it is necessary to do the compaction with an adequate tool.



digging the hole

>> To begin with the construction, we dig a 1,20 metres in height hole. To do that we mark the soil, drawing a circle of 2.30 metres radius. That way, the hole for the cistern will have a diameter of 4.60 metres, leaving a space of approximately half a metre for the work area of the bricklayers.

Important tip!

It is possible to use a 2.30 metres piece of string tied to a stake at the center of the circle to draw all its diameter.

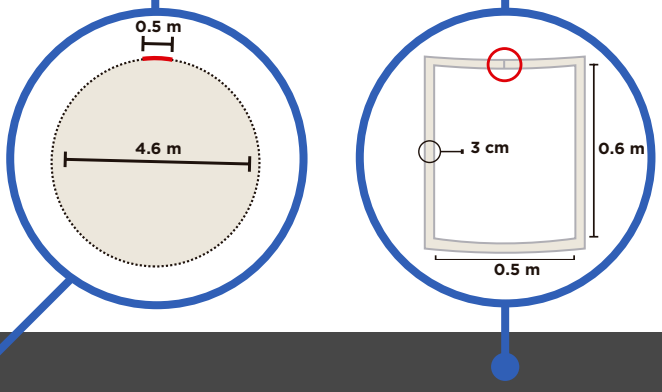
05 MANUFACTURE OF THE PLATES

With moulds, we'll build the plates that will be used on the wall and on the roof of the cistern. The plates can be manufactured on the same place where the cistern will be built and they are made of precast concrete. The moulds for its manufacturing can be made of wood or iron.

wall • *moulds*

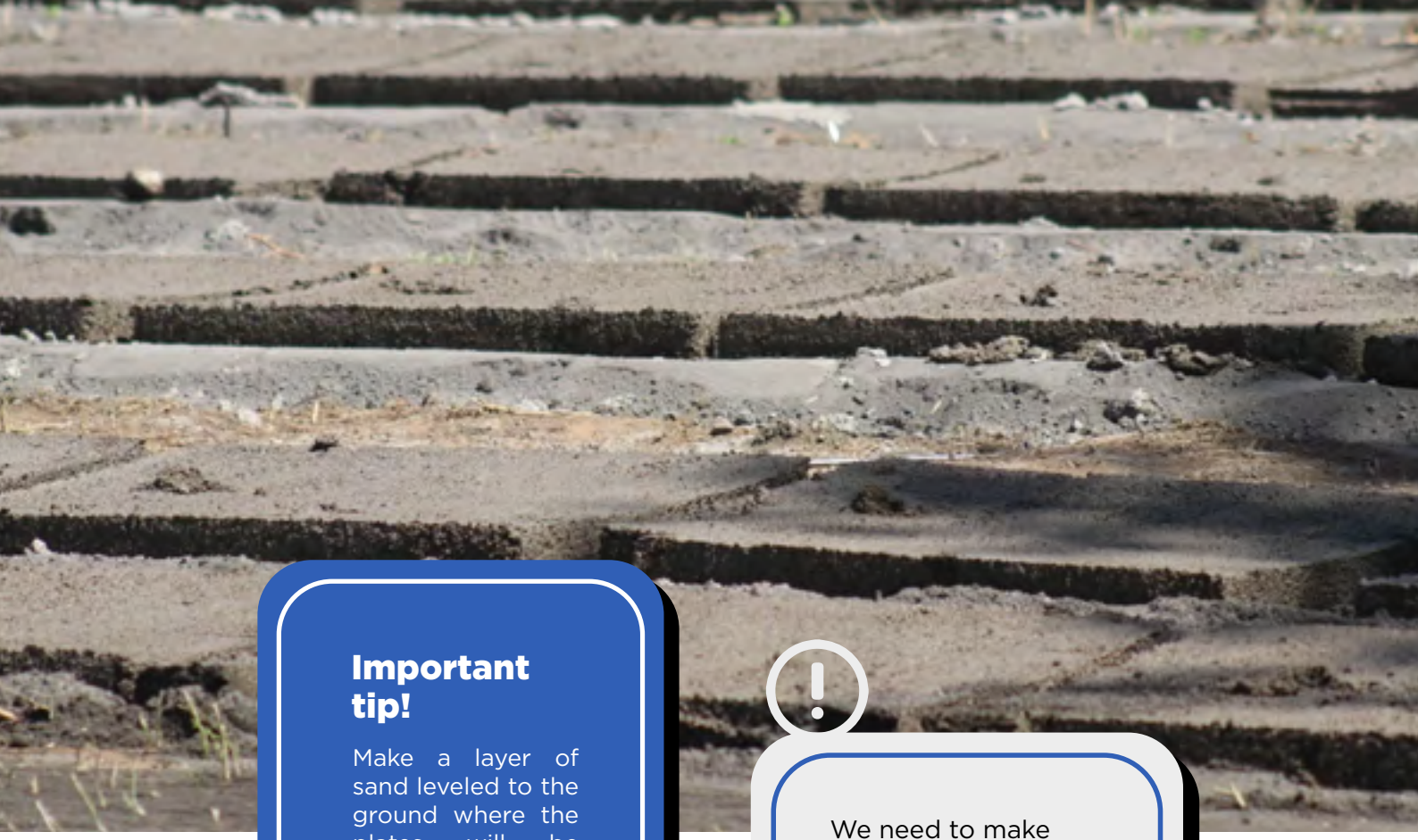
The mould for the wall plates can be made of wood or metal and must have a slight curvature in its smaller sides, allowing the walls to get a round shape.

This is calculated as follows:



On the 4.60 m diameter marking made on the soil, you must lean a 0.5 m wire on the ground giving it the form of the curve. This will be the curvature of the mould.

Measuring 0.5 metres width, 0.6 m height and being 3 cm thick, the mould has a little mark that assists the work of assemble of the walls, making it more diligent and precise.



Important tip!

Make a layer of sand leveled to the ground where the plates will be manufactured.

We need to make three sets of 21 plates for the wall, but it is recommended to make some more in case of them breaking or cracking during the transfer and installation process.

» For all the measurements we will use a tin that holds 20kg of sand as baseline.

Ratio os the mass: 4 tins of sand to 1 tin of cement.

Make a layer of fine sand leveled to the ground where the plates will be manufactured.

Drag the mould on the sand to make sure it take the round shape of the plate when filled with the concrete.

Lean the mould and fill it with the concrete.

4

Distribute the concrete inside the mould giving special attention to the corners.

Pass a piece of wood over the mould to remove all the surplus of concrete and level it.

5

6

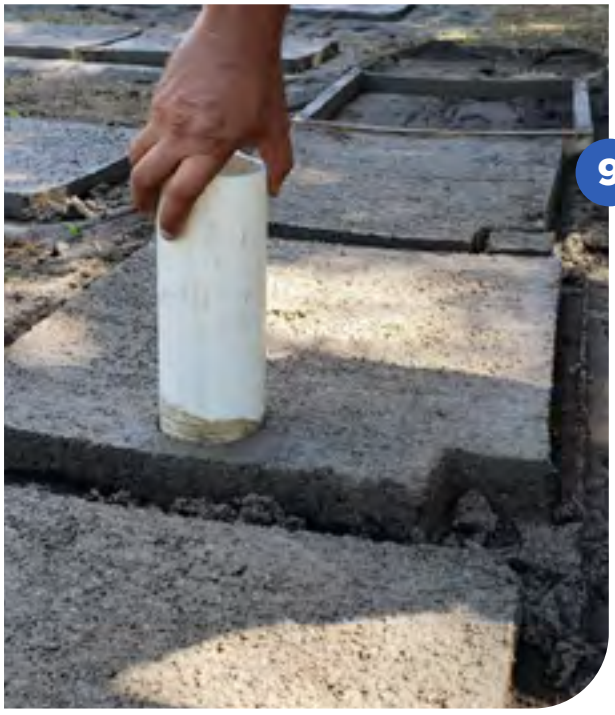
Wait a few minutes to take off the mould holding the corners diagonally so the shape of the plate is not altered.

7

In all the plates, make a mark sinking a spoon near the edge as it can be seen here. This will make the suppporting easier when it's time to assemble the wall.

8

In 21 plates it is necessary to make a 8 x 8 centimetre cut while the concrete is still fresh. This will be the upper row of plates, where the roof beams will be leaned over.



9

In just one of the plates make a hole using a 100 millimetres PVC pipe. This hole will be the water escape when it reaches the full capacity of the cistern.

Important!

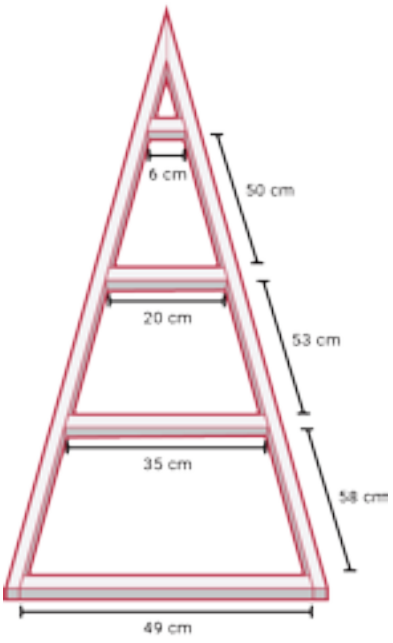
The drying period of the plates is about 24h in the summer time and 48h in the winter time, depending on the local climate. It is necessary to wet the plates every three hours during the drying period to avoid damage and craks.

roof • *moulds*

To make a wood or metal mould as it can be seen on the drawing and on the pictures.

>> The **ratio of the mass** is the same used on the walls: 4 tins of sand to one tin of cement.

It'll be 21 plates for the roof and the manufacture process is the same as the one of the plates for the wall. It is suggested to make 2 or 3 extra plates in case of breaks and cracks.



Important tip!

Remember to make the sand layer well leveled to the ground where the plates will be built.

1

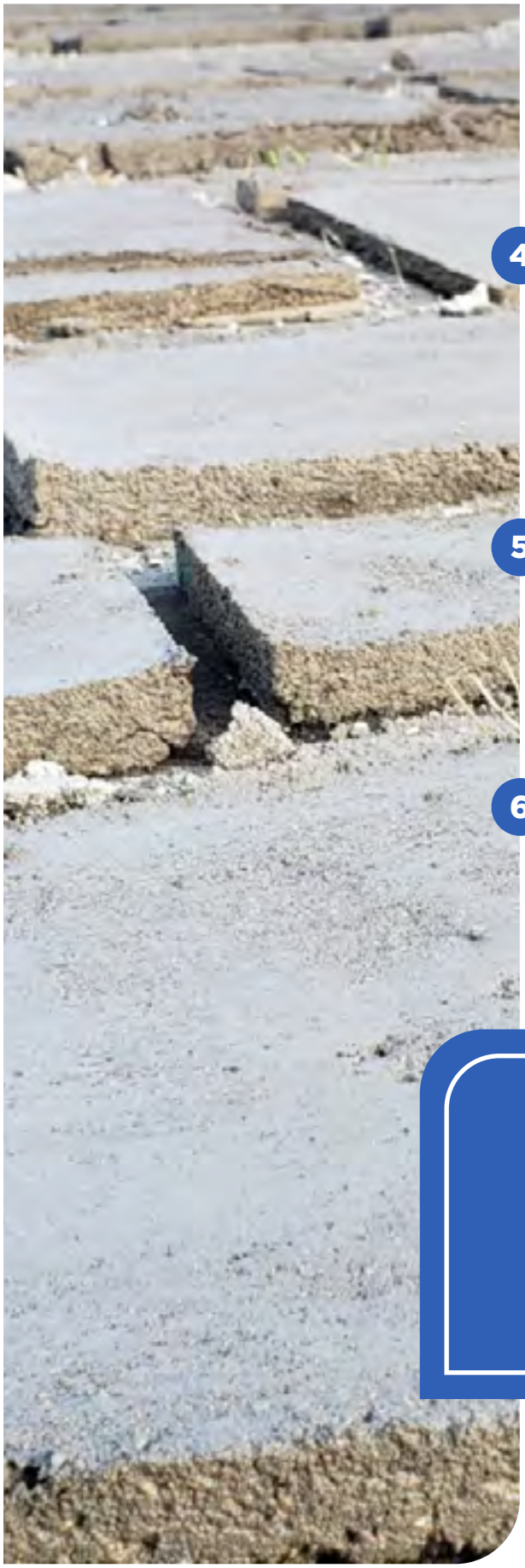
Fill the moulds with concrete, spreading it on the whole area and removing the surplus with a piece of wood.

2

Put them side by side in opposite position to take advantage of the space.

3

In one of the plates, on the bigger part, make a hole using a 110 millimetres PVC pipe. That will be the entrance of water to the cistern.



4 In case of using a suction pump, it's necessary to make a hole in one of the plates. The hole must be from 32 mm to 44 mm depending on the size of the ducting of the pump.

5 Let them dry for the same period of time as the plates for the wall.

6 During the drying period it's important to wet the plates for the wall and for the roof every three hours, specially in dry climates and places under strong sunlight to avoid crackings.

On the following day to the manufacture of the plates, they can be leaned on a wall to facilitate the drying.

06 MANUFACTURE OF THE BEAMS

Let's learn how to manufacture the 21 beams that will support the roof of the plates cistern.

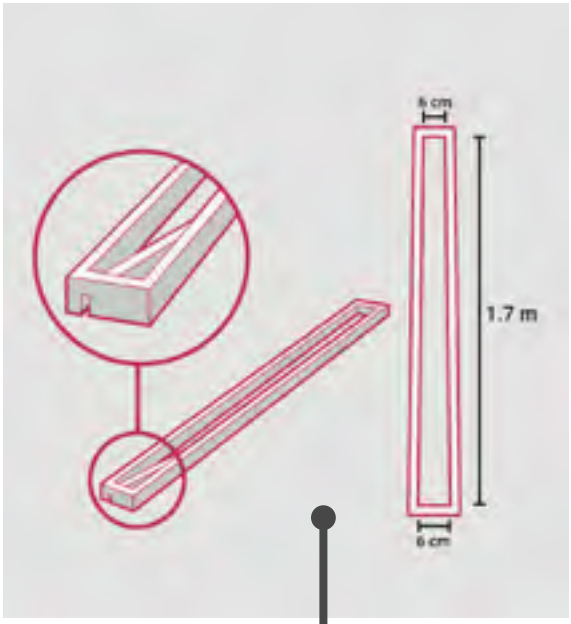
iron bars *for the beams*

The beams are made with an iron bar inside them. So the first thing you have to do is cutting 21 8 mm iron bars of 1.85 length each. It is recommended to cut 2 or 3 more for backup.

With the help of a tool or a pipe, bend one of the ends of all the iron bars, making a hook of approximately 10 centimetres.

beams • *moulds*

To make the beams we will need a mould with the following measures: 1.30 m length, 6 cm width on one end and 8 cm width on the other and from 2 to 3 cm thick.



The mould has a gap in the middle of the extremity where the iron bar will be inserted during the assembly of the beam. In the picture we can see an adpated mould from a rectangular form. In one of the extremities, a small piece of wood was crossed diagonally to obtain the desired form.

Ratio of the mass: 2 tins of sand, 2 tins of gravel and 2 tins of cement. Water for the mixture.

Important!

Remember the mixture must be a little dry to allow the immediate release of the mould.

beams • *step-by-step*

1

Like it was made with the plates, start making a layer of sand leveled to the ground where the beams will be manufactured.

2

Fill approximately one half of the mould with concrete.

3. Put the iron bar inside, with the hook going out the narrower part of the mould.

4. Fill the rest of the mould with concrete until covering up all the interior.

5. On the opposite extreme of the hook make a small bend with the trowel to have a more rounded finish.

6. Remove the surplus of cement with the piece of wood and pat to facilitate the removal of the mould.

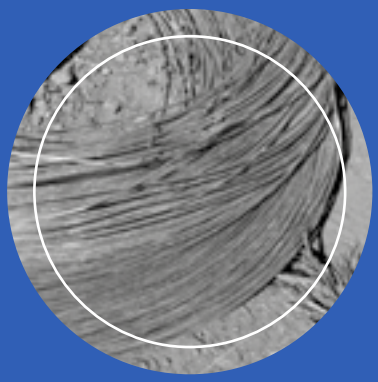
7. Let it dry for the same period of time and following the same recommendations given for the plates.

07 BASE OF THE FLOOR

When the plates and beams are ready it's time to start assembling the plates cistern. But first we need to make the base.

base of the floor • *materials*

- Seven 20 cm iron stakes;
- Eight 8 mm and 3,60 m length iron bars;
- One kg of wire;
- One 8 mm iron bar longer than 6 m length;
- Three 8 mm iron bars under 3 m lenth.



base of the floor • *step-by-step*

1

In an open and clean space, different from the cistern's site, we mark on the floor a circle of 1.75 m radius that equals 3.5 m diameter. It's important the soil is very compact.

2

Use the 8 mm iron bar of 6 m in length to form the circle that was marked, tying the iron ends with wire and a stake.

Cut 8 8mm iron bars of 3.6 m in length and put the first one in the middle of the circle, tying its extremities with wire. Put the second one perpendicular to the first.

3

4

Then put the other 6 remaining iron bars in a way the structure has 16 radius formed by iron bars.

5

Put the other 8 mm iron bars in a concentric way with a distance of approximately 55 cm from the main circle tying the ends with wire.

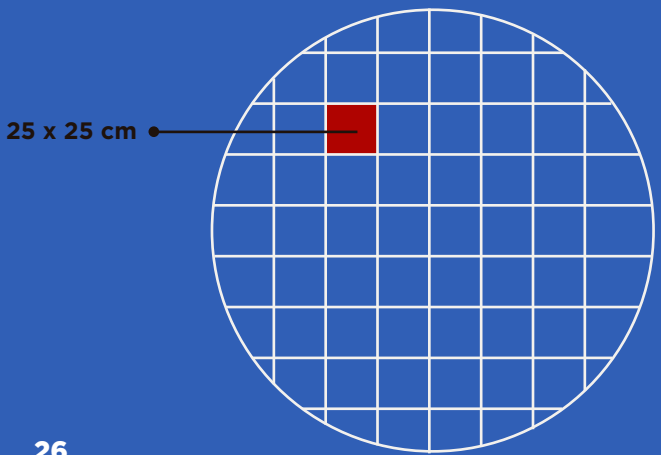
6

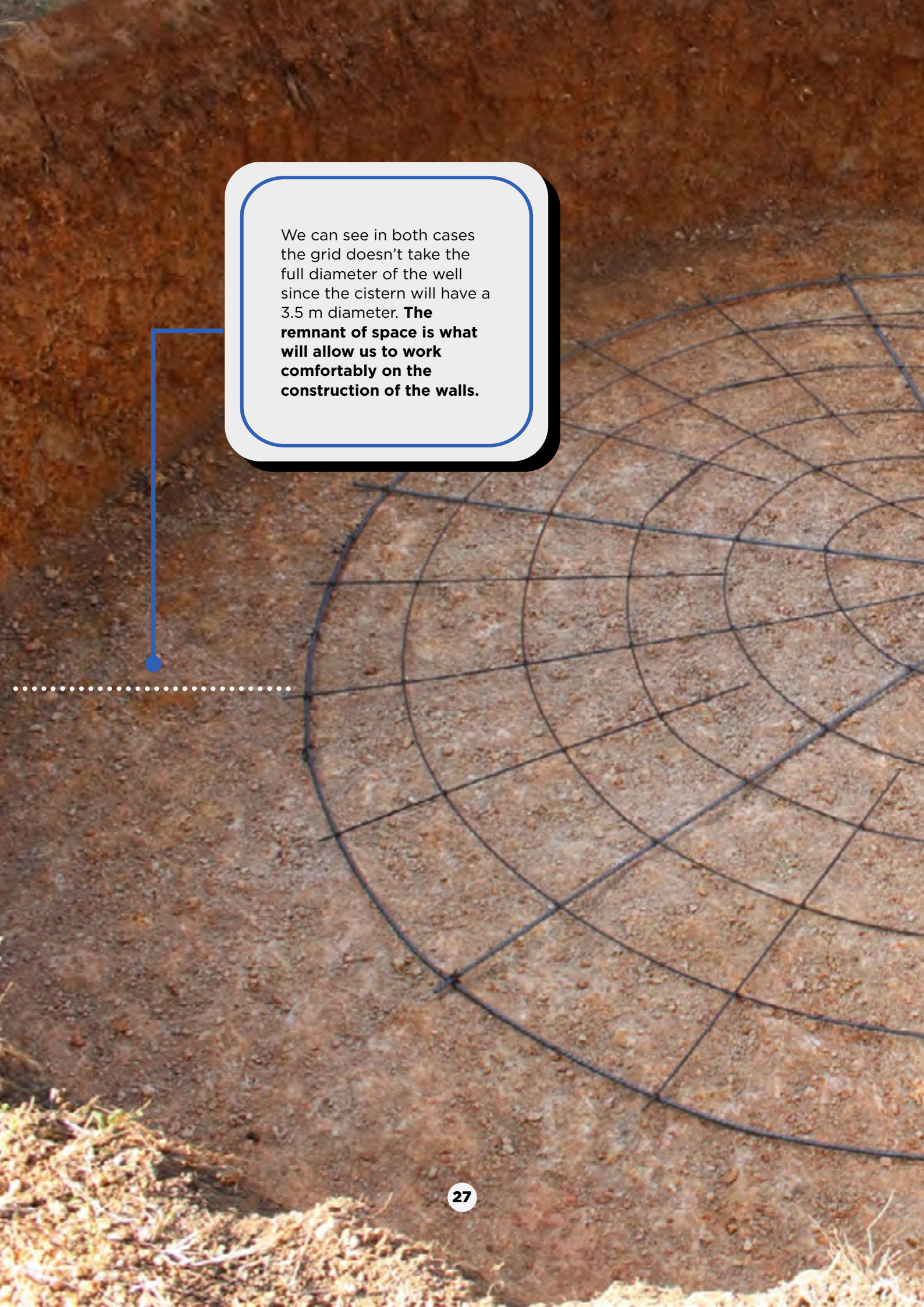
Let's cut the wires that are tying the structure to the stakes and transfer the base to the interior of the well where the cistern will be built. Put it right in the center.

another alternative: squared base

It is possible to build the base with a squared interior formed by 25 x 25 cm squares made with 8 mm iron bars.

This kind of structure requires 3 extra iron bars apart from the ones used on the circular one.





We can see in both cases the grid doesn't take the full diameter of the well since the cistern will have a 3.5 m diameter. **The remnant of space is what will allow us to work comfortably on the construction of the walls.**

08 FLOOR

To make the floor we prepare a **concrete mixture**. The concrete must be 10 centimetres thick.

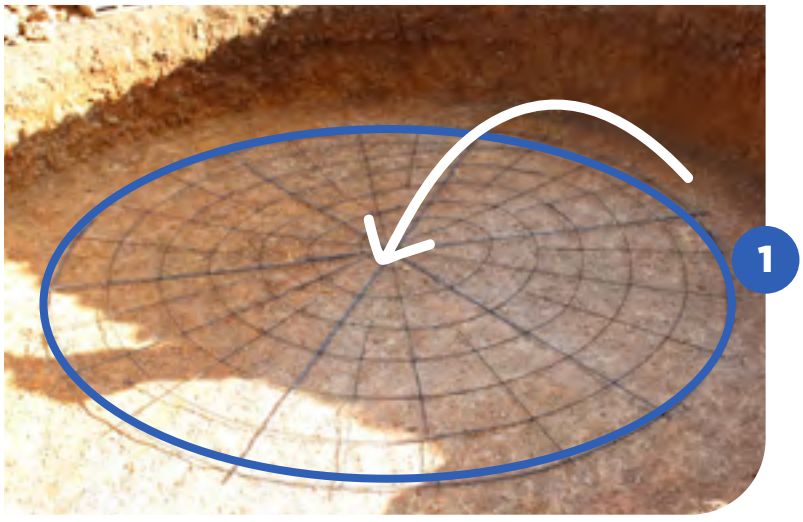
Before applying it it is recommended to lift the base grid 4 or 5 centimetres up. We do this by **putting rocks** at certain points. This way the grid is embbed inside the concrete and it works correctly.

Ratio of the mass: 2 tins of coarse sand, 2 tins of gravel and water for the mixture.

Tip!

It is recommended to do this task using the hand level.

floor • *step-by-step*



1

Start filling the grid with concrete from the outside in.

2

It is important to keep leveling the floor throughout the structure construction, specially the more external area.

After finishing the floor, the external perimeter is traced (a radius of 1.75 m) with a wire tied to the central stake, that will be the final measure of the floor. We will start putting the plates on this mark as soon as they are dry.

3

4

Make the finish of the borders outside the marked perimeter.

09 WALLS

Let's learn how to assemble the three rows of plates that will form the wall of the cistern.

propping system

Trere are three systems. **They can be used alone or in combination** to prop the plates up while we build the wall.

- Using thin sticks or branches.
- Using wood beams or long thick trunks.
- Making little clamps or iron guides that will tie two plates at their intersection.

Ratio of the mortar for the grouting: 2 tins of sand to 1 tin of cement.

first row • *step-by-step*

1

Once we choose the propping system, we prepare the mortar to assemble the plates and carefully transfer them to the interior of the well. We can lean them on the walls.

2

Put the mortar on the perimeter and stick the first plate. Continue the same way with the other plates following the round mark.

3

Each time we stick a plate we underpin the internal and external sides with branches for support like we see on the pictures. The inside branch goes at the mark we did with a spoon while moulding the plates.

4

We leave a 2 cm distance between one plate and the other. Later we will fill it with mortar.

5

It is important to use the plumb bob every time we stick a plate to make sure it is straight.

6

With the mortar we make a kind of excess border on both sides of the plates next to the ground so they fix well on the base.

from the second row on • *step-by-step*

It's important to consider before the beginning:

» If you're using the system with branches you have to cut longer branches because these rows are farther from the ground.

» The little mark or incision the plates present in the middle of the upper part is the guide to place them correctly, sticking every new plate between the notch on the plates of the row below.

» Leave one plate out of place for now so you can work comfortably, going inside and out of the well.

Attention!

As you build the wall with the plates it's necessary to calculate the space between them so that the 21 plates can be put in place. The space can't be too big or too little, but in case this happens it can be necessary to cut a plate into the right size to complete the row.

1

We follow the same way to put the second row of plates for the wall into place, using the chosen propping system. The plates of the upper wall are stuck overlapping the joints on the first row of plates to complete the whole wall.

2

Each time a row is completed, we encircle all the circumference with number 12 galvanised steel wire. We repeat this procedure seven times. In other words, every row of plates will be encircled externally by seven turns of wire, as the pictures show. This wire works to strengthen the wall of the cistern.

3

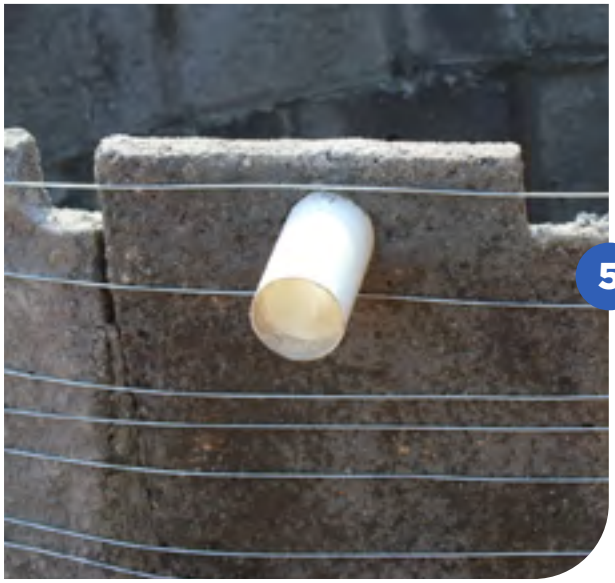
We put up the third row of plates for the wall in the same way we did the others, using a plumb bob and putting the joints perfectly together inside and outside. We do that paying attention to the lines and plates.

Reminder!

On the third row we will use the plates with a cut; they will be at the top and will support the beams.

4

We encircle the third row with nine to eleven turns of wire. It is important at least three turns of wire are placed at the spaces where the beams will be put.



5

On this row we put the plate with the hole for the water escape. We put it in a convenient place, where there's the possibility of taking advantage of the overflow to irrigation and so it doesn't flood the front of the house. This hole must be covered with a netting to prevent the entry of little animals, dirt and dust.

Reminder!

To use the plumb bob to put every plate into place and make the perfect union in all the lines.

10

PLASTER

external plaster

>> As soon as we finish the first two rows of the wall and putting the wire around them, we can start to plaster the external part. **It is important that the plaster covers all the wire of the structure.**

Ratio of the mass: 5 tins of sand to 1 tin of cement and water.

step-by-step

1. Brush the walls to remove the loose sand and apply two thick layers, plastering until covering the whole wall. It is important all the turns of the wire are covered.

2. Plaster a thin layer only on the section of the cistern that will not be buried.

After 8 hours the props can be removed and then the plaster can be made on the internal wall.

internal plaster

We do this plaster as soon as the wall with the three rows of plates is finished. The whole wall must be well covered with a good finish. **It's important that no section of the internal wall remain without plaster.**

Waterproofing!

For the internal plaster, **you must add to the mixture some waterproofing material** and apply it on the entire wall and floor after the plaster is finished.

The mixture is of 1 litre of waterproofing to 10 litres of water.

Ratio of the mass: 3 tins of sand to 1 tin of cement and the water mixed with the waterproofing material.

step-by-step

With the mixture we plaster the interior covering the entire wall. Smooth it to have a good finish. This plaster must not be too thin. It's important to pay attention if the entire wall is plastered and there are not any cracks.

2

On the floor of the cistern we mix the mass and the diluted waterproofing.

3

Finishing the plaster we make a mortar with water and cement (fifty-fifty) to brush the wall and the floor.

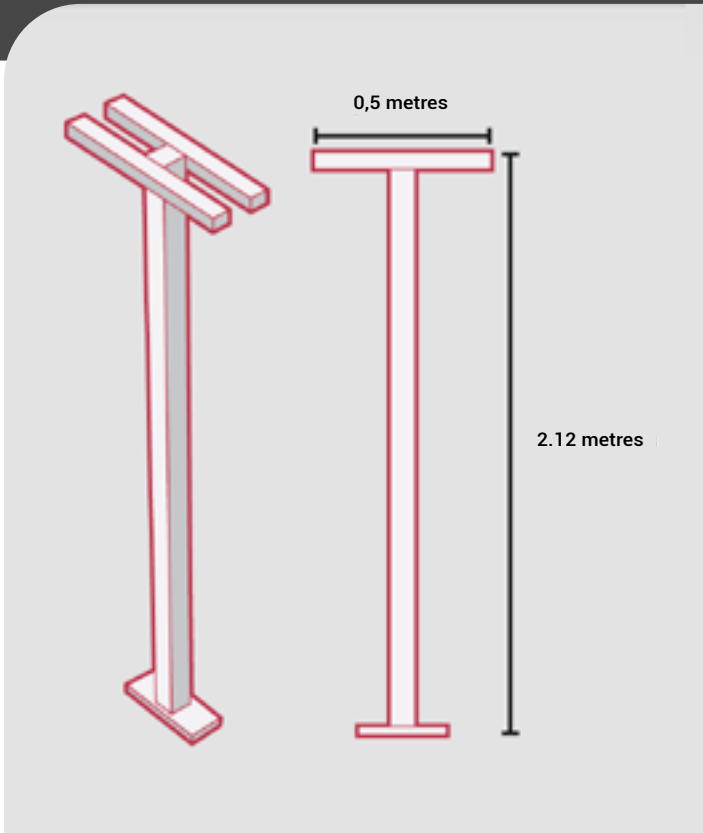
4

After everything is ready we seal the ditch around the cistern, ensuring it's well strengthened.

11 ASSEMBLY OF THE BEAMS

central pillar

This pillar will help us putting the roof together and after some days we will remove it from the plates cistern. Here's how we do it:



>> We cut a 2.12 m length wood beam.

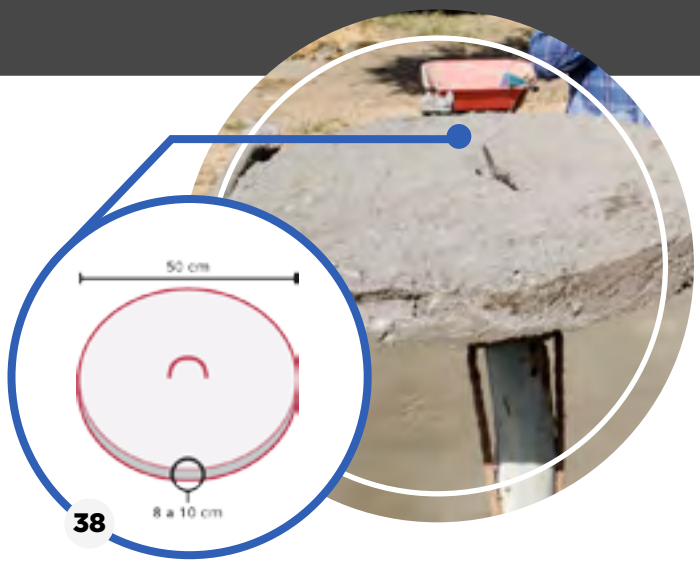
>> We put two 50 cm length pieces of wood transversally in one extremity.

>> On the other extremity we put a little shorter piece of wood.

cement cover

To build a cement cover with a diameter of 50 cm and from 8 to 10 centimetres thick.

Inside it you must put an 8 mm iron bar and finish it with a handle, like the image shows.



step-by-step

1

At the center of the cistern we apply some of the mixture in the form of a circle with a diameter of approximately 40 cm.

2

Upon this mixture we fix the central pillar with the end with the two pieces of wood facing up.

3

We fix the pillar with four wires crossed perpendicularly. We also could fix them with two pieces of wood, propped and tied.

4 We put the cement cover over the pillar, carefully.

5 We put the beams placing the ends with the hooks at the center with caution to keep the central pillar and the cement cover balanced.

6 We start with one and then put another at its opposite side for a better balance.

7

Each beam's iron hook is placed facing up, side by side, forming a little circle at the cement cover.

8

It may be necessary to scratch a little the edges of the extremities of some beams so they fit better.

9

After all the beams are in their places we encircle the hooks with many turns of wire.

10

Put concrete between the cover and the hooks. It must be pretty firm because we will remove the central pillar after five days.

Observe:

The concrete cover play the function of a mould, propping the concrete so it doesn't fall through the filling of the beam's joints.

another way of building the central pillar

This pillar will help us putting the roof together and after some days we will remove it from the plates cistern. Here's how we do it:

- Use the same pole or wooden beam but here you put a cover with a diameter of 50 cm (like an oil barrel cover) instead of the concrete cover, fixed to the beam by four pieces of wood.
- We can fix it with a wooden cross, tying the pillar with a wire so it remains well fixed.
- It is installed the same way as the former: upon a little mixture of concrete at the center of the floor of the cistern.
- The beams are placed the same way as in the previous example.

12 ROOF AND OTHER FINAL DETAILS

step-by-step

1

After the assembly of the beams with one of the two systems of central pillars we put the roof plates, one by one, leaning them on the beams with their smooth side facing in.

2

We grout the plates to fix them together.

3

We put the plate with the hole for the entry of water at the most convenient place for it to receive the water. For example, next to the roof gutter to channel the rainwater.

Important!

This entrance must remain closed while there's no water harvesting to avoid the entry of little animals, dirt, trash, etc.

4

We complete the plaster of the entire cistern with the same material of the external wall.

5

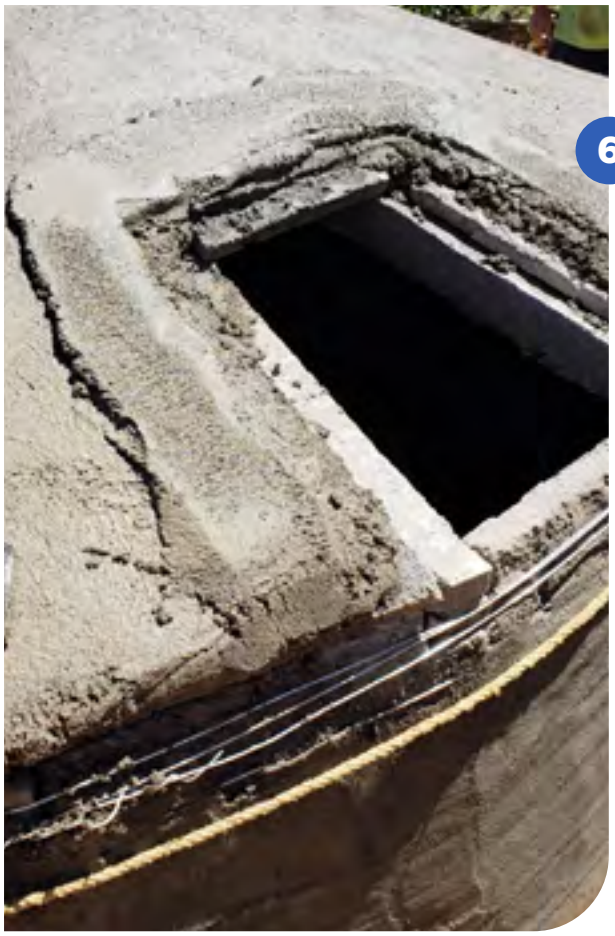
Around the plate where the door will be installed we make a frame to avoid the water from flowing into the cistern directly. This will protect the cistern from earth and will facilitate the installation of the door.

Tip!

Until the door for the plates cistern is installed we leave one plate loose so it can be easily removed allowing the entry and exit of a person.

Important!

It's very important to install the door as quickly as possible and to lock it up with a padlock for safety reasons, specially if there are children around that may have access to the cistern.



6

With a flexible material like a thin hose we encircle the cistern on the upper section of the wall, around 10 cm down from the limit with the beggining of the roof and we make a flange filling this with plaster mixture. This finish is a reinforcement to the place where the beams are laid.

7

We paint the exterior of the plates cistern with lime or water-based paint. This refflects sunlight, reducing the temperature inside the cistern, protecting it from humidity and diminishing the possibility of future cracks and dilations.

Here we finish the step-by-step guide for the construction of the plates cistern.

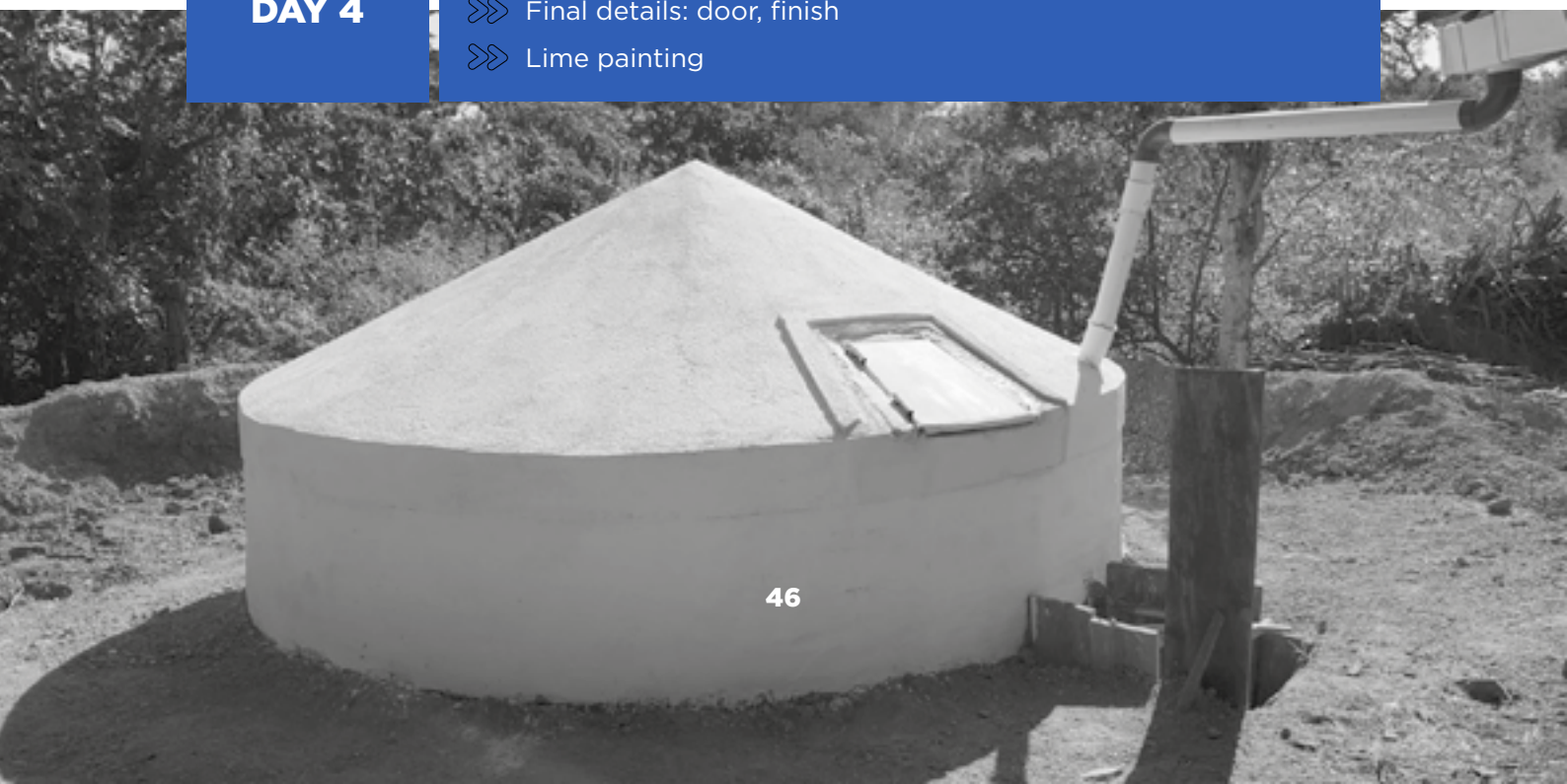
13 EXPECTED WORK SCHEDULE

The process of construction of a plates cistern takes from **4 to 5 days** with a team of **three or more people.**

There are tasks that can be carried out in advance:

- The digging of the hole where the cistern will be built.
- The manufacture of the moulds for roof, wall and beams.
- The gathering of all the tools and materials.

DAY	ACTIVITY
DAY 1	Manufacture of the plates
DAY 2 AND 3	Construction of the base for the bottom of the cistern Placement of the base grid and the construction of the floor Building of the wall, wiring and external plaster
DAY 4	Assembly of the roof, internal and external plaster Final details: door, finish Lime painting



14 HARVESTING WATER SYSTEM

tips to store clean water

- Clean water when stored probably won't lose quality over time.
- Make sure the subsequent treatment to eliminate pathogens is effective.
- The water we drink must be clean, odourless and free of sediments.

To make sure the water is clean and have the quality needed, a **filter system** before the water enters the cistern is necessary.

functioning

The roof collects the first rainwater that enters the prefilter with sticks, leaves and earth. It is filled and the plunger covers the entrance of the prefilter. The remaining water, already clean, passes through the pipe directly into the cistern.

meet 2 kinds of prototype

prototype 1

Based on the Brazilian Semiarid Articulation's (ASA) proposal. It has a fast prefilter for rainwater (float valve).

prototype 2

This prototype has a prefilter and a filter system before the water enters the cistern.

prefilter

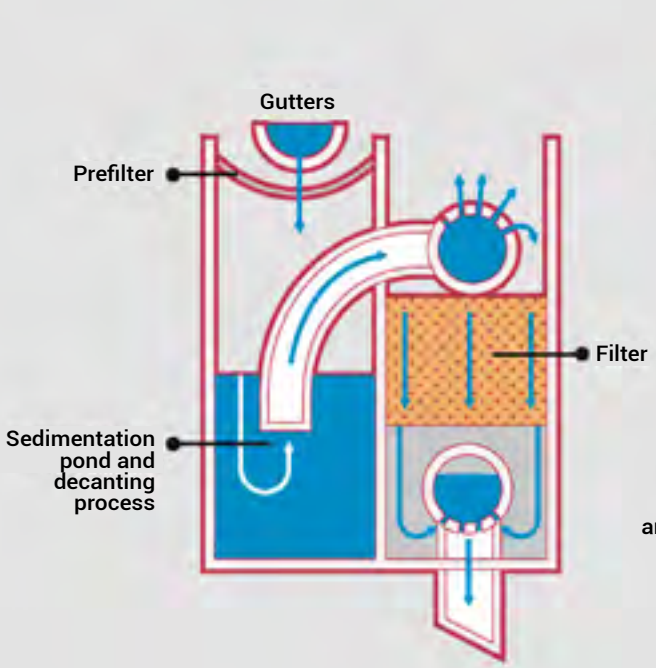
>> Holds bigger particles like leaves, sticks and bugs. It is used like a netting or a plastic grid.

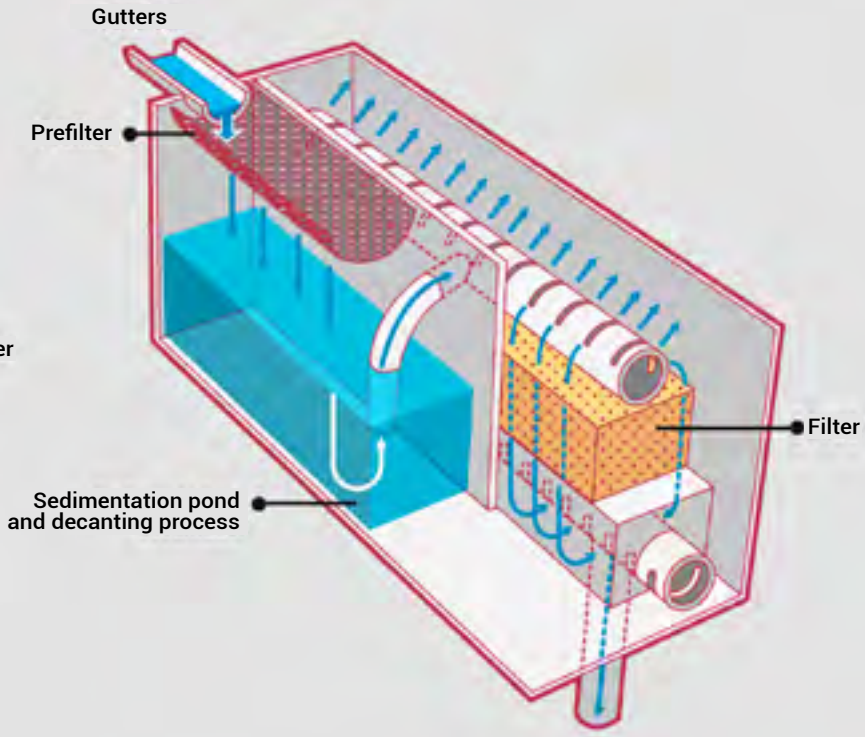
sedimentation pond and decanting process

>> They reduce the speed of the water as it goes down, this way some solid elements stay at the bottom of this structure and don't go into the cistern.

filter

>> Allows the thinner solid residues and the dissolved particles to be removed. There are commercial and homemade alternatives.





15 WITHDRAWAL OF THE WATER

To withdraw the water from the plates cistern the installation of a suction pump system is recommended. This way we avoid a possible contamination through buckets, trash bins or others and reduce the probability of accidents.

If it's not possible to use a pump, you can use a bucket exclusively for this purpose and make sure the bucket is always clean before putting it into the cistern.

how to avoid the contamination of the water after it is withdrawn from the cistern?

- The water of the first rain must be discarded and must not go directly into the cistern, because it may contain dirt from the roof;
- The cistern must always be tightly covered and the water must be withdrawn for usage always through the manual suction pump;
- The water that will be consumed must be treated using sodium hypochlorite or sanitary water.

other cautions that can improve the cleaning of the system

- Keep the roof and the gutters that channel the water well cleaned, specially before the beginning of the rain period.
- The PVC pipes that take the water from the roof to the cistern must be stored throughout the dry season to avoid them from cracking.
- Discard the first rainwater and avoid it getting into the cistern.

- It is recommended to clean the cistern every year. It's important this task is made by a pair so one person can be inside the cistern and the other one outside the cistern in case any inconvenience happens during the cleaning.
- Make sure no big or little animals (rodents, frogs) have access to the inside of the cistern. Place nettings or plastic covers over the entrances.
- The annual cleaning must be made on the entire cistern, using a mix with a ratio of one litre of sanitary water or chlorine to 5 litres of pure water.

This booklet is available in **Portuguese**, **Spanish**, **French** and **English**.

This booklet was financially supported by FAO.

You can also watch the video about the construction of the plates cistern with subtitles in the same languages. All this contents are available at the Brazilian Semiarid Articulation's website: **www.asabrasil.com.br**

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WHAT IS ASA?

The **Brazilian Semiarid Articulation**, ASA, is a network that for over 20 years proposes and implements politics for the coexistence with the Semiarid, developing the Training and Social Mobilisation for Living with the Semiarid Program. Its action, through the implementation of rainwater harvesting social technologies, has taken water to more than one million people, democratising the access to water in all the Brazilian Semiarid region.

ASA's experience is also shared with arid, semiarid and dry sub-humid areas from the whole world. Among its actions of implementation of rainwater harvesting technologies are the 1 Million Cisterns Program (P1MC), the Cisterns at the Schools Program and the One Land and Two Waters Program (P1+2).

IMPLEMENTATION: