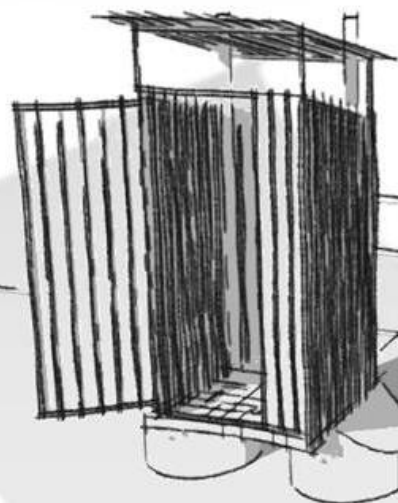




easy shower latrine

Technical handbook



LATRINE CONSTRUCTION

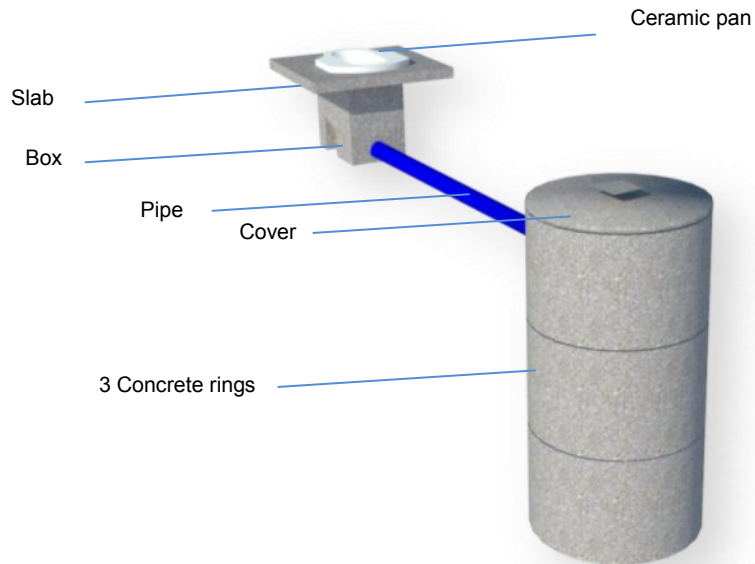
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SHELTER CONSTRUCTION

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Pour flush latrine

Developed by IDE-Cambodia, the “easy latrine” was inspired by the double pit latrine design originally developed in India by Sulabh International. However, the main adjustments we have made to this technology are to the price and the production methods. The construction methods are therefore at the center of the design, and we'll try to explain them clearly.

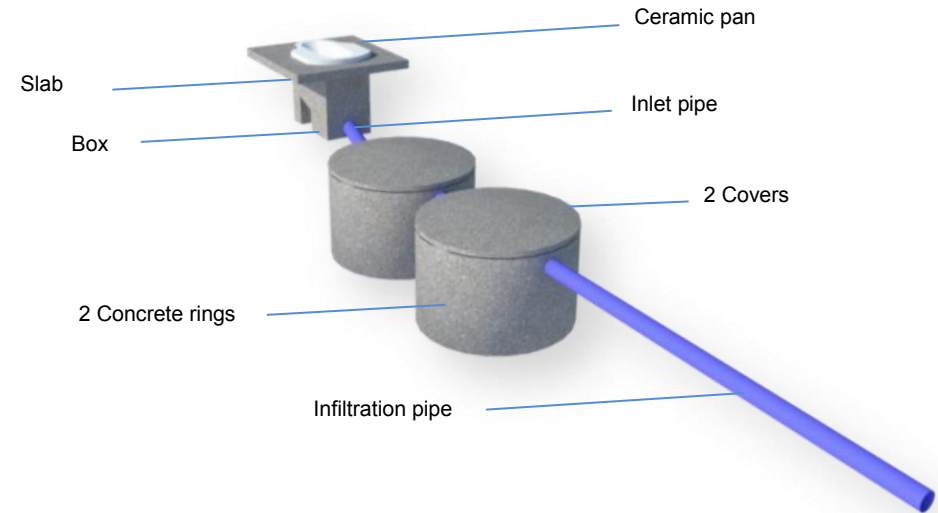


The elements will be described in the following chapters

- Quantity of concrete : 190 liters = 400 kg
- Effective capacity volume : 650 liters
- Labor time for construction of elements : 1 day worker
- Average material total price : 19 US\$ = 80,000 Riels

Pour flush micro septic tank

This concept was developed by GRET in areas where the bed rock is very shallow, making it impossible to dig more than 50 cm in depth. An optional third ring placed after the second pit and before the infiltration pipe will improve the treatment capacity of the latrine.



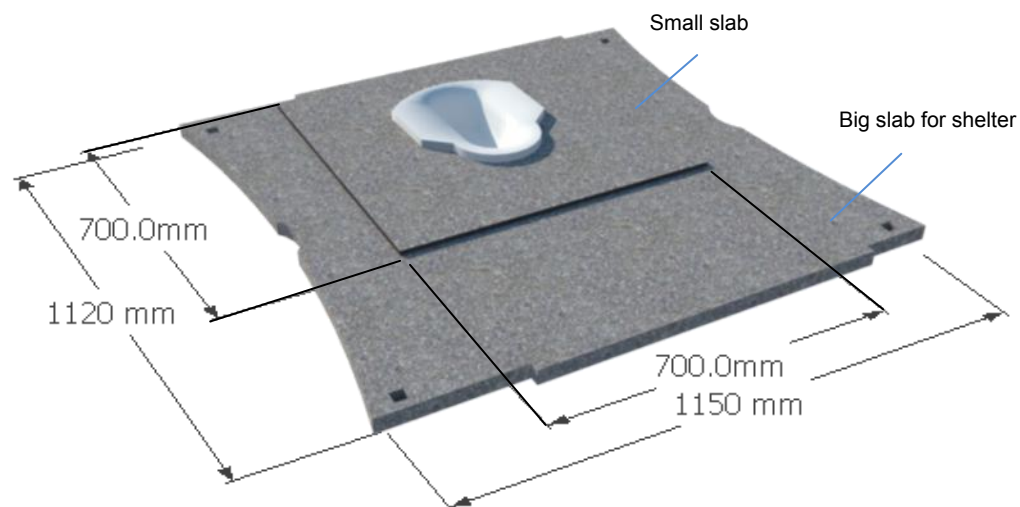
- Quantity of concrete : 175 liters = 380 kg
- Effective capacity volume : 450 liters
- Labor time for construction of elements : 1 day worker
- Average material total price : 21 US\$ = 88,000 Riels



A second pit should be purchased by the user. When full, the first pit should be filled with soil. After an average of 10 months the night soil becomes valuable compost. The second pit is usually sold for 10 US\$. You can reuse the same pipe for both pits by changing the angle.

Slab and ceramic pan for pour flush systems

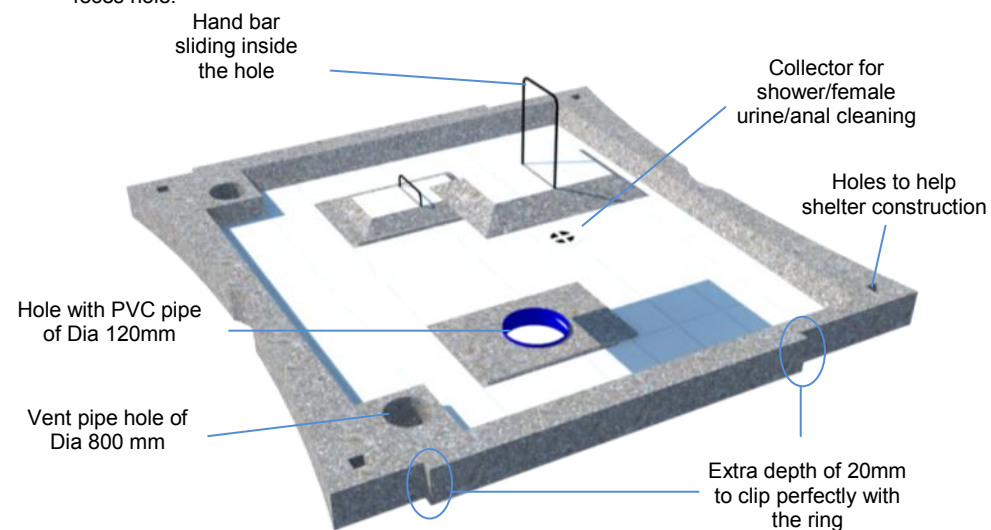
Different slab dimensions can be used with or without the shelter. The holes in the slab make it very easy to build (see page 13). The left columns (white) of the quantity chart refer to the small slab (0.7 x 0.7 m), the right columns (grey) refer to the big one (same size as easy shower slab presented further on).








Element	Kg/m ³	Weight kg		Volume l		Price (riel)		Price (\$)	
Sand 	1600	32	64	50	100	1000	2000	0.2-0.25	0.4-0.5
Water 	120	2.6	5	2	4	20	40		
Cement 	400	8	16	3	6	3900	7800	0.9-1	1.8-2
Rice Husk Ashes 	20	0.3	0.6	0.7	1.4	20	40		
Reinforcement 	70	1.4	3			4500	9000	1-1.2	2-2.4
		47 kg	95 kg	19 l	38 l	9,000	18,200	2.1-2.45	4.2-4.9

Slab for easy shower

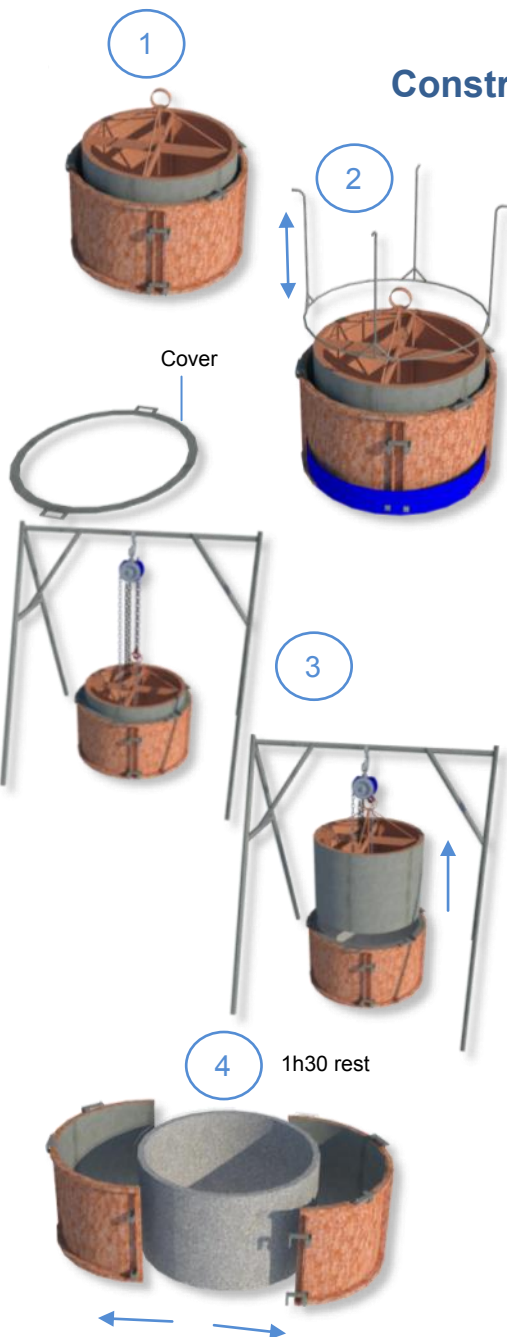
The slab of easy shower has a lot of small, specific details which make it easier to use and maintain. The design has two goals, firstly to collect all water through the central collector, and secondly to avoid any water in the two dry pits and consequently avoid water reaching the feces hole.



Element	Kg/m ³	Weight kg	Volume l	Price (\$)	
Sand 	1600	64	100	2000	0.4-0.5
Water 	120	5	4	40	
Cement 	400	16	6	7800	1.8-2
Rice Husk Ashes 	20	0.6	1.4	40	
Reinforcement 	70	3		9000	2-2.4
		95 kg	38 l	18,200	4.2-4.9

With Tiles = 10\$ extra

Construction Process



STEP 1 (1) Put oil, diesel or any other grease on the molds to prevent sticking to the metal molds.

The concrete has to be very dry so it will keep its shape when the inside mold is removed. After a few tests the right concrete consistency will be found.

STEP 2 Gently and equally pour the concrete inside the molds. After a third of the mold (marked in blue on the picture) is filled, start using the "compactor" (2) which will compact the concrete and remove any air bubbles stuck inside the concrete.

Compact the concrete for 1-2 minutes then place the first 2mm reinforcement wire inside the mold taking care to place the reinforcement wire 15cm apart. When the mold is full, place the mold lid on top and close the clips.

Once the mold is full of concrete and well compacted, put the cover and close the clips all around the outside mold. Once it's done, place the crane (3).

STEP 3 Place the crane over the closed mold. To lift the mold, one laborer has to stand on the top of the outside mold to make it easier to remove the inside mold. Lifting must be done smoothly and without stopping to avoid poor quality rings. Step 3 is completed when the inside mold is removed.

STEP 4 The outside mold and the concrete need to be left untouched for 1hr30min - 2 hours, depending on the quality of the sand (4). After this time is completed, open and remove the outside mold. The outside mold can now be reused to make another ring.

This method of production is very attractive because money is saved by needing only one inside mold and greater production volume is achieved with the accelerated curing process (1hr30min compared to 3 hours with traditional practices) This production technique is easy and fast to learn and takes only a few practice tries to perfect the technique.

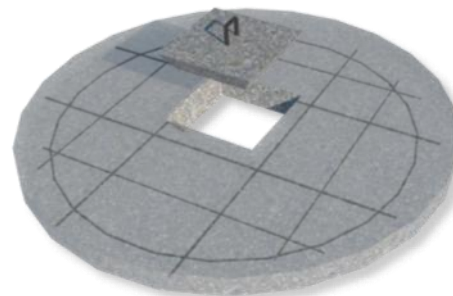


The rings have to cure for **10 days** before transportation, in order to let the concrete reach half its final strength.

Concrete Reinforcement for other elements

Basic rules of reinforcement bars

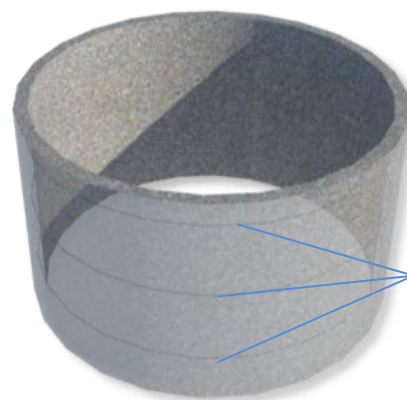
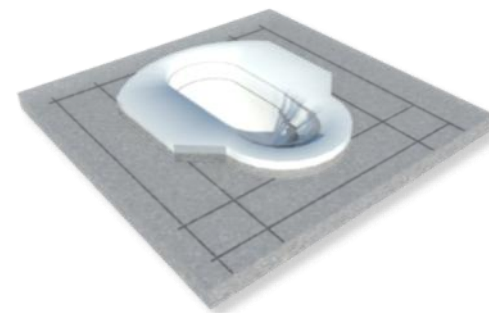
The steel bars have to be attached to one another with wire – The reinforcement steel bars should always be placed in the middle of the concrete, because of the thinness of the concrete components this is of extreme importance – High adherence steel bars should be used, but smooth bars can be used – The steel bars need to be inside the concrete and not at all visible on the outside - DO NOT use bamboo reinforcement for these elements this will produce a low quality product that risks braking and harming users.



The cover metal reinforcement are usually **4 mm** diameter but should be bigger if we expect cars or heavy loads on this cover through the time. Almost **7 m long are required for the cover**. It is extremely important to place the steel bars in the middle of the concrete.

The center hold cover doesn't need reinforcement but a handle bar for lifting.

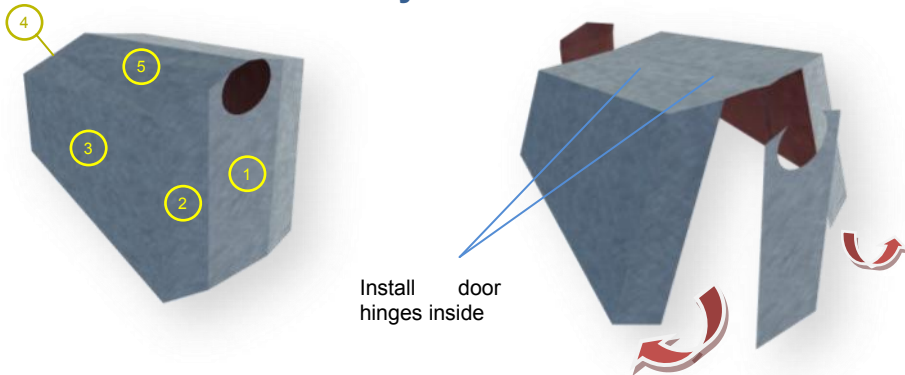
The steel reinforcement for the slab needs to be at least **4mm diameter**. **4.2 m long are required**. Placement of the steel reinforcement is more important than the diameter of the steel. The steel bars need to be placed underneath the ceramic pan at the edges to support it - placing the steel bars too far towards the middle of the ceramic pan will make it difficult to form a seal between the ceramic pan and catchment box when the latrine is assembled.



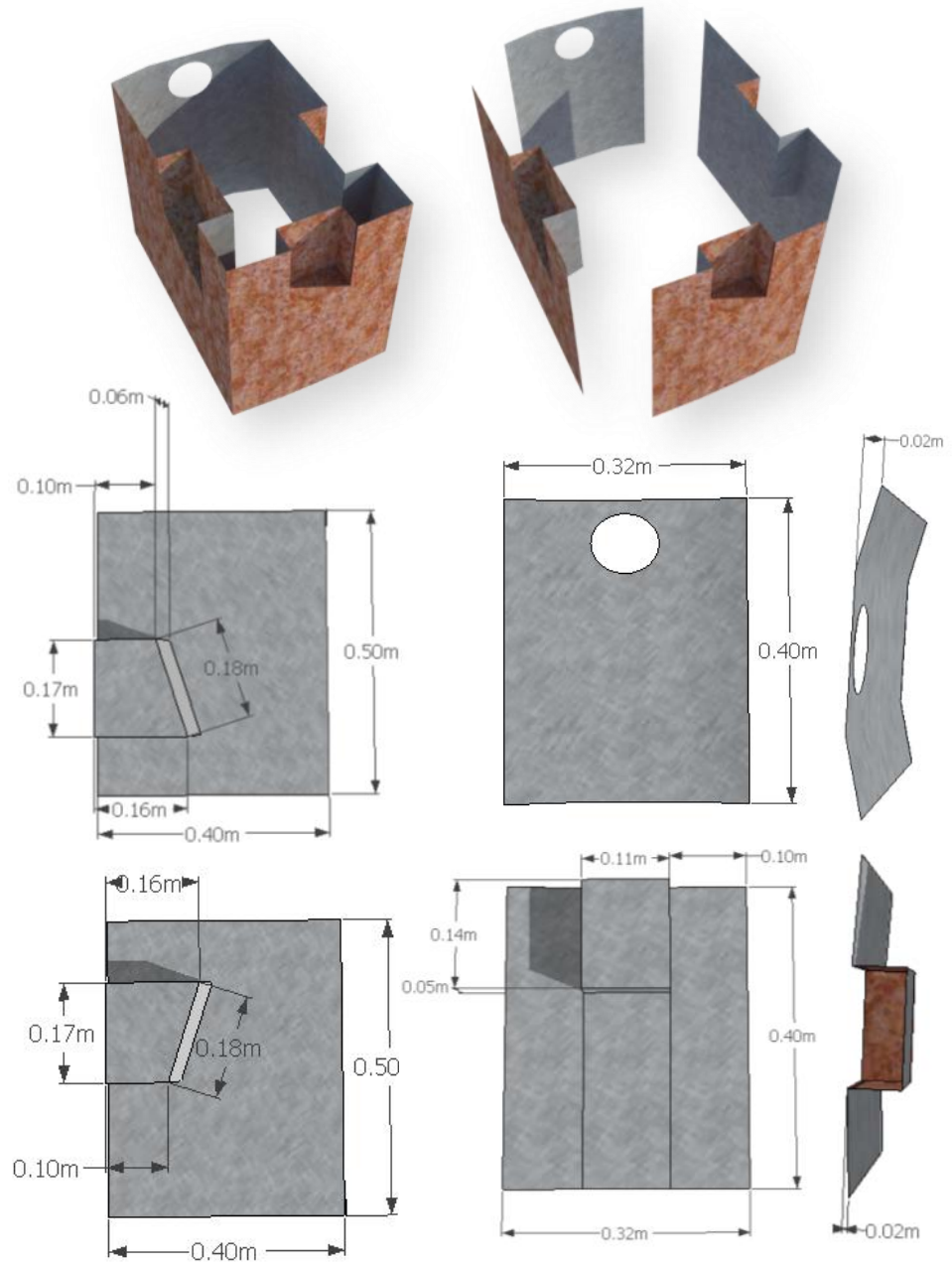
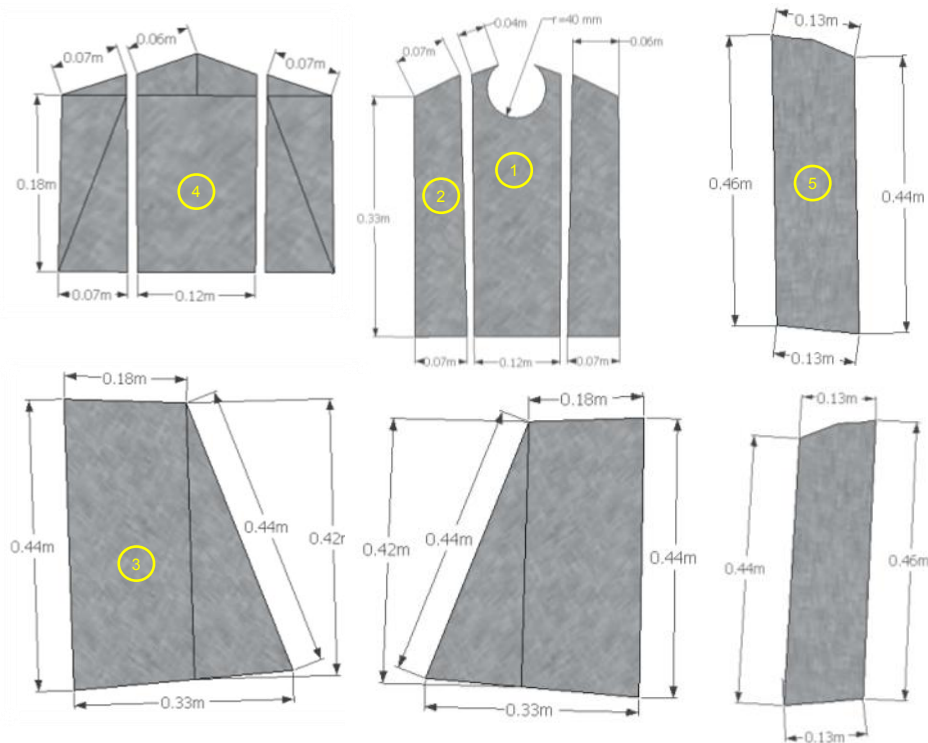
Reinforcement for the rings is very thin stainless steel wire, 2mm diameter. Three rings of the wire needs to be placed equal distance apart while avoiding covering the handling holes in the middle.

Reinforcement bars

Pour flush systems Box mold

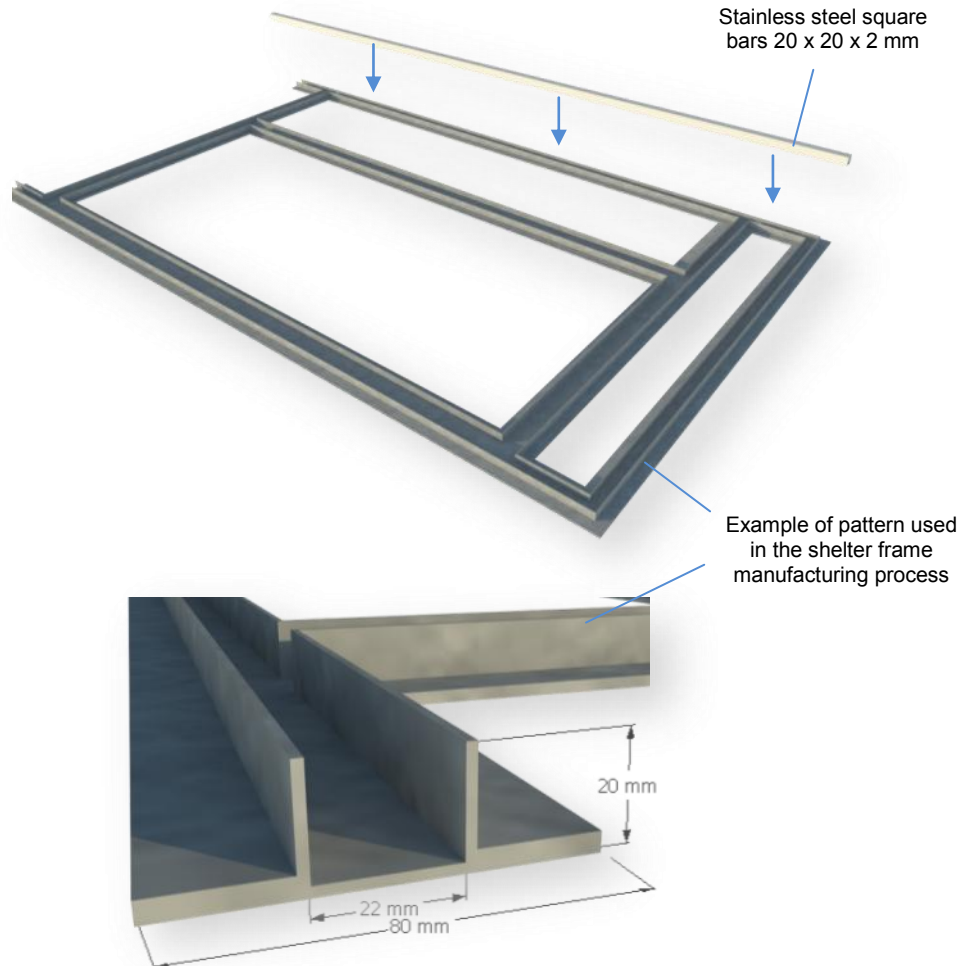


The inside box mold has a pyramid shape, giving it a smooth angle shape which makes mold removal easy. This point is very important if you don't want to break the box when you're removing it and to minimize breakage during removal.



Production methods

To build every component, a concept of "pattern" has been developed. It is basically assembled bar which will guide the shelter frame 2 x 2 cm square bars in order to manufacture the structure easy, quick, consistent and standardized. The pages 23 to 31 are dedicated to the dimension of these patterns.



To prevent the pattern away from rusting, it is important to buy stainless bars, paint them and keep them covered when not in use.



The production steps are the following:

STEP 1 Use the shelter pattern to measure the length for the shelter frame by placing the steel pieces into the pattern and cut to the length of the pattern (1).

STEP 2 For the horizontal frame pieces, on the ends of the steel cut off only 3 sides of the steel and leave at least 25 mm of excess length on one side. This extra steel at the end will be used to attach pieces together (2).

STEP 3 When all of the pieces have been cut, drill a hole through both bars to connect. Make sure the hole is the same diameter as the head rivets (3).

STEP 4 Secure rivets in the drilled holes to attach together all of the pieces (4).

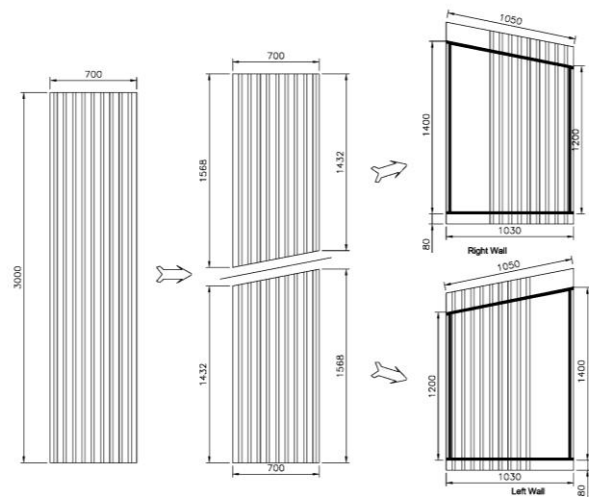
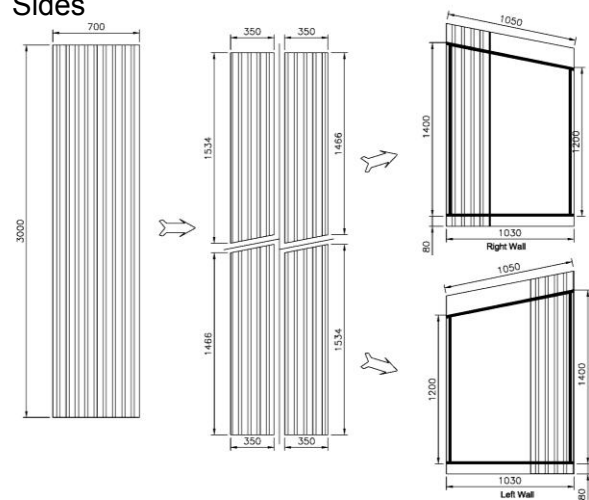
Then cut corrugated iron following the instruction on following chapter [Corrugated iron cutting model p30](#).

STEP 5 Attach the corrugated iron to the each of the four walls of the shelter frame by drilling holes through the corrugated iron and the shelter frame and attaching them together using rivets. Attaching the corrugated iron to the frame makes the finished shelter stable and strong (5).

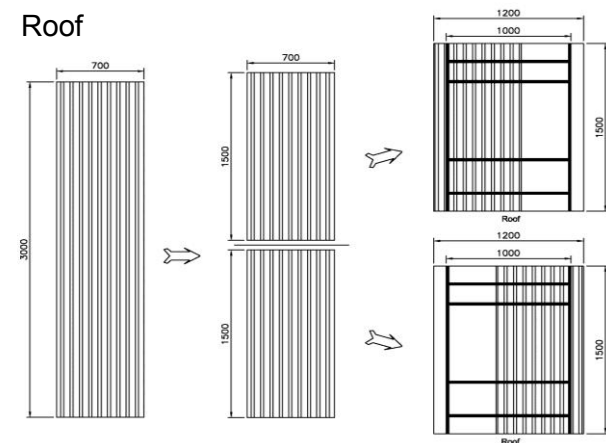


The choice of making the shelter 0.7 x 1.05 m on the ground has been made because in Cambodia the standard width for corrugated iron is 0.7 m. Corrugated iron is the most expensive part of the shelter, as you can see from p 30, corrugated iron cutting pattern. In other countries, other dimensions can be taken depending on the size of locally sourced materials, and keeping the spirit of the design.

Sides



Roof



Handout / "Do It Yourself" leaflets

