iDE CAMBODIA:
WASH EZ SHELTER HI RES PROTOTYPE
IN PARTNERSHIP WITH AUSTRALIAN DFAT – JUNE 2015
ABOUT THE LAB

inCompass Human-Centered Innovation Lab is a social innovation lab as well as a non-profit HCD (Human-Centered Design) consulting group within iDE. inCompass brings together a multi-disciplinary team of HCD practitioners from the fields of Service Design, Marketing Strategy, Industrial Design, Mechanical Engineering, Business Strategy, and Research Design -- the team has a combined 40+ years of professional experience in applying Human-Centered Design to designing solutions in a range of topic areas around the globe. inCompass provides HCD consultative services to NGO's, grant-makers, social enterprises, corporations, and aid agencies designing for the BoP in the areas of Water, Sanitation, Hygiene, Water Access, Schools, Rural Electrification, Irrigation, Agriculture, and Alternative Energy.

inCompass’ lab and team is based in the developing world -- in Cambodia -- to remain close to the BoP user context. inCompass has been engaged in projects in Cambodia, Vietnam, Bangladesh, Nepal, Laos, and Ethiopia to date.

ABOUT THE COVER

The cover represents the degree markings of a traditional compass. At inCompass we use human-centered insight as our compass towards sustainable innovation. The degree markings seen here are symbols of our approach, methodology and process which diverge and converge along each phase – guided by deep user understanding, desires and needs.

At inCompass our approach to social innovation always begins with people.
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  - User Testing
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- The Final Product
EASY SHELTER ORIGINS
MR. PISEY, iDE WASHS’ ENGINEER LED A SMALL PROJECT TO IMPROVE THE EXISTING SHELTER THAT IS ON THE MARKET.

THIS INITIATIVE LED TO A DESIGN THAT SERVED AS THE FOUNDATION FOR THIS PROJECT.
PROJECT GOALS

Design Improvements* for the latrine shelter in order to equally catalyze manufacturer-supply and user demand.

*Design Improvements include:

- Product design improvements
- Manufacturing process improvements related to the product design
- To a lesser extent: marketing strategy or service elements that are critical to the product design
OUR HUMAN CENTERED DESIGN PROCESS
HUMAN-CENTERED DESIGN

What is the BIG DEAL about HCD?

Leading innovation methodology to create solutions that are desirable, viable and feasible. Design solutions for both existing markets and new markets. Design new solutions or re-design existing solutions. Solutions can be products, services, systems, technologies and programs. Solutions are holistic: supply-chain, marketing, product, price and service.
HUMAN-CENTERED DESIGN
The HCD Process has 3 Main Stages

HCD uses a flexible process. We expand as we explore and generate possibilities. We narrow as we evaluate and select among the best ideas.
HEAR

- Where We Started
- Who We Spoke To
- Who We Met
- Where We Went
- User Insights and Design Principles
- Constraints
WHERE WE STARTED
WHO WE SPOKE TO

EXPERTS:

Ms. Tamara Baker, Director, iDE Global WASH
Mr. Ly Saroeun, SanMark Deputy Program Director – iDE Cambodia
Mr. Lim Pisey, SanMark Technical Engineering Manager
Mr. Pun Soly, RTLO - Regional Technical and Logistic Officer
Mr. Michel Dauguet, WASH Program Director

MANUFACTURERS:

Latrine Business Owners who have participated in the Shelter Pilot in Svay Rieng
Masons who have participated in the Shelter Pilot in Svay Rieng

END-USERS:

Customers who have bought Easy Shelter during last few months
Customers who have bought a brick shelter during the last year
Customers who have bought the Easy Latrine but not a shelter yet
WHO WE MET

ST: 1
BDC: 1
LBO - EASY SHELTER: 4
LBO - NON-EASY SHELTER: 4
MASONS FROM iDE INSTALLATION TEAM : 2
OTHER MASONS NOT WORKING WITH iDE: 2
END USER - EASY SHELTER: 17
END USER - NON - EASY SHELTER: 4
END USER - WITH EASY LATRINE BUT NO SHELTER YET: 13

Total: 50

Field Visit 1 - November 24th- 28th | Field Visit 2 - January 26th- 28th
Field Visit 3 - March 23rd- 27th | Field Visit 4 – June 1 – June 3
WHERE WE WENT
Easy Shelter 2.0 Test Site
DEEP DIVE – TO GAIN INSIGHTS

IDEAS

TIME

Hear
Research Planning and Research Design
In Field Analysis
Deep Dive

Create
Analyse & Synthesise
User Insights & Design Principles

Deliver
User Testing
User Testing
User Testing
Final Product

Scale
A User Insight

A User Insight captures the motivation, needs or mindset of a human user. An insight is the “WHY?” behind the behaviour. It is what users feel and desire but do not say explicitly.

Design Principles

Design Principles identify the most important user needs, and turn them into a clear direction forward. They become the foundation for a strategy that responds to what users need.
HOUSEHOLDS BUY THE EASY SHELTER EXPECTING MULTI-FUNCTIONALITY.

USERS TRADE-OFF BETWEEN MULTI-PURPOSE + FREQUENT BASIN REFILLS vs. SINGLE-PURPOSE + LESS BASIN REFILLS.
HAVING A SHELTER MEANS FREQUENT USE BY MULTIPLE PEOPLE. SIMULTANEOUS USE IS NOT POSSIBLE.

PEOPLE DREAM ABOUT EXPANDING TO A TWO-ROOM SHELTER. WHEN THEY BUY A SHELTER, THEY BUY WITH THE POSSIBILITY OF ADDING-ON IN THE FUTURE.
DESIGN PRINCIPLES

A solution that enables ** USERS ** to:

1. Access multi-functional use without feeling the need to trade-off with the pain of refilling.

2. Enable a multi-functional experience without interrupted access to water.

3. Have a space that enables both privacy and emotional transformation.

4. Have a space that can be used by multiple people without compromising privacy.

5. Avoid choosing between water that’s “conveniently close” and “appropriately clean”.

6. Have “clean-looking” water for longer.

7. Buy and act on the possibility of adding-on to the shelter in the future.

8. Not be disappointed by unmet pre-purchase expectations.

9. Get a “beautiful, ready-to-use” shelter that requires no further effort and money.
DESIGN PRINCIPLES

A solution that enables **LBOs** to:

10. Do their measurements more quickly and easily.
11. Be freed from personal oversight and construction of the shelter.
12. Minimize or avoid the use of skilled production labour.
13. Produce the shelters in a “Just-In-Time” manner.
14. Build without so many disjointed instructions and components to remember.
15. Produce concrete components faster, without additional capital investment.
16. Use equipment that can withstand rough-handling.

A solution that enables **Masons** to:

17. Get paid for any additional “repair” work required.
CONSTRAINTS

A few constraints that were taken into account during our exploration:

- The overall footprint of the shelter to be kept close to the existing Easy Shelter
- The overall price of the shelter to be kept close to the existing Easy Shelter
- The size of the components to be regulated as per the needs of transportation
- The design of the components to be ‘cast-concrete friendly’
- Focus on re-use/multiple use of the Easy Shelter Components
- Focus on no development of additional molds

*for more information, please refer to Wash Shelter DEEP DIVE*
CREATE

- Idea Generation Session
- Low Resolution Prototype
  - User Testing
  - Methods
- Medium Resolution Prototype
  - User Testing
  - Methods
MAPPING THE DESIGN PRINCIPLES

Mapping all Design Principle(s) to find connections and for directions to generate more ideas and concepts.
IDEA GENERATION SESSION

Following the design principles, a collaborative session between iDE WASH and inCompass was conducted using two techniques.

1. Brain drawing
2. Brainstorming
DIRECTION FOR CONCEPTS

Inspiration from:
• Ideas from idea generation session
• Discussions with Lucas and Pisey
• Trends research (Toilet and Shelter(s) around the world and other sources)

The output of the synthesis of the above information led us to several early concepts.
FROM EARLY CONCEPTS TO FINAL CONCEPTS

After analyzing the early concepts through different lenses (Feasibility, Viability and the Design Principles - user needs) we narrowed down to 4 concepts with different options.
LOW RESOLUTION PROTOTYPE
CONCEPT A: Basin Orientation, Long Inside Basin, Outside Basin, Outside Foundation

CONCEPT B: Elevated Pan – Slab, Step – Down Basin
FINAL CONCEPTS (Contd.)

CONCEPT C: Cover for the Pan - Slab, Small size Pan - Slab

CONCEPT D: Long Inside Basin, Partition, Two Doors
USER TESTING – LOW RESOLUTION PROTOTYPE
USER TESTING METHODS & TOOLS

- 1:1 Interviews to test our Low resolution prototypes (4 selected concepts)
- Co-creation design session with our users to design their ideal toilet with stimulus (scenarios and shelter components pieces).
- Think Aloud
- Observations
AN OUTSIDE BASIN IS AN ENABLER TO DO MULTIPLE ACTIVITIES BY DIFFERENT PEOPLE AT SAME TIME.

ACCESS FROM RIGHT SIDE IS THE MOST PREFERRED ORIENTATION OF THE BASIN.
Tiles are associated with clean activities. They are also a clean surface to wash clothes (even outside the shelter).

Step is a means to keep the pan clean and dry.
TWO ROOMS IS THE FINAL STAGE OF THE ASPIRATIONAL SHELTER BUILDING JOURNEY.
# SUMMARY

User Testing – Low Resolution Prototype

<table>
<thead>
<tr>
<th>Concept A</th>
<th>Basin on Right, Outside Basin, Outside foundation</th>
<th>Long Inside Basin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concept B</td>
<td>Raised Pan - Slab</td>
<td>Step Down Basin</td>
</tr>
<tr>
<td>Concept C</td>
<td>None</td>
<td>Cover, Small Pan - Slab</td>
</tr>
<tr>
<td>Concept D</td>
<td>None</td>
<td>Partition</td>
</tr>
</tbody>
</table>

Other recommendation(s):

- Rainwater gutter & Downpipe
- Tiles on both foundation- floor (inside and outside)
- Add – on 2nd room

*for more information, please refer to [Wash Shelter LOW RES PROTOTYPE](#)*
DIRECTION

Medium Resolution Prototype
MEDIUM RESOLUTION PROTOTYPE
SITE SELECTION: EXISTING WASH SHELTER
BUILDING THE FOUNDATION, LAYING TILES & FINISHING
OPTION 1: RECTANGULAR BASIN
OPTION 3: SEMI-CIRCULAR BASIN
USER TESTING – MEDIUM RESOLUTION PROTOTYPE
USER TESTING METHODS & TOOLS

- 1:1 Interviews to test our Medium resolution prototype (3 basin configurations)
- Think Aloud
- Observations
USERS PERCEIVE THE $350-MARK AS ‘AFFORDABLE’ AND ‘NOT EXPENSIVE’ FOR THE FEATURES.
RECTANGULAR BASIN IS THE MOST PREFERRED SHAPE FOR THE USERS.

STORAGE IS THE MOST IMPORTANT FACTOR IN CHOOSING A BASIN.
THE OUTSIDE FOUNDATION SERVES AS A ‘CLEAN AREA’ FOR WASHING CLOTHES AND BATHING SELF AND KIDS.

CERTAIN USERS PREFER TO HAVE DIFFERENT WATER FOR DEFECATION AND BATHING.
Masons: Preparation of tiles is perceived as the most time consuming activity.

Water – run off from the outside foundation is seen as an element of risk.
### SUMMARY

User Testing – Medium Resolution Prototype

<table>
<thead>
<tr>
<th></th>
<th>+</th>
<th>-</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rectangular Basin</td>
<td>Form, Finish, Placement of basin</td>
<td>Capacity</td>
</tr>
<tr>
<td>Circular Basin</td>
<td>Capacity</td>
<td>Form (shape), Placement of basin</td>
</tr>
<tr>
<td>Half Circle Basin</td>
<td>Small Size Basin Cover</td>
<td>Form (shape), Capacity</td>
</tr>
</tbody>
</table>

Other Element(s):

- Rainwater gutter & Downpipe - As an Accessory
- Tiles on both foundation - floor (inside and outside)
- Add – on 2\textsuperscript{nd} room
- Marketing & Sales Elements

*for more information, please refer to [Wash Shelter MED RES PROTOTYPE](#)*
FUTURE DIRECTION
HI RES PROTOTYPE

MANUFACTURING PROCESS IMPROVEMENTS WITH LBOs

- Inside Basin (mod.) on the right
- Elevated Pan - Slab
- Molds - Reduced Height Foundation
- Rectangular Outside Basin w/ Increased Capacity
- Minimal Tile Preparation
- Outside Foundation (w/o Water Runoff)
- Lighting Options
DELIVER

- Space Perception Test
- High Resolution Prototype
  - User Testing
  - Users with Special Needs Testing
  - Methods
- Medium Resolution Prototype
  - User Testing
  - Methods
- The Final Product
METHODS & TOOLS

• Quantitative survey using Likert scale to measure:
  • General impression
  • Space perception (big-small)
  • Comfort
  • Privacy

• Those variables were measured after performing 3 tasks: using the underground latrine, having a bath and washing the clothes. They were performed randomly.

• 4 different concepts were tested

• The test was conducted at the inCompass Lab

• 20 end-users came to our prototype and participated in this test
SPACE PERCEPTION TEST
One of our participants from the Shelter Perception Test
SPACE PERCEPTION TEST
Four Different Interior Layouts of the Easy Shelter 2.0

Unit: Mean based on Likert scale from 1 to 5, where 1 is small/short and 5 big/high
Sample: 20 people
THE WINNER
HI RES PROTOTYPE CONCEPT DEVELOPMENT
HI RES PROTOTYPE CONCEPT DEVELOPMENT
HI RES PROTOTYPE CONCEPT DEVELOPMENT
OPTION 1
OPTION 2
HI RESOLUTION PROTOTYPE
FINAL BUILD
HI RESOLUTION PROTOTYPE
FINAL BUILD
USER TESTING - HI-RES PROTOTYPE
USER TESTING METHODS & TOOLS

- 1:1 Interviews to test our Hi resolution prototype
- Task performance
- Observations
THE SPACE INSIDE IS PERCEIVED AS ‘BIG’ FOR ACTIVITIES LIKE TAKING A BATH & WASHING CLOTHES
THE OUTSIDE BASIN, COVER AND RAIN WATER GUTTER WERE THE THINGS THAT WERE LIKED THE MOST. (OUTSIDE FOUNDATION)
THE STEP AND THE BIG INSIDE BASIN WERE THE THINGS THAT WERE LIKED THE MOST. (INSIDE THE SHELTER)
AN OUTSIDE BASIN IS AN ENABLER TO DO MULTIPLE ACTIVITIES BY DIFFERENT PEOPLE AT SAME TIME. ACCESS FROM RIGHT SIDE IS THE MOST PREFERRED ORIENTATION OF THE BASIN USERS. USERS DID NOT FIND THE PARTITION IN THE OUTSIDE BASIN USEFUL.
AN OUTSIDE BASIN IS AN ENABLER TO DO MULTIPLE ACTIVITIES BY DIFFERENT PEOPLE AT THE SAME TIME.

ACCESS FROM THE RIGHT SIDE IS THE MOST PREFERRED ORIENTATION OF THE BASIN.

WARRANTY IS THE MOST IMPORTANT FACTOR IN CHOOSING A LANTERN.
AN OUTSIDE BASIN IS AN ENABLER TO DO MULTIPLE ACTIVITIES BY DIFFERENT PEOPLE AT THE SAME TIME. ACCESS FROM THE RIGHT SIDE IS THE MOST PREFERRED ORIENTATION OF THE BASIN.

THE $20-$25 RANGE WAS ‘EXPENSIVE’ FOR MOST OF THE USERS.
USERS WITH SPECIAL NEEDS TESTING
AN OUTSIDE BASIN IS AN ENABLER TO DO MULTIPLE ACTIVITIES BY DIFFERENT PEOPLE AT THE SAME TIME. ACCESS FROM THE RIGHT SIDE IS THE MOST PREFERRED ORIENTATION OF THE BASIN.

THE WIDTH OF THE DOOR WAS FOUND TO BE A BARRIER TO ENTER THE TOILET.
A SITTING TYPE PAN WAS RECOMMENDED INSTEAD OF THE SQUAT PAN.
EASY SHELTER 2.0 – EASY ACCESS
LET’S CHECK OUR DESIGN PRINCIPLES
THE USER
01. ACCESS MULTI-FUNCTIONAL USE WITHOUT FEELING THE NEED TO TRADE-OFF WITH THE PAIN OF REFILLING.
01. ACCESS MULTI-FUNCTIONAL USE WITHOUT FEELING THE NEED TO TRADE-OFF WITH THE PAIN OF REFILLING.
02. ENABLE A MULTI-FUNCTIONAL EXPERIENCE WITHOUT INTERRUPTED ACCESS TO WATER.
02. ENABLE A MULTI-FUNCTIONAL EXPERIENCE WITHOUT INTERRUPTED ACCESS TO WATER.
03. HAVE A SPACE THAT ENABLES BOTH PRIVACY AND EMOTIONAL TRANSFORMATION.
03. HAVE A SPACE THAT ENABLES BOTH PRIVACY AND EMOTIONAL TRANSFORMATION.
04. HAVE A SPACE THAT CAN BE USED BY MULTIPLE PEOPLE WITHOUT COMPROMISING PRIVACY.
04. HAVE A SPACE THAT CAN BE USED BY MULTIPLE PEOPLE WITHOUT COMPROMISING PRIVACY.
05. AVOID CHOOSING BETWEEN WATER THAT’S “CONVENIENTLY CLOSE” AND “APPROPRIATELY CLEAN”.
05. AVOID CHOOSING BETWEEN WATER THAT’S “CONVENIENTLY CLOSE” AND “APPROPRIATELY CLEAN”.
06. HAVE ‘CLEAN-LOOKING’ WATER FOR LONGER.
06. HAVE ‘CLEAN-LOOKING’ WATER FOR LONGER.
07. Buy and act on the possibility of adding-on to the shelter in the future.
07. BUY AND ACT ON THE POSSIBILITY OF ADDING-ON TO THE SHELTER IN THE FUTURE.
08. NOT BE DISAPPOINTED BY UNMET PRE-PURCHASE EXPECTATIONS.
08. NOT BE DISAPPOINTED BY UNMET PRE-PURCHASE EXPECTATIONS.
09. Get a ‘beautiful, ready-to-use shelter that requires no further effort and money.'
09. Get a ‘Beautiful, Ready-to-Use Shelter That Requires No Further Effort and Money.'
THE LBO
10. DO THEIR MEASUREMENTS MORE QUICKLY AND EASILY.
10. DO THEIR MEASUREMENTS MORE QUICKLY AND EASILY.
11. BE FREED FROM PERSONAL OVERSIGHT AND CONSTRUCTION OF THE SHELTER.
11. BE FREED FROM PERSONAL OVERSIGHT AND CONSTRUCTION OF THE SHELTER.
12. MINIMISE OR AVOID THE USE OF SKILLED PRODUCTION LABOUR.
12. MINIMISE OR AVOID THE USE OF SKILLED PRODUCTION LABOUR.
13. PRODUCE THE SHELTERS IN A ‘JUST-IN-TIME’ MANNER.

14. BUILD WITHOUT SO MANY DISJOINTED INSTRUCTIONS AND COMPONENTS TO REMEMBER.

15. PRODUCE CONCRETE COMPONENTS FASTER, WITHOUT ADDITIONAL CAPITAL INVESTMENT.
13. PRODUCE THE SHELTERS IN A ‘JUST-IN-TIME’ MANNER.

14. BUILD WITHOUT SO MANY DISJOINTED INSTRUCTIONS AND COMPONENTS TO REMEMBER

15. PRODUCE CONCRETE COMPONENTS FASTER, WITHOUT ADDITIONAL CAPITAL INVESTMENT.
16. USE EQUIPMENT THAT CAN WITHSTAND ROUGH-HANDLING.
16. USE EQUIPMENT THAT CAN WITHSTAND ROUGH-HANDLING.
SHELTER OVERVIEW:
[FUNCTIONALITY OF MAJOR SHELTERS EXISTING IN THE MARKET]

<table>
<thead>
<tr>
<th>FUNCTIONALITY</th>
<th>Only for defecating</th>
<th>Primarily for defecating</th>
<th>Multi-Functional</th>
<th>Multi-Functional</th>
</tr>
</thead>
<tbody>
<tr>
<td>OCCUPANTS</td>
<td>One</td>
<td>One</td>
<td>One</td>
<td>2+</td>
</tr>
<tr>
<td>PRIVACY</td>
<td>Minimal</td>
<td>Only for 1 person</td>
<td>Only for 1 person</td>
<td>Separate bathing/toilet areas</td>
</tr>
<tr>
<td>BASIN</td>
<td>None</td>
<td>1, limited size</td>
<td>Large basin/multiple</td>
<td>Large basin outside and inside</td>
</tr>
<tr>
<td>PRIMARY BLOCK</td>
<td>Temporary Materials</td>
<td>Not Expandable</td>
<td>Does not allow simultaneous usage</td>
<td>None</td>
</tr>
<tr>
<td>USER PERCEPTION</td>
<td>Temporary</td>
<td>Unfinished and limited functionality</td>
<td>Ready-to-use</td>
<td>Ready-to-use, Good Value for Money</td>
</tr>
</tbody>
</table>
FINAL PRODUCT
### SUMMARY

<table>
<thead>
<tr>
<th></th>
<th>EASY SHELTER</th>
<th>EASY SHELTER 2.0</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DIMENSIONS</strong></td>
<td>1.4m x 1.4m</td>
<td>1.6m x 1.6m each (Two Foundations)</td>
</tr>
<tr>
<td><strong>CAPACITIES</strong></td>
<td>Inside Basin – 150L</td>
<td>Inside Basin – 311 L Inside Basin – 973L</td>
</tr>
<tr>
<td><strong>ADDITIONS</strong></td>
<td>NA</td>
<td>Step for Pan, Outside Foundation, Outside Basin w Cover</td>
</tr>
<tr>
<td><strong>ACCESSORIES</strong></td>
<td>NA</td>
<td>Rainwater Gutter, Light</td>
</tr>
<tr>
<td><strong>TIME FOR INSTALLATION</strong></td>
<td>1 Day</td>
<td>1.5 Days</td>
</tr>
<tr>
<td><strong>UPGRADEABLE</strong></td>
<td>NO</td>
<td>YES</td>
</tr>
<tr>
<td><strong>PRICE</strong></td>
<td>$280</td>
<td>$350</td>
</tr>
</tbody>
</table>
EASY SHELTER 2.0 SALES RECOMMENDATIONS
CUSTOMER’S DISAPPOINTMENT JOURNEY

CUSTOMER DESIRE
Because of different triggers [safety of daughters, problems with open defecation, etc.] the customer desires a ready-to-use shelter, that allows multi-use.

SALES PROCESS
ST presents the Easy Shelter as “ready-to-use.” The sales brochure shows interior tiles, the dimensions of the basins and different pictures of the shelter.

Customer interprets the Easy Shelter as “ready-to-use” and likes that the package includes delivery and installation of the underground latrine.

On delivery, the customer is surprised and slightly disappointed to see that the Easy Shelter is not made from bricks, has a smaller basin, and does not include tiles.
At installation, customer is very disappointed to find that no tiles are added, the size is smaller than stated, the walls are unpainted, and that the seams are highly visible.

Once installation finishes, the customer must pay extra for getting the shelter “ready-to-use.” The customer requires additional savings, time, effort, and cost to add the tiles and paint originally implied in the sales presentation.

Customer is further exasperated to learn that the Easy Shelter cannot be modified in the future. The customer is now stuck with a shelter he cannot upgrade.

The disappointment leads to growing chain-reaction of negative feelings leading to multiple, immediate cancellations throughout the village.
The ST wants to ensure that he/she sells at least one product within the iDE WASH product portfolio. ST’s actively push the underground latrine to ensure they get the commission from this product. They do not push the sales of the shelter because it is a much more difficult sell.

Recommendations for Easy Shelter 2.0:

1. The shelter target should not be the same as the underground latrine. The new shelter should be sold primarily to:
   - Users who have already purchased the underground latrine.
   - Users with a permanent structure who do not have an underground latrine yet.

2. When trying to sell the underground latrine, the ST often emphasises that the user can buy the underground latrine and build a shelter independently at their leisure. WASH ST’s should avoid saying this as it is harmful to future Easy Shelter 2.0 sales.
3. The ST should sell the idea that the Easy Shelter 2.0 is a turn-key sanitation solution. Which includes: the underground latrine, concrete shelter, tiles, paint, delivery and installation. Another key selling point is that the Easy Shelter 2.0 can be used by multiple people at once while guaranteeing privacy.

4. The ST should show the add-on option of additional walls to create a two-room shelter from the Easy Shelter 2.0. Emphasizing the price of only $150.00 to update. This product add-on should be included in the sales material/collateral.

5. The Easy Shelter 2.0 should be sold on formal credit or payment plans (6-7 payments of $50). A pricing and payment option leave-behind should be left with the customer.

6. The Easy Shelter 2.0 sales brochure should include additional photos of new current design including dimensions/proportions and photos of the exact materials (tiles, cement/rock, steel, etc.)
7. The Easy Shelter 2.0 sales brochure should include the product pricing spectrum. It should be explained that the two models of Easy Shelter 2.0, Easy Shelter 2.0 + add-on functional equally and offer the same opportunities as brick shelters but are less expensive.

8. The Easy Shelter 2.0 sales brochure should include a page with six small images (as found in the current brochure) which depicting the disadvantages of having an underground latrine paired with a non-permanent shelter:
   - Smell goes to their neighbours.
   - Only one person can use it at a time.
   - Lack of water in a non-permanent shelter for washing themselves after use and before eating.
   - Pain of refilling the bucket constantly.
   - It is not a turn-key solution (no tiles, no paint, etc.).
   - No light.
9. The Easy Shelter 2.0 sales brochure should include a page with eight small images depicting the *advantages* of purchasing the new Easy Shelter 2.0:

- It is a turn-key product includes all materials including: underground latrine, concrete walls, tiles, paint, delivery and installation.
- Two to three members of a household can use the Easy Shelter 2.0 simultaneously.
- Activities that can be performed inside the shelter and outside the shelter as washing clothes on the floor, washing the dishes, bathing, bathing children, etc.
- The large capacity of the outside basin significantly reduces the effort of refilling the inside basin.
- There is now a large quantity of water within the Easy Shelter 2.0.
- The new dimensions of the Easy Shelter 2.0.

10. For group sales, the ST should invite participants to a household that has already purchased the Easy Shelter 2.0. The village chief should be there too as an important influencer.
TECHNICAL SPECIFICATIONS - COST & OTHER CALCULATIONS
AMOUNT OF RAINWATER COLLECTED

Calculations for the amount of water collected by the Rainwater gutter

Annual average rainfall in Cambodia: 1000mm - 1500mm (39.4in – 59.1in)

Size of the shelter roof: 2000mm x 2000mm (78.74in x 78.74in)
6.56ft x 6.56ft = 43 sq. ft.

Average rainfall: 49.25in
43sq. ft. x 0.623 (conversion factor) = 26.80 gallons
26.80 x 49.25 = 1320.38 gallons ~ 4996 liters

Run off percentage – 0.9
4996 x 0.9 = 4496.4 liters

Minimum amount of C.S of the pipe – 1cm^2 of gutter C.S / 1 m^2 of roof area
Roof area – 2 x 2 = 4 sq. m
Minimum C.S of the gutter pipe – 4 cm^2
AMOUNT OF WATER IN THE BASIN

Calculations for the amount of water in the basin

Outside Basin (Option 1):
1000mm x 700mm x 1390mm
973 liters

Outside Basin (Option 2):
900mm x 720mm x 720mm
466 liters
466 liters x 2 = 933 liters

Inside Basin:
600mm x 720mm x 720mm
311 liters
Pressure Calculations for the Outside basin walls

Considering an outside basin of 1.2m x 0.6m x 0.6m

Force on the wall:

\[ F_{\text{wall}} = \frac{1}{2} (\rho) \times g \times w \times h^2 \]

\[ \frac{1}{2} \times 1000 \text{ kg/m}^3 \times 9.8 \text{ m/s}^2 \times 1.2 \text{m} \times 0.6 \text{m} \times 0.6 \text{m} \]

\[ 2116.8 \text{ m kg/s}^2 \]

\[ 2117 \text{N} \]

-----------------------------------------------

Force on the base:

Mass of water in a basin of 1.2m x 0.6m x 0.6m = Density/Volume

1000kg/m^3/ 0.432m^3

432kg

\[ F_{\text{base}} = m \times g \]

432kg x 9.8m/s^2

4233.6 m kg/s^2

\[ 4234 \text{N} \]
## COST CALCULATIONS

**Cost Estimate for the EZ Shelter 2.0**

**Size: 3.0m x 3.6m x 1.8m**

### Foundation and Reinforcement Bar Inputs for Foundation

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
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<th>Material Cost</th>
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<th>Unit Measure</th>
<th>Units Req.</th>
<th>Total # Unit req.</th>
<th>Cost/unit (BRL)</th>
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<th>Cost (USD)</th>
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<td>2</td>
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<td>15.13</td>
<td>517</td>
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</tr>
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<td>15.13</td>
<td>517</td>
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<tr>
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<td>2</td>
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<td>13.07</td>
<td>4,523</td>
<td>32.57</td>
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<td>280</td>
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<td>6.30 kg</td>
<td>1</td>
<td>2</td>
<td>13</td>
<td>42.44</td>
<td>1,556</td>
<td>11.03</td>
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<td>3.35 kg</td>
<td>1</td>
<td>2</td>
<td>67</td>
<td>17.67</td>
<td>689</td>
<td>4.92</td>
</tr>
<tr>
<td>4</td>
<td>Fill the foundation with</td>
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<td>31</td>
<td>13.07</td>
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### Column

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<tr>
<th>No.</th>
<th>Description</th>
<th>Material</th>
<th>Material Cost</th>
<th>Volumetric Measure (m^3)</th>
<th>Unit Measure</th>
<th>Units Req.</th>
<th>Total # Unit req.</th>
<th>Cost/unit (BRL)</th>
<th>Cost (BRL)</th>
<th>Cost (USD)</th>
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<td>3</td>
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<td>2</td>
<td>Front wall</td>
<td>Cement</td>
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<td>2</td>
<td>4</td>
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<td>981</td>
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<td></td>
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<td>Sand</td>
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<td>2.07 kg</td>
<td>2</td>
<td>4</td>
<td>8</td>
<td>13.07</td>
<td>4,523</td>
<td>32.57</td>
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<tr>
<td></td>
<td></td>
<td>Gravel</td>
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<td>1.83 kg</td>
<td>2</td>
<td>4</td>
<td>8</td>
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<td>517</td>
<td>3.46</td>
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<td>78</td>
<td>1.83 kg</td>
<td>2</td>
<td>4</td>
<td>8</td>
<td>15.13</td>
<td>517</td>
<td>3.46</td>
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<tr>
<td>3</td>
<td>Back and 2 sides wall</td>
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<td>408</td>
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<td>4</td>
<td>3</td>
<td>12</td>
<td>16.36</td>
<td>528</td>
<td>3.81</td>
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<td></td>
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<td>Sand</td>
<td>22</td>
<td>1.25 kg</td>
<td>4</td>
<td>3</td>
<td>12</td>
<td>16.36</td>
<td>528</td>
<td>3.81</td>
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<td>Gravel</td>
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<td>1.25 kg</td>
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<td>3</td>
<td>12</td>
<td>16.36</td>
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## COST CALCULATIONS

### IV. Concrete and Reinforcement bar inputs for Basins

<table>
<thead>
<tr>
<th>Material</th>
<th>Inside Basin</th>
<th>Outside Basin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cement</td>
<td>406</td>
<td>406</td>
</tr>
<tr>
<td>Sand</td>
<td>13.36</td>
<td>13.36</td>
</tr>
<tr>
<td>Gravel</td>
<td>78</td>
<td>78</td>
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<tr>
<td>Bar Diameter</td>
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</tr>
<tr>
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### V. Input for Shelter Roof Structure

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<th>Item</th>
<th>Inside Basin</th>
<th>Outside Basin</th>
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<tr>
<td>Roof Battens</td>
<td>1,783</td>
<td>1,783</td>
</tr>
<tr>
<td>Rafter of the gable of a shelter</td>
<td>2,2</td>
<td>2,2</td>
</tr>
<tr>
<td>Common Rafter</td>
<td>2,2</td>
<td>2,2</td>
</tr>
<tr>
<td>Steel embedded in the top column (front column)</td>
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<td>3,554</td>
</tr>
<tr>
<td>Roof Battens</td>
<td>3,554</td>
<td>3,554</td>
</tr>
<tr>
<td>Rafter of the gable of a shelter</td>
<td>3,554</td>
<td>3,554</td>
</tr>
<tr>
<td>Common Rafter</td>
<td>3,554</td>
<td>3,554</td>
</tr>
<tr>
<td>Steel embedded in the top column (back column)</td>
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<td>Total</td>
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### VI. Input for Outside Basin Roof Structure

<table>
<thead>
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</tr>
</thead>
<tbody>
<tr>
<td>Corrugated zinc sheet (0.68m*3m)</td>
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<tr>
<td>Rivets</td>
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<td>50</td>
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<tr>
<td>Bolts (8mm)</td>
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<td>500</td>
</tr>
<tr>
<td>Total</td>
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### VII. Input for Finishing work

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<td>Door</td>
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<td>60,000</td>
</tr>
<tr>
<td>Tile 20cm*20cm input for Foundation 1</td>
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</tr>
<tr>
<td>Tile 20cm*20cm input for Foundation 2</td>
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<td>813</td>
</tr>
<tr>
<td>Floor Drainage input for Foundation 1</td>
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<td>Floor Drainage input for Foundation 2</td>
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<tr>
<td>PVC Pipe input for Drainage of Foundation 1</td>
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<tr>
<td>PVC Pipe input for Drainage of Foundation 2</td>
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<td>Rain Gutter</td>
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**Total Cost in Riel** 792,892

**Total Cost in USD** $175.72

Labor Fee (Installation) 40$ (2 laborer x 2 days x $10)
Labor Fee (Manufacturing) 20$
Labor Fee (Up/Down Loading) 10$
Transport 10$
ST 10$
Total 90$

Total (without margin) 175$ + 90$ = 265$
TWO MORE EASY SHELTER 2.0 SOLD LAST WEEK!
4997 TO GO..
THANK YOU!

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SanMark Technical Engineering Manager
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