

UNHCR Household Toilet / Bathing Unit

D403-2015a

**Tools and Guidance for
Refugee Settings**



UNHCR
The UN Refugee Agency

UNHCR Standardized WASH Designs

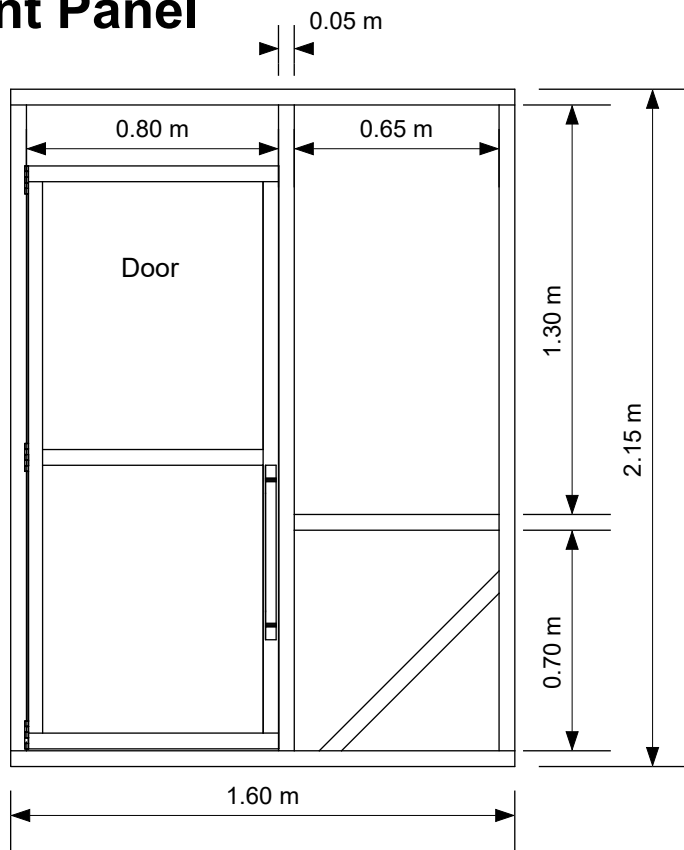
Household Toilet / Bathing Unit (Domed Slab)

FOREWORD

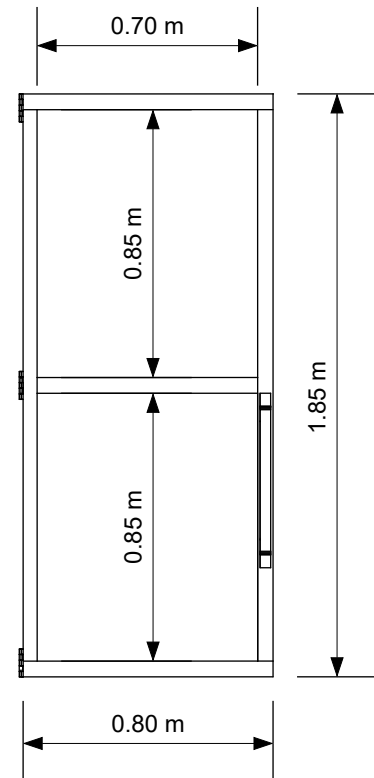
These household toilet and bathing unit (domed slab) designs form part of UNHCR's series of Standardized WASH Design Guidelines for Refugee Settings which are the result of an extensive review process with WASH actors active in refugee settings. It is recognized that the Standardized WASH Designs will require continuous review and amendment in response to changes in engineering best-practice and feedback from the field. Therefore further review will be managed by a Technical Review Committee which will meet regularly to discuss issues related to the use of the design and an annual review will be reported back to the WASH community. More urgent amendments will be reported as, and when, required.

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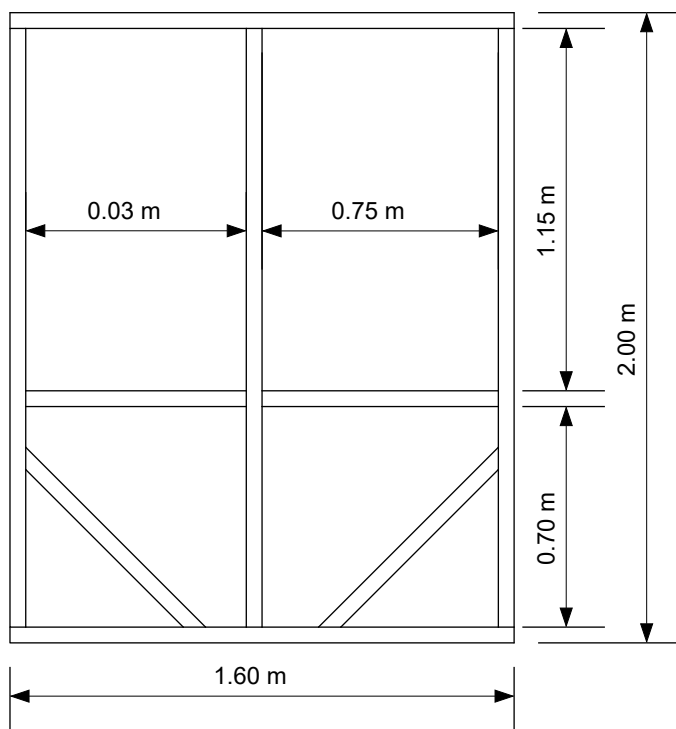
Front Panel



Door Detail



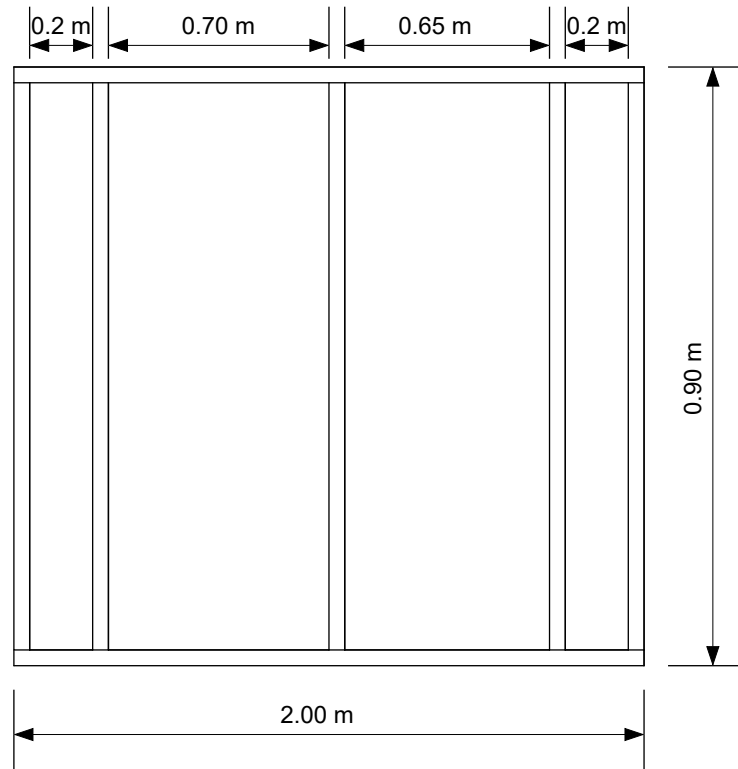
Rear Panel



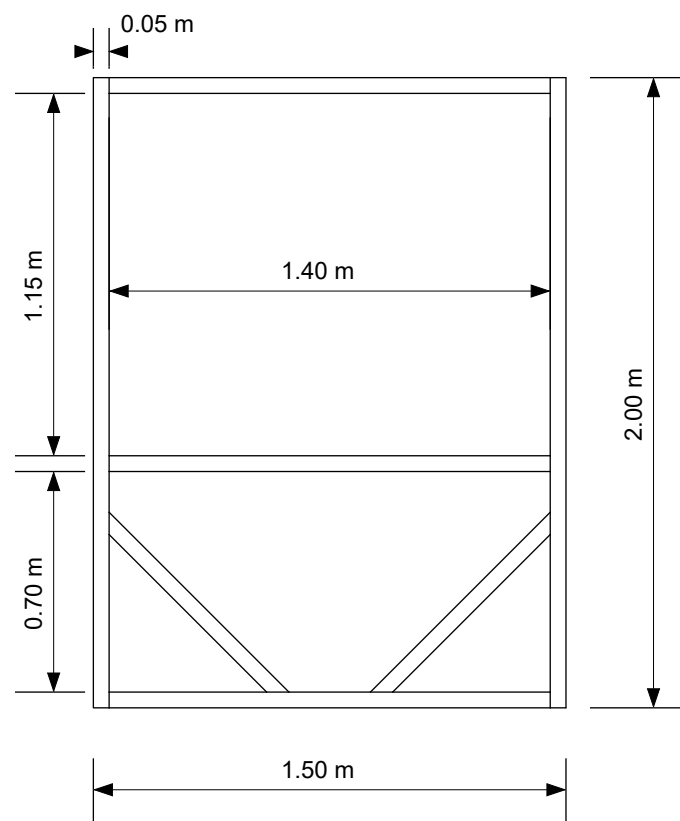
NOTES

1. All WASH infrastructure to be located at least 30m from water sources.
2. Distances to be increased when excavating infiltration pits in fissured rock.
3. The base of all latrine pits and infiltration pits must be at least 1.5m higher than maximum annual groundwater table.
4. Site to be adequately cleared and levelled before starting construction.
5. All doors hung straight and level.
6. All doors equipped with three (3) hinges at least 50cm long. All screw holes filled with screws. Nails not permitted.
7. Maximum gap between door and frame 3mm. Maximum gap between door and floor 10mm.
8. All doors to be equipped with a long child friendly handle of at least 50cm length on both the inside and outside door faces.
9. All doors to be equipped with a child friendly and secure locking mechanism.
10. Superstructure construction materials to be harmonized with household shelter materials taking into account local culture and context. Options for the superstructure material include plastic sheeting, elephant grass, wood planks, wood panels, adobe, or corrugated iron sheeting.
11. In some settings the provision of materials for the superstructure may be the responsibility of the household.

Roof Panel



Side Panels



x2

NOTES

1. Individual panels to be prepared in a dedicated mass production facility and transported to the assembly location.
2. Panels timbers to be joined either using galvanized screws or at least two (2) galvanized skewed nails at each connection location.
3. Panel-to-panel connections to be made using M10 bolts for ease of disassembly or movement to new locations.
4. All plastic sheeting to meet UN humanitarian standards (i.e. 200g/m² 700N tensile strength, UV stabilized laminated woven or braided mesh of black high density polyethylene between two white layers of low density polyethylene).

D-403

TITLE
Household Bathroom Unit
 General Layout
PROJECT
 Project Name, Country

DRAWN BY
 B. Harvey - 11/10/15
APPROVED BY
 M. Burt - 15/11/15
SCALE
 1:30

UNITS
 metres
SHEET
 2 of 4
DATE PUBLISHED
 15/11/15



Alternating Pit Philosophy

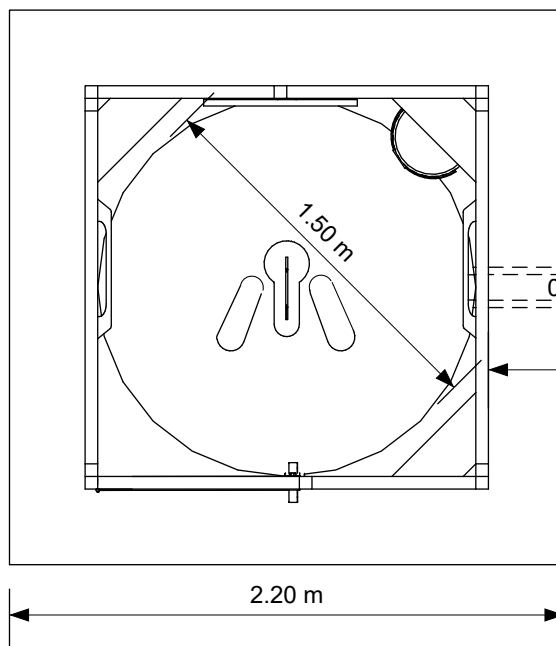
When the first pit is full (50cm from surface) a second pit may be constructed by the household close to the first pit.

The first pit should be backfilled with soil and approximately 10kg of lime added to help neutralise the pH and help with decomposition.

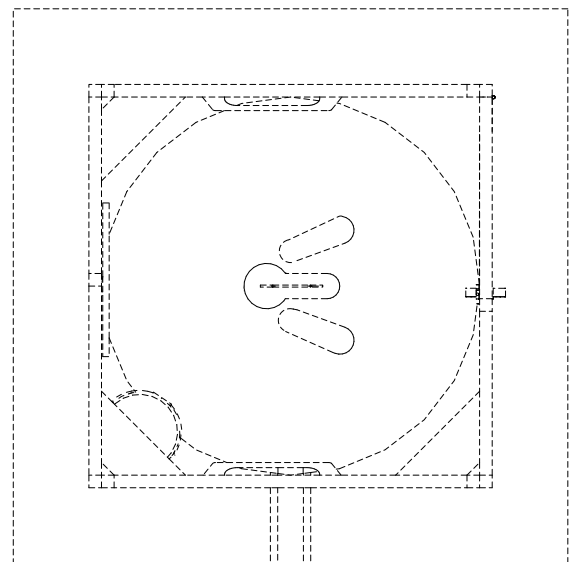
Every 2/3 years the superstructure can be alternated between the two pits. This period is sufficient for natural predators in the soil to neutralize any pathogens and to process the contents into nutrient rich soil.

The alternating twin pits can be used indefinitely at minimal cost with the additional added benefit of producing nutritious soil conditioner.

**PIT AND
SUPERSTRUCTURE #1**



**PIT AND
SUPERSTRUCTURE #2**



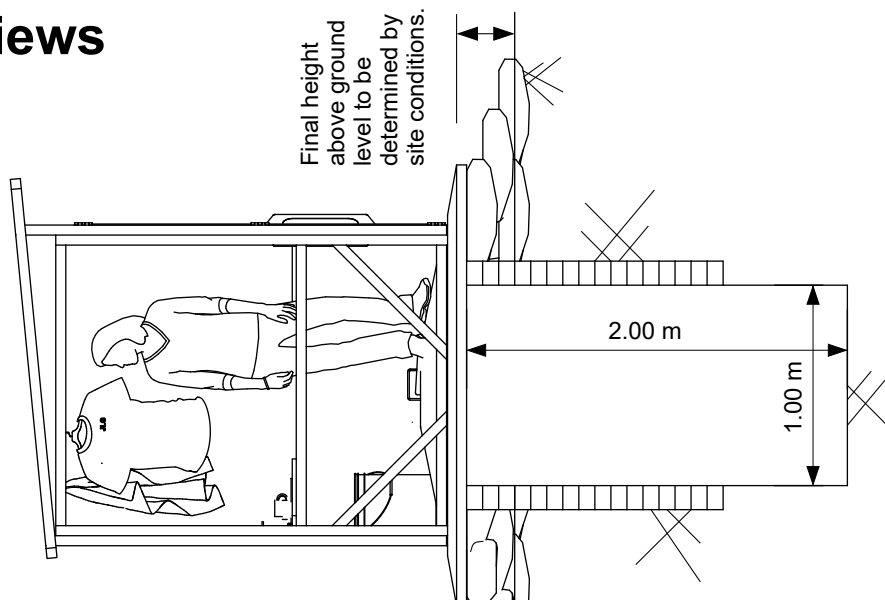
Optional drainage trench and
soakaway pit if the unit is to be also
used as a bathing cubicle.

NOTES

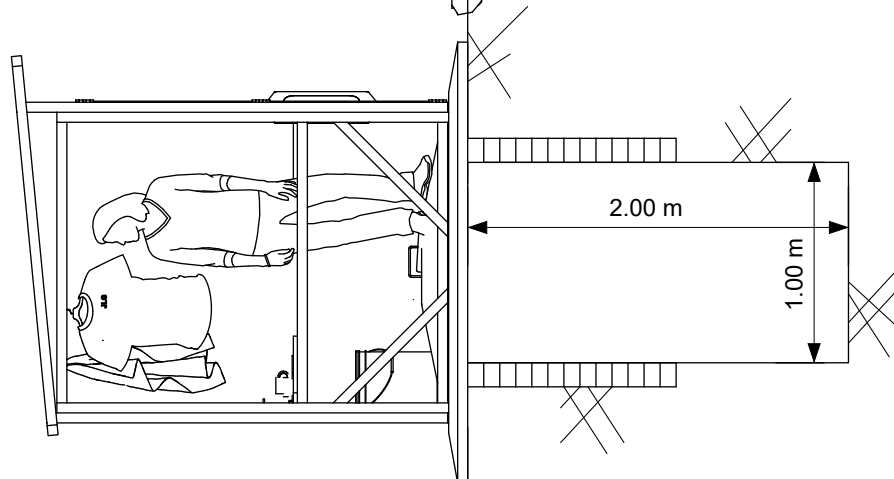
1. Drainage depth to be determined based on number of users and soil infiltration capacity (see Appendix 20 of Engineering in Emergencies or page 213 of UNHCR WASH Manual).
2. In cold climates, pit depth should be deeper than maximum permafrost level.

Sectional Views

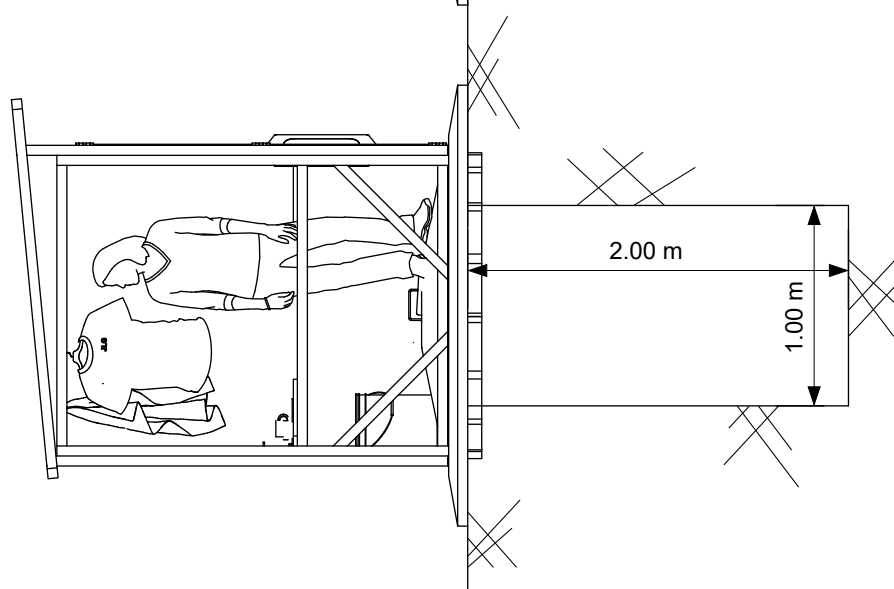
**C) Lined and Raised Design for Sites
Liable to Flooding**



**B) Brick Lined Version for Sites
with Soft Soils**



A) Unlined Version



Pit volumes optimised to fill in 2/3 years based on a family of 6 persons using decomposable anal cleansing materials (see calculation in UNHCR WASH Manual). The size has been calculated to allow 50cm freeboard.

NOTES

1. Final slab surface to be at least 20cm - 30cm above ground level to prevent water ingress.
2. In soft soils, pits to be lined with appropriate locally available materials e.g. brick masonry, sandbags, blocks, bamboo, branches, to at least 1.0m depth or more if required.

D-403

TITLE
Household Bathroom Unit
General Layout
PROJECT
Project Name, Country

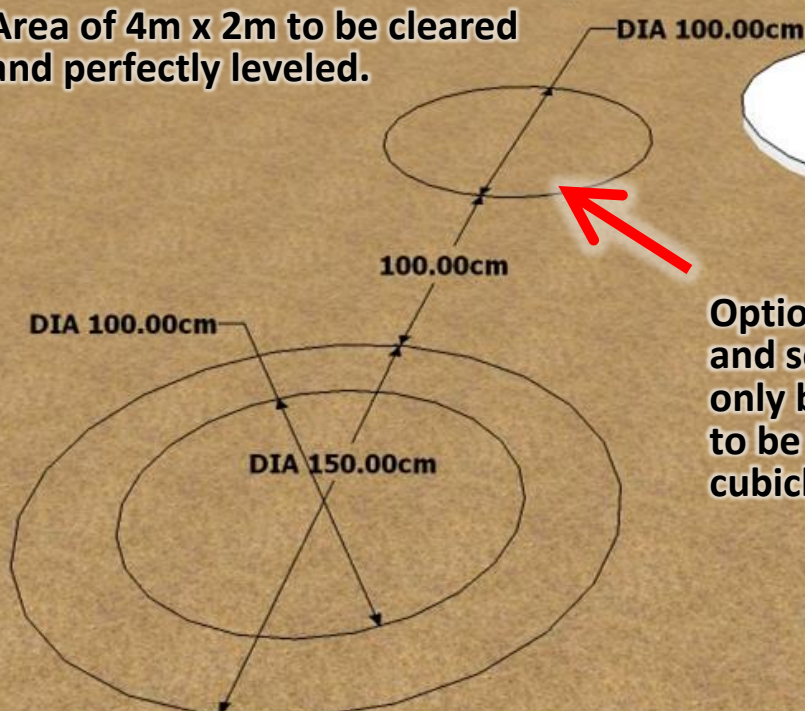
DRAWN BY
B. Harvey - 11/10/15
APPROVED BY
M. Burt - 15/11/15
SCALE
1:30

UNITS
metres
SHEET
4 of 4
DATE PUBLISHED
15/11/15

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Select an area within the plot as agreed with the owner.

Area of 4m x 2m to be cleared and perfectly leveled.



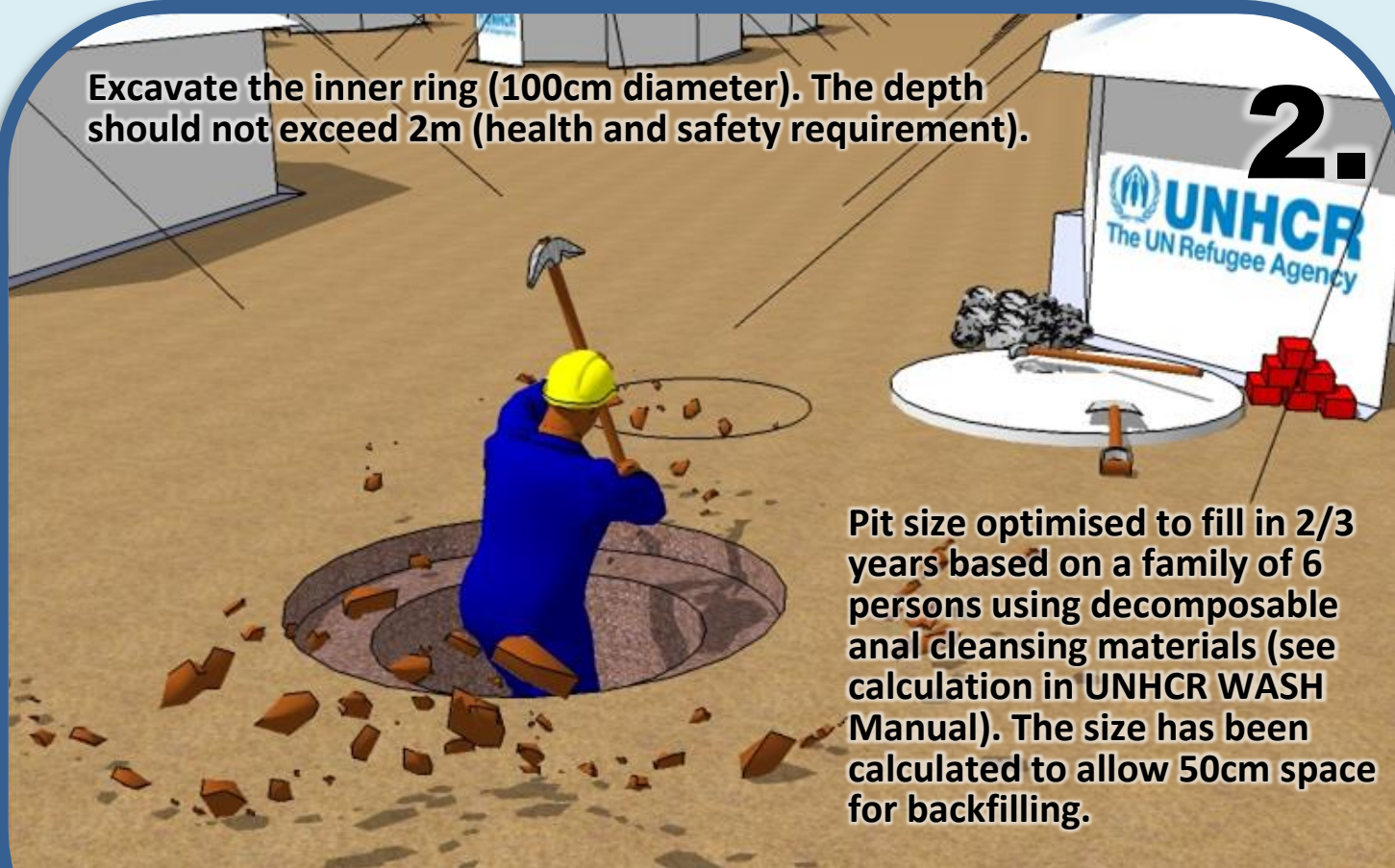
Optional drainage trench and soakaway pit should only be added if the unit is to be also used as a bathing cubicle.



Ensure site is at least 30m from any water source.

2.

Excavate the inner ring (100cm diameter). The depth should not exceed 2m (health and safety requirement).

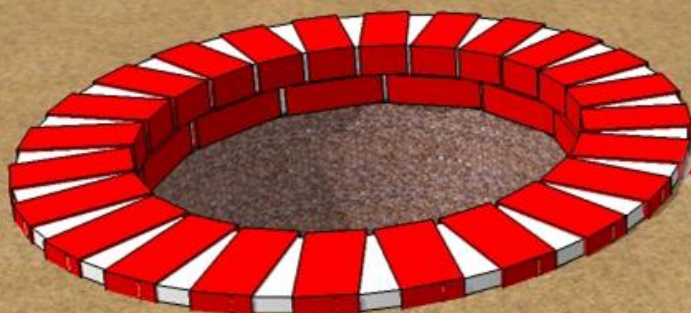


Pit size optimised to fill in 2/3 years based on a family of 6 persons using decomposable anal cleansing materials (see calculation in UNHCR WASH Manual). The size has been calculated to allow 50cm space for backfilling.

In areas of high groundwater, ensure the pit base is always at least 1.5m above the average annual groundwater level.

3.

Construct the slab support ring of at least two brick courses thick (min 30cm). In soft soils this brick lining depth may need to be increased to at least 1m or more if required.



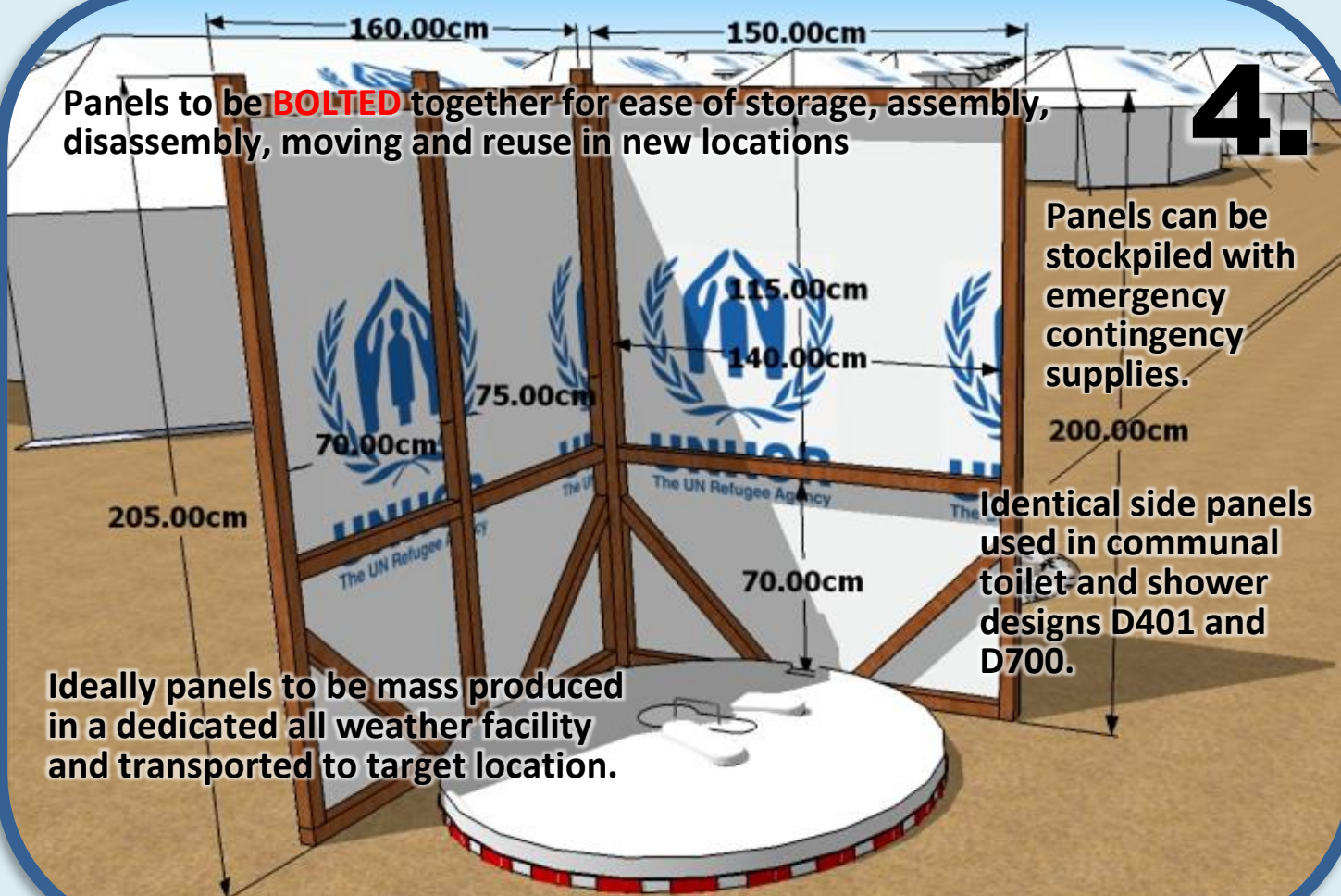
30 litres of mortar (1 part cement to 3 parts coarse sand). Soak bricks in water before placement.

Alternative lining materials include sandbags, cement blocks, bamboo lattice, branches, or GI sheeting.

Ensure the top of the slab support ring is perfectly level. The brick mortar ring should finish 10cm above ground level.

4.

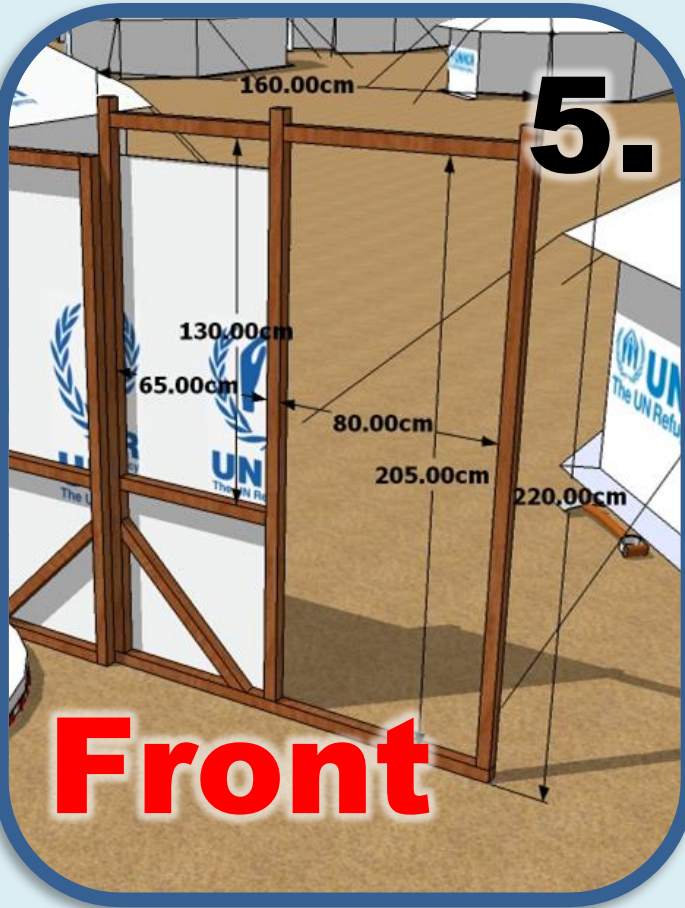
Panels to be **BOLTED** together for ease of storage, assembly, disassembly, moving and reuse in new locations



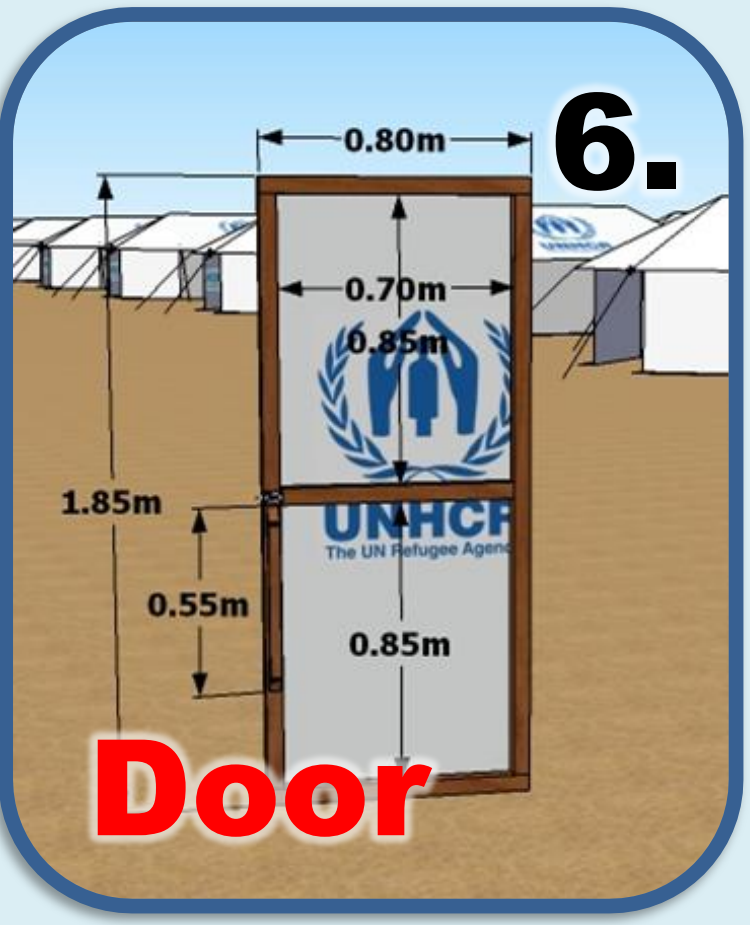
Panels can be stockpiled with emergency contingency supplies.

Identical side panels used in communal toilet and shower designs D401 and D700.

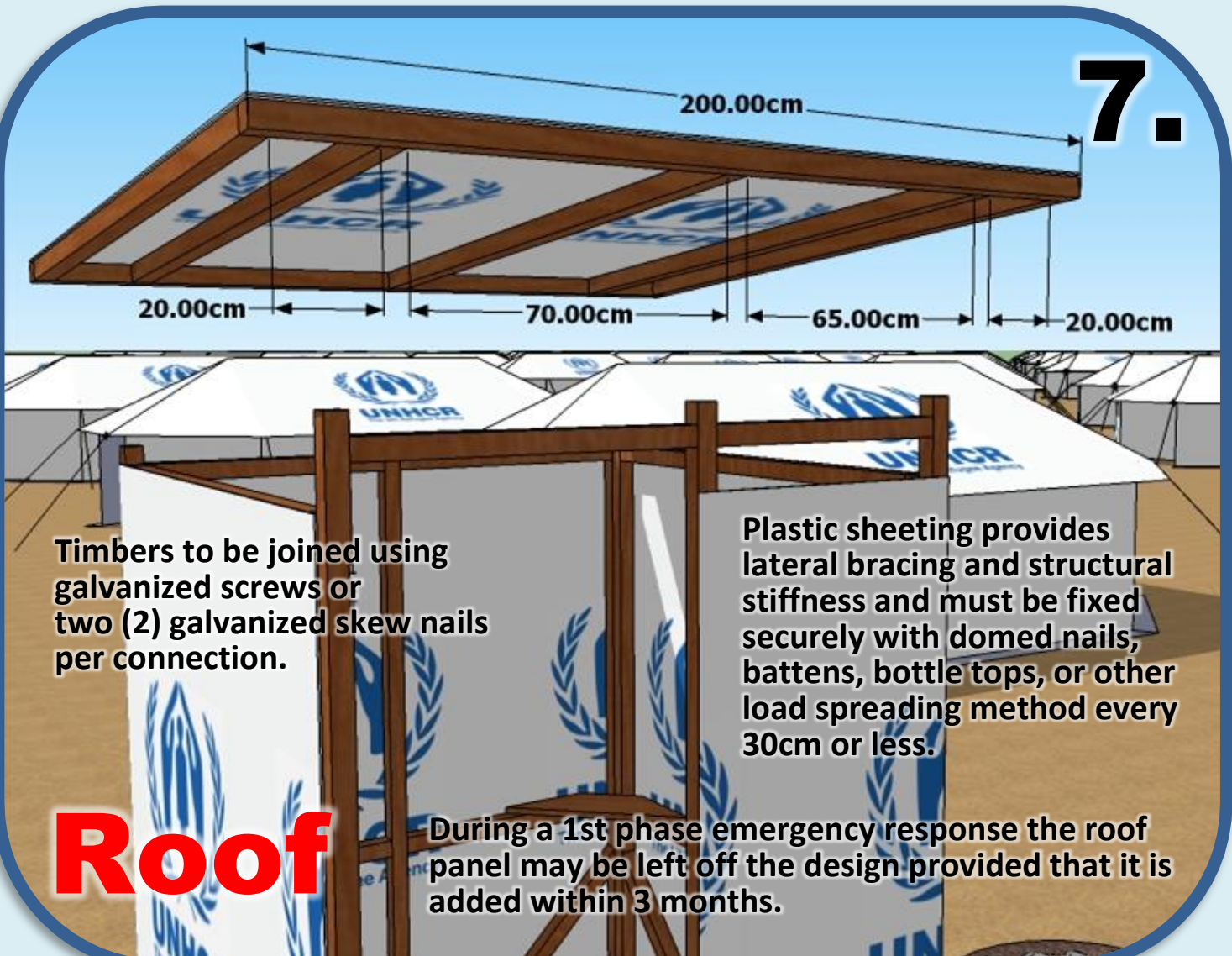
Ideally panels to be mass produced in a dedicated all weather facility and transported to target location.



Front



Door



Roof

8.

Child friendly
door bolt
4cm long

Child friendly
door handle
55 cm long
both sides

Child friendly
door handle
55cm long
both sides

9.

Every hinge
hole to be filled
with a screw
of at least 4cm.
Nails must not
be used!

Every door to
have 3 heavy
duty steel
hinges at least
75mm long.

Large cubicle facilitates use by elderly person and carer or
mother and young child.

10.

Grab rails provide
support for elderly
person or young
children.

Shelves provide lateral bracing and keep soap or clothes off the ground.

Assembly

Sanitary Seal

11.

Concrete Mix
1 part cement:
2 parts coarse sand
4 parts coarse gravel

220.00cm

220.00cm

0.43m³ of 25cm thick outward sloped concrete (dosage 320 kg/m³) or tamped clay seal to prevent water ingress.

If the structure is to be also used as a bathing unit the undertake a soil permeability test using an upright steel cylinder and following the procedure in Appendix 20 of Engineering in Emergencies . Alternatively refer to the table of typical soil infiltration rates on page 213 of the UNHCR WASH Manual.

12.

104.14cm

16.00cm

The infiltration trench depth and size may need to be increased based on the number of users and soil infiltration capacity.

13.

All plastic sheeting to meet humanitarian standards i.e. 200g/m² 700N UV stabilized triple layer HDPE.

Gap between door and floor < 10mm.

All cubicles to be fitted with a padlock.

14.

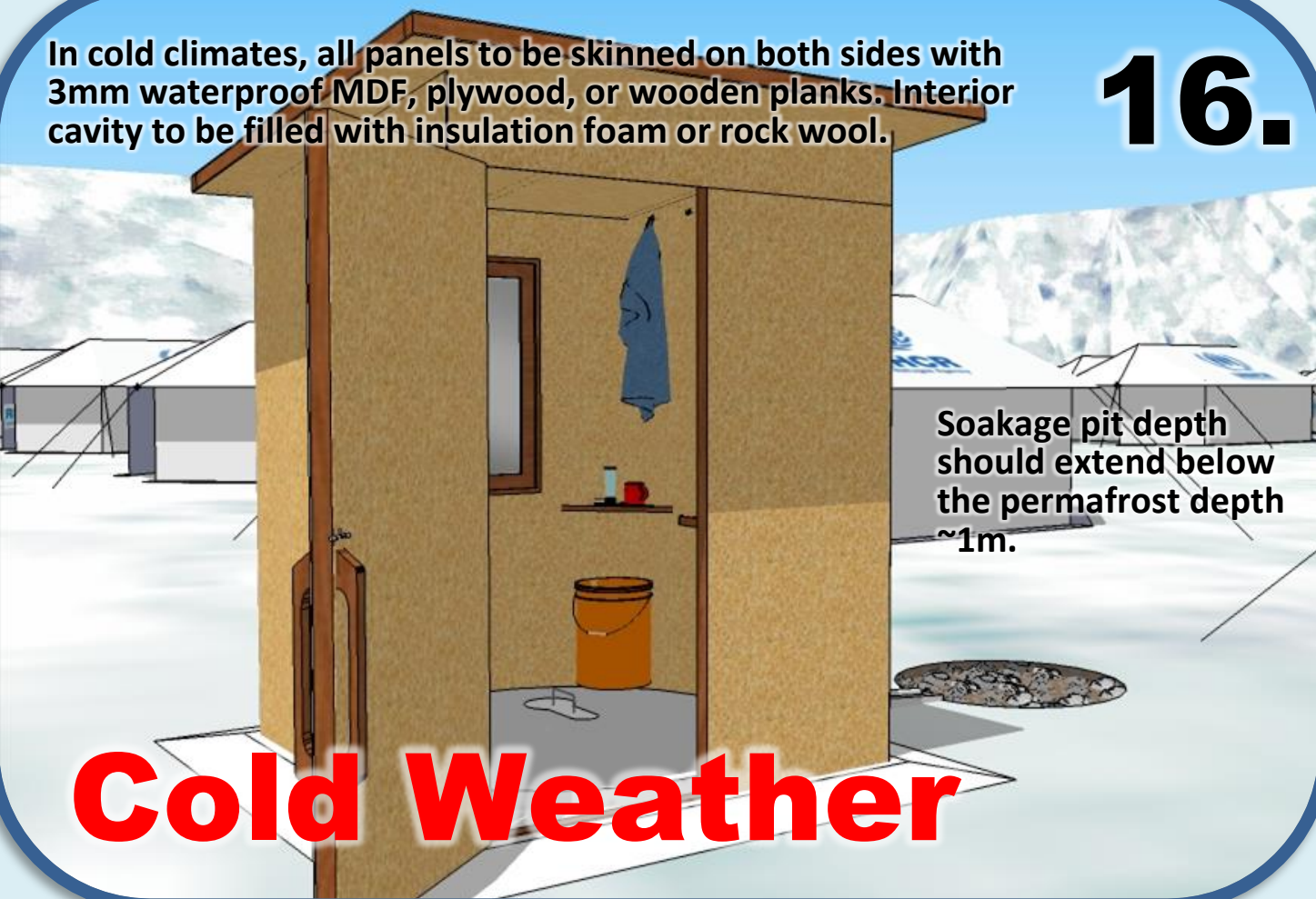
Privacy and Security

An illustration of a shelter upgrade. It shows a wooden frame structure with a corrugated metal roof. The walls are made of grey corrugated metal sheets. A wooden door is open, revealing the interior. Inside, there is a yellow bucket, a small shelf with a red cup, and a blue cloth hanging on the wall. The shelter is situated on a sandy ground with other similar structures in the background.

15.

Superstructure construction materials to be harmonized with household shelter materials taking into account local culture and context. Options for the superstructure material include plastic sheeting, elephant grass, wood planks, wood panels, adobe, or corrugated iron sheeting. In some settings the provision of materials for the superstructure may be the responsibility of the household.

Upgrades

An illustration of a cold weather shelter. It shows a wooden frame structure with a gabled roof. The walls are made of brown panels. A wooden door is open, revealing the interior. Inside, there is a yellow bucket, a small shelf with a red cup, and a blue cloth hanging on the wall. The shelter is situated on a snowy ground with other similar structures in the background.

In cold climates, all panels to be skinned on both sides with 3mm waterproof MDF, plywood, or wooden planks. Interior cavity to be filled with insulation foam or rock wool.

16.

Soakage pit depth should extend below the permafrost depth ~1m.

Cold Weather

BILL OF QUANTITIES

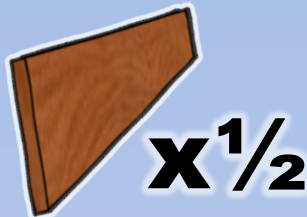
Description	QTY
Wooden Posts (4m x 5cm x 5cm)	16 pcs
Wooden Planks (4m x 20cm x 2.5cm)	½ pc
Nails (10cm Galvanized)	½ kg
Domed Head Nails (4cm Galvanized)	½ kg
Domed Latrine Slab (150cm dia x 5cm)	1 pc
Bricks (8cm x 12cm x 25cm)	54 pcs
Plastic Sheeting	16 m ²
Metal Bolts and Washers (M10 x 12cm)	12 pcs
Metallic Door Bolt (4cm Galvanized)	1 pc
Metallic Padlock with 4 Sets of Keys	1 pc
Metallic Door Hinge (4cm x 8cm x 2mm Galvanized)	3 pcs
Wooden Grab Rails and Door Handles (Minimum 50cm Length)	4 pcs
Mirror (80cm x 60cm)	1 pc
Coarse Sand	0.4 m ³
Coarse Gravel (6mm – 10mm)	0.8 m ³
Cement (50kg sacks)	6 sack

Bill of Quantities

1. Wooden Posts (pc)
5cm x 5cm x 4m



2. Wooden Planks (pc)
2.5cm x 20 cm x 4m



3. Nails 10cm (kg)



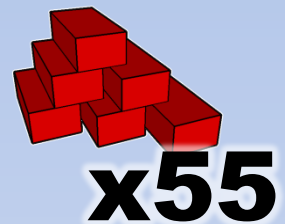
4. Domed Head Nails 4cm (kg)



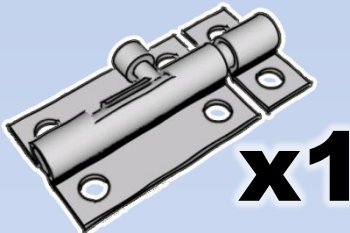
5. Domed Slab Ø 1.5m,
5cm Thick (pc)



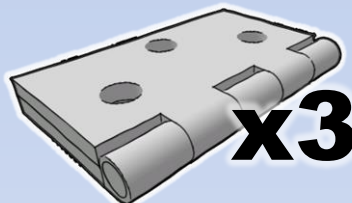
6. Bricks 12cm x 8cm x
25cm (pc)



7. Door Bolt 4cm (pc)



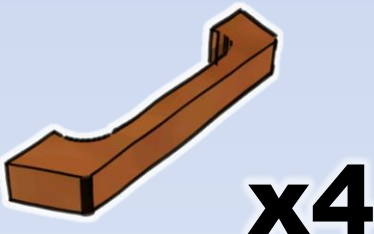
8. Door Hinge (pc)
4cm x 8cm



9. Metal Bolts + Washers
M10 x 12cm



10. Grab Rails and Door
Handles 50cm (pc)



11. Mirror 60cm x 80cm



12. Plastic Sheeting (m²)



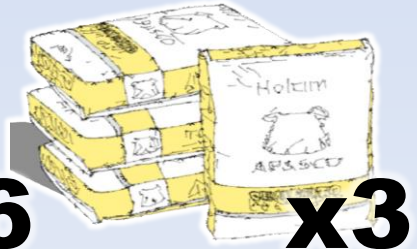
13. Sand (m³)



14. Gravel (m³)



15. Cement 50kg (sacks)



SPECIFICATIONS FOR TOILET CONSTRUCTION IN REFUGEE SETTINGS

400 SCOPE

- 400.1 These design guidelines specifically define the quality of materials and workmanship to be used when constructing toilets in refugee settings. A description of principles of excreta management programmes in addition to excreta management technical options and their advantages and disadvantages can be found in the UNHCR WASH Manual.

401 SITE SELECTION

- 401.1 A basic requirement is that the site selected for the toilet facility is free from the risk of high winds, flooding, subsidence, or erosion.

402 PREVENTION OF SURFACE OR GROUND WATER CONTAMINATION

- 402.1 UNHCR and WASH actors must ensure that all excreta containment systems including any pits, tanks, lagoons, sewerage or soakaway do not contaminate surface water or shallow groundwater sources.
- 402.2 All excreta management systems must be located at least 30 metres away from groundwater sources. The bottom of any pit or soak-away must be at least 1.5m above the highest average groundwater table level. These distances should be increased for fissured rocks and limestone.
- 402.3 In some situations temporary groundwater contamination from on-site excreta management systems may not be of immediate concern if the groundwater is non-potable. An example of this can be found in coastal areas where groundwater is heavily saline beyond drinking water health limits of $1,500\mu\text{S}/\text{cm}^2$. In all cases, local legislation should be respected.

403 GUIDELINES FOR PIT REINFORCEMENT

- 403.1 All toilet pits should have an upper reinforcement ring of either: wooden beams, wooden trunks, brick masonry or concrete to evenly spread the load of the superstructure and raise it above ground level by at least 20 - 30cm to avoid water entering the pit.
- 403.2 Any toilet built on soft, sandy or collapsing soils should have a brick or concrete lined pit to at least 1m below the ground surface or greater if the soil is still unstable. Any desludgable toilet should have a fully lined pit that is able to withstand repeated evacuation. Safety should be of the utmost consideration when manually excavating pits. In soft soils, pit walls should be adequately cross-braced and excavation must never exceed 2.0m depth.

404 GUIDELINES FOR TOILET SLAB STRENGTH

- 404.1 The toilet slab and supporting beams must be sufficiently strong to support the weight of users and should not flex or give the user reason to doubt its strength. Support beams should span at least 50cm into each of the pit walls.
- 404.2 Wooden, concrete or plastic slabs should be tested with the weight of 4 persons before use. Concrete slabs should be reinforced regardless of their type. Wooden planks, trunks and beams should be free from insect attack of any kind with no other defects which would affect its strength. Wooden structures in contact with the ground should be treated with used engine oil or diesel to deter termites.

405 GUIDELINES FOR TOILET SLAB ANCHORAGE

- 405.1 Latrine slabs should be firmly anchored in place. If plastic latrine slabs are used they should be firmly attached to the support structure either through the use of sufficiently long nails, bolts with washers, metal stakes, or heavy gauge wire.

406 GUIDELINES FOR SANITARY SEALING

- 406.1 In all toilet installations there should be no visible gaps between the squat plate and the pit walls either through the use of at least 30cm of tamped clay soil or 30cm of concrete sanitary seal.

407 GUIDELINES FOR THE USE OF PLASTIC SHEETING

- 407.1 Plastic sheeting used in toilet super structures should meet the international minimum humanitarian standards (i.e. 200g/m² 700N tensile strength, UV stabilized laminated woven or braided mesh of black high density polyethylene between two white layers of low density polyethylene). Plastic sheeting is typically supplied as sheets 6m x 4m or in rolls 4m x 50m long. Before using plastic sheeting consider if there are more suitable durable materials available locally.
- 407.2 Plastic sheeting should be attached to wooden toilet frames using domed head nails, or standard nails with either wooden battens or some other form of load spreading structure (e.g. bottle tops). The most effective way of attaching plastic sheeting to a wooden frame is to wrap it around a wooden batten and then nail the batten to the support structure. Nails spacing should be no more than every 30cm. Some humanitarian plastic sheeting contains reinforcing bands of grey colour and nails should pass through these bands.
- 407.3 Plastic sheeting should be securely fixed to the ground by wrapping the edge in a wooden post and burying it to at least 40cm deep. If rope is attached to plastic sheeting it should either be attached through a reinforced eyelet or it should be tightly tied around a knot in the plastic sheeting itself.



- 407.4 The use of plastic sheeting toilet superstructures is an emergency solution and must be phased out after the first six months of any response. Flaps of plastic sheeting may be used in the initial first phase response provided they are adequately weighted at the bottom of the flap and they are phased out within 3 months. Female blocks with plastic flap doors should be equipped with a privacy screen.

408 GUIDELINES FOR TOILET DOORS

- 408.1 Every toilet door should be hung straight and vertical with no more than 3mm gap between both sides of the door and the door frame and a maximum 10-20mm gap between the door and floor. All doors should open and close properly without fouling on the floor or door frame.
- 408.2 Each door should have at least three hinges of good quality heavy duty steel at least 50mm long, and every hole in the hinges should be filled with a screw of at least 4cm length.
- 408.3 All doors should be fitted with a long upright handle of at least 50cm length on the inside and the outside that allows both children from 3 years of age and adults to open and close the toilet. A simple to use yet secure internal locking device should be installed that is positioned for use by children and adults (such as a metal bolt).

409 GUIDELINES FOR COMMUNAL TOILET PRIVACY WALLS

- 409.1 Privacy walls should be installed completely around all female toilet facilities. Solid wooden fencing posts of at least 3m length should be installed every 4m to a depth of at least 1m. Wooden braces should be used every 5 posts and at corners. Small holes of 2 or 3cm should be cut in the plastic sheeting every 20cm to reduce wind load and deter theft. A double privacy screen with a small gap may be required in some cultures and contexts where there is a risk of people creating peep holes. Care should be taken on steep ground and a privacy roofing structure may be required to prevent onlookers.

410 GUIDELINES FOR LIGHTING

- 410.1 Ideally all toilet facilities should be adequately illuminated to at least 50 lumens per square metre (this can be easily verified using a smart

phone light meter app). However, lighting should not be provided solely at toilet blocks as there is a risk that men will congregate at these locations. Lighting for toilet blocks should be planned in consultation with users in particular women and girls.

411 GUIDELINES FOR VECTOR CONTROL MEASURES

- 411.1 UNHCR and WASH actors should ensure that the toilet design eliminates fly and mosquito breeding. All vent pipes should be fitted with galvanized metal fly screens. Toilet cubicles should be kept shaded with lightly sprung self-closing doors. If the toilet is not of the VIP design, tightly fitting closable lids should be used.



412 GUIDELINES FOR RAIN AND STORMWATER PROTECTION

- 412.1 The ground directly around the outside of the toilet facilities should be backfilled and compacted to slope outwards and prevent surface water entering or eroding the toilet facilities. A drainage ditch at least 30cm deep should be installed around the WASH services to minimize external surface water entering the block.

413 GUIDELINES FOR ADDITIONAL WASH BLOCK ACCESSORIES

- 413.1 Small modifications to toilet blocks can greatly increase the dignity of users. UNHCR and WASH actors should ensure that all toilet cubicles are equipped with either hooks or shelves so that users are able to hang additional clothes or possessions off the floor when using the facilities. If possible, the relatively cheap addition of a mirror can greatly improve the experience of using WASH facilities.

414 COLLECTION OF ANAL CLEANSING AND SANITARY MATERIALS

- 414.1 UNHCR and WASH actors should ensure that provision is made for the separate collection and disposal of used anal cleaning materials or women's sanitary material if there is a risk they may block or damage the toilet infrastructure or any desludging equipment. This also has the added advantage of extending the life of the system.

415 MATERIAL SPECIFICATIONS OF COMMON CONSTRUCTION MATERIALS

- 415.1 Gravel used for constructing concrete toilet slabs must be clean and free from mud, dust and plant material. UNHCR and WASH actors must ensure that only crushed aggregates (not river gravel) between 6mm and 10mm are used to prevent inter granular crack propagation across the thin toilet slab and to ensure an adequate covering under bars.
- 415.2 Sand used for latrine slabs should be coarse (no fines), clean and free from mud, dust and plant material.
- 415.3 Water should be non-saline and free from organic matter.
- 415.4 Bricks should be fully burnt (ringing sound when two bricks are hit together), of consistent shape and size and should be sufficiently strong (crush test) with a high proportion of clay.
- 415.5 Cement must be fresh (manufactured in the last three months) dry, and should be stored in a safe, dry, place at least 15cm off the ground. Toilet slabs should be cast with a 1:2:4 concrete mixture. Care should be taken to ensure that the mixture is not over watered (bucket slump test should show no greater than ¼ reduction in the slump height). Cast slabs should be immediately covered with straw, cement bags, sacking or leaves to keep the concrete moist and cool. The concrete should be cured with frequent watering at least twice daily for at least 10 days before use.
- 415.6 Reinforcement bars should be free from rust and of the correct type and size for concrete construction work (typically a characteristic yield stress of at least 210 N/mm²). Steel reinforcement should be placed on the lower side of the slab (the part in tension) with at least 12mm concrete covering under every bar. Reinforcement should be laid in both directions. Where the slab is rectangular, the bars parallel to the smaller span should be below the bars reinforcing the greater span. Domed Mozambican slabs must be reinforced with the correct size chicken wire covered with wire mesh and a mixture of 1 part cement to two parts sand.

Box: Spacing of mild steel bars for concrete toilet slabs

Span	65mm Slab		80mm Slab	
	Ø 6mm	Ø 8mm	Ø 6mm	Ø 8mm
1.00m	150mm	250mm	150mm	250mm
1.25m	150mm	250mm	150mm	250mm
1.50m	125mm	200mm	150mm	250mm
1.75m	75mm	150mm	125mm	200mm
2.00m	50mm	125mm	75mm	150mm

Source: Franceys, Pickford & Reed (1992)
'Guide to the development of on-site sanitation'.
 World Health Organization, Geneva.

416 HANDWASHING STATIONS DESIGN CONSIDERATIONS

- 416.1 UNHCR and WASH actors must plan for at least one functional hand washing dispenser per communal or public toilet block, ensuring at least one handwashing dispenser for every five toilet cubicles. Handwashing dispensers should be conveniently located within 10m of each toilet exit and their use should be actively promoted. The water dispensing device and soap must be located within easy reach of all users, especially children. Liquid soap, or bars attached to string, may be used if there is soap theft. All handwashing units that use bars of soap should have a fixed self-draining dish where the soap can be placed between use without getting dirty or becoming mislaid.
- 416.2 Hand-washing water storage containers should be sized to hold at least half a day of hand-washing water. To conserve water and avoid wastage, the hand-washing taps may need to be restricted with orifice plates to flows of 50 cubic centimetres per second (0.05 litres per second). Calculation of the total volume of hand-washing water required should be based on 0.5 to 1.0 litre of water per person per day. Hand washing reservoirs must be covered to prevent contamination or vector breeding.

417 ENVIRONMENTAL CONSIDERATIONS FOR SOURCING WOOD

- 417.1 Ensure that all supplies of wood for household latrine slabs, latrine superstructures, privacy screens, and latrine brick production has been procured from sustainable sources outside of the refugee camp environment.

418 DECOMMISSIONING

- 418.1 The toilet should be decommissioned when the level of excreta is within 50cm of the surface (DO NOT WAIT FOR THE PIT TO FILL TO THE SURFACE OF THE LATRINE SLAB). The superstructure should be removed and the pit should be back-filled with earth to a height of approximately 50cm to allow for settlement. Approximately 10 kg of lime may be used per cubicle to help neutralize the pH of the pit and assist in decomposition and drying. Where possible, quick growing plants or trees should be planted on the site to assist with drying of the pit.

419 UNHCR STANDARD TOILET DESIGNS FOR REFUGEE SETTINGS

- 419.1 The following drawings should be used in conjunction with these technical design guidelines.

D-400/2015a	Communal Trench Latrine (Poles + Plastic) – EMERGENCY
D-401/2015a	Communal Trench Latrine (Wood + Plastic) – EMERGENCY
D-402/2015a	Household Domed Slab Mass Fabrication
D-403/2015a	Household Toilet / Bathing Unit (1 Family, Dome Slab, Alternating)
D-404/2015a	Household Toilet / Bathing Unit (Septic Tank and Drain Field)
D-405/2015a	Raised Storage Latrine (Holding Tanks) - EMERGENCY
D-406/2015a	Urine Diverting Dry Toilet (UDDT)
D-407/2015a	Institutional Latrine (Desludgable with Raised Option)
D-408/2015a	Institutional Latrine (Septic Tanks and Drain Field)

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