

# **UNHCR WASH Block (Sinks - 20ft Container)**

**D702-2016a**

**Tools and Guidance for  
Refugee Settings**



**UNHCR**  
The UN Refugee Agency

# UNHCR Standardized WASH Designs

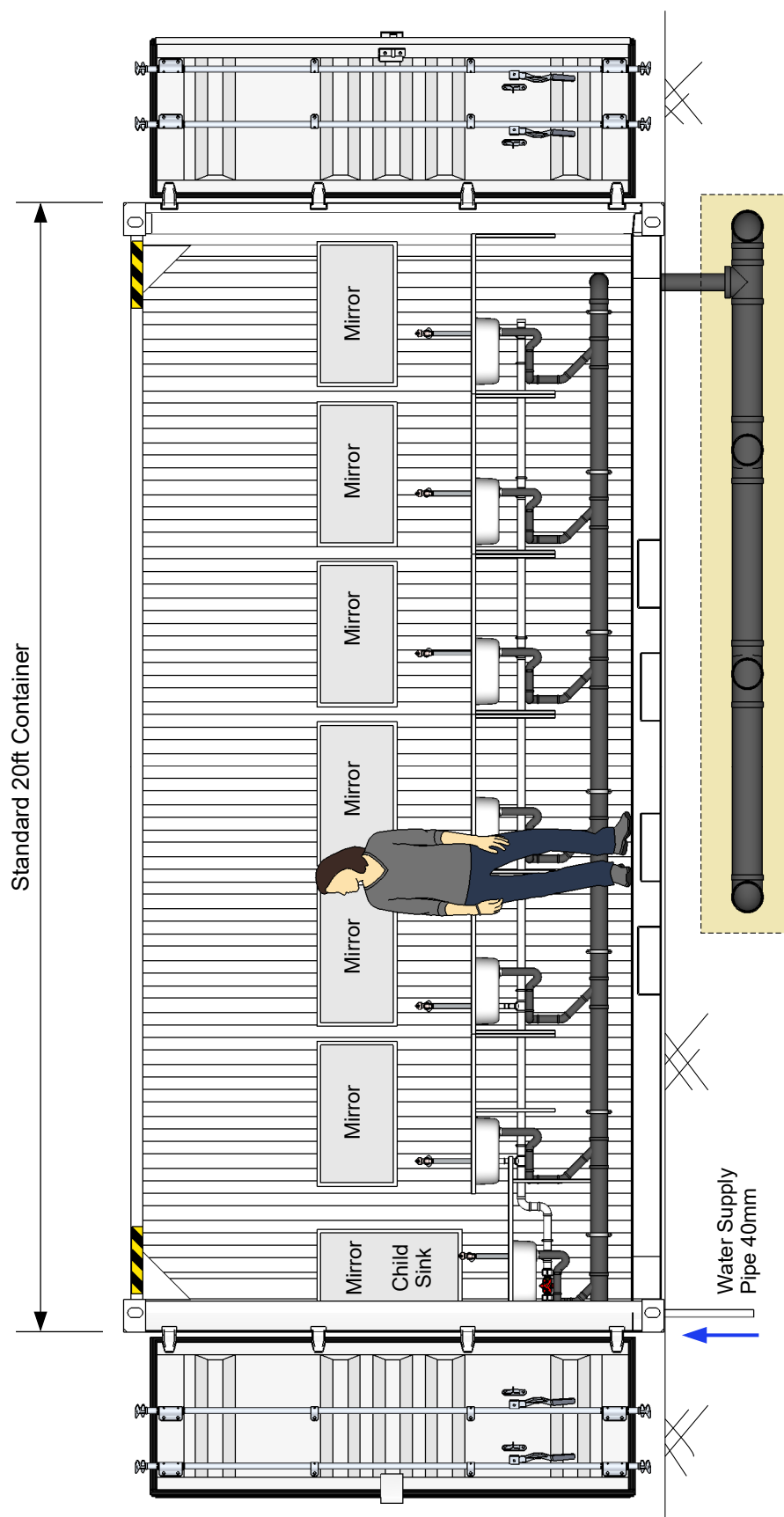
## Shipping Container WASH Block (Sinks Only)

### FOREWORD

These emergency communal WASH block 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. Note that this WASH block is based on a design developed by A21.

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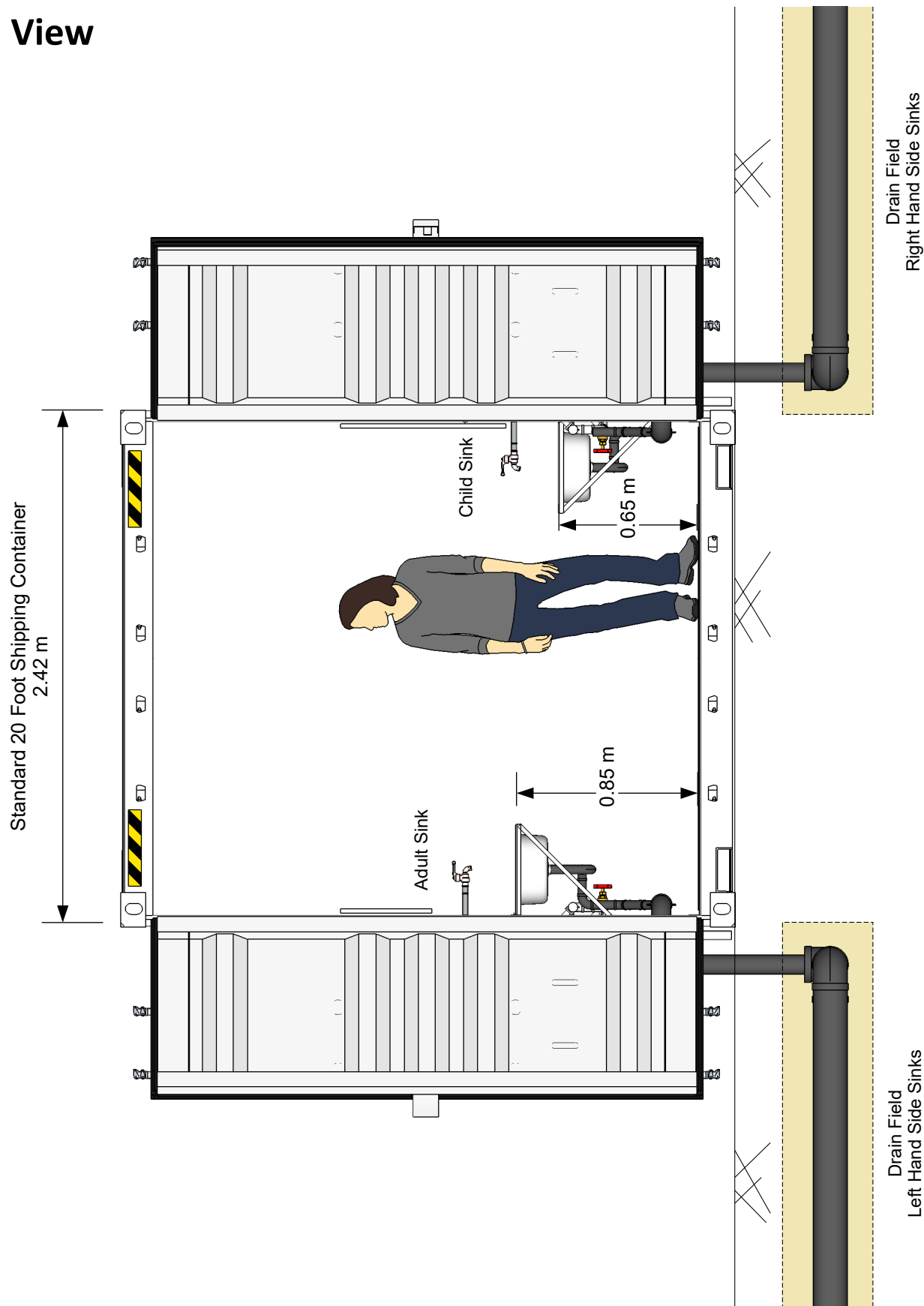
# Side View



## DRAIN FIELD NOTES

1. Where possible, WASH block should be connected to existing centralized wastewater treatment infrastructure. Drainfield should only be used if this option is not possible.
2. The size of the drainage fields should be calculated according to the local soil infiltration rate and the expected wastewater generation rate. Refer to the UNHCR EXCEL drain field sizing tool.
3. On flat ground the trenches may set up as a series of parallel branches. On sloped ground the trenches should zig zag with each pipe parallel to the contour.
4. Drain field pipes to be constructed from rigid 6" (160mm) PVC pipes with 12mm holes drilled in the 4 o'clock and 8 o'clock positions every 4 cm. Slotted pipes (or PVC pipes with slots cut with a saw) should not be used as the slots clog easily.
5. Fill the trenches with a 40 cm deep bed of gravel of 15mm - 40mm. Prepare the trenches a minimum of 40cm wide and 40cm deep with a spacing of 1m. Ensure that the PVC pipe assembly is inclined away from the WASH block at an angle of 1:50

# End View



## NOTES

1. Sink support structure fabricated from 20mm x 20mm x 2mm welded steel tube.
2. Floor tiles must be non-slip type (plastic shower room type)
3. Mirrors, lighting and disabled access to be installed as required.

**D-702**

## TITLE

**WASH Block (20ft Container)**

End View and General Layout

## PROJECT

Project Name, Country

## DRAWN BY

B. Harvey - 11/10/16

## APPROVED BY

M. Burt - 15/11/16

## SCALE

1:25

## UNITS

metres

## SHEET

2 of 4

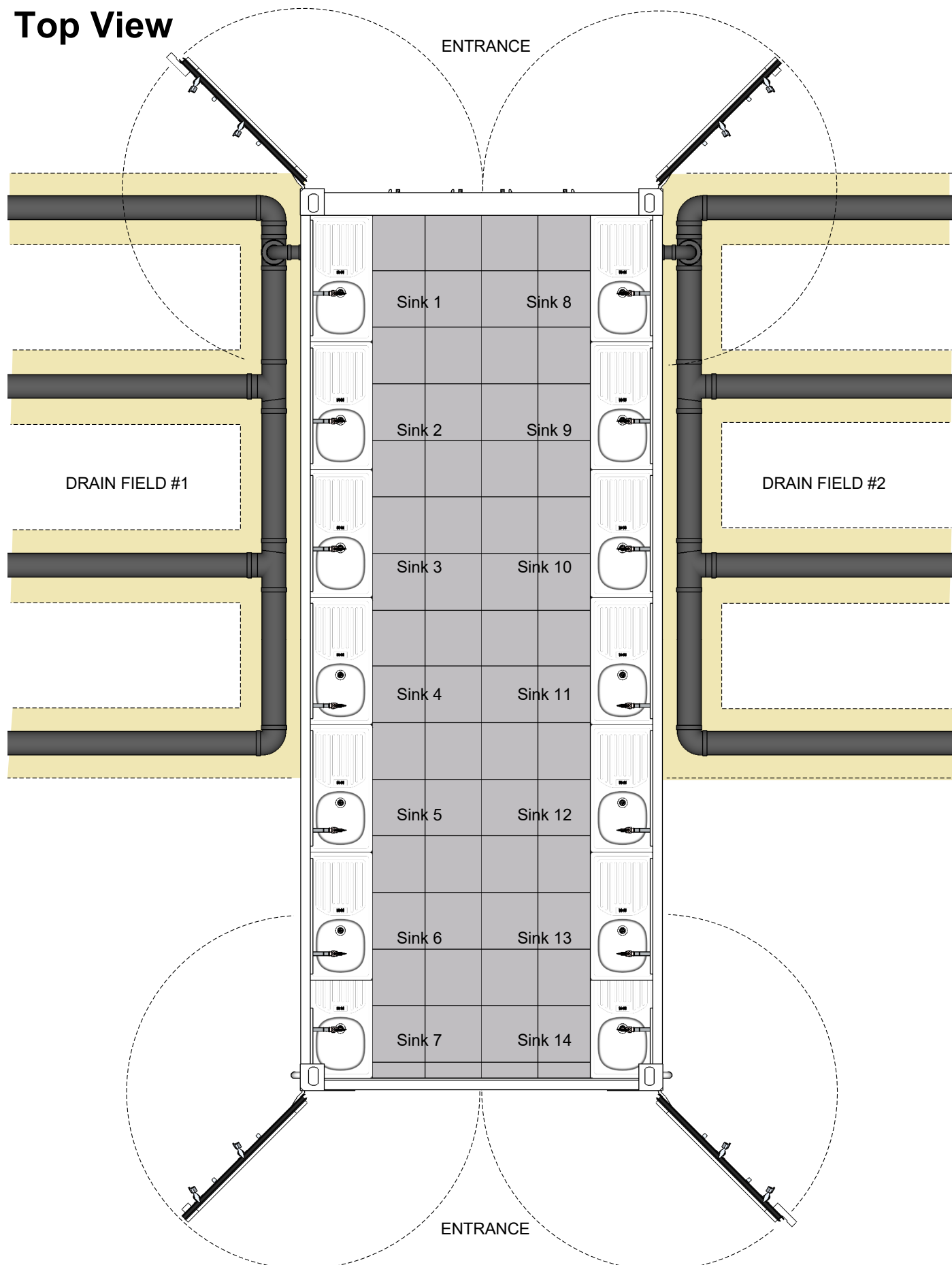
## PUBLISHED

15/11/16



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# Top View



**D-702**

**TITLE**  
**WASH Block (20ft Container)**  
 Top View and General Layout  
**PROJECT**  
 Project Name, Country

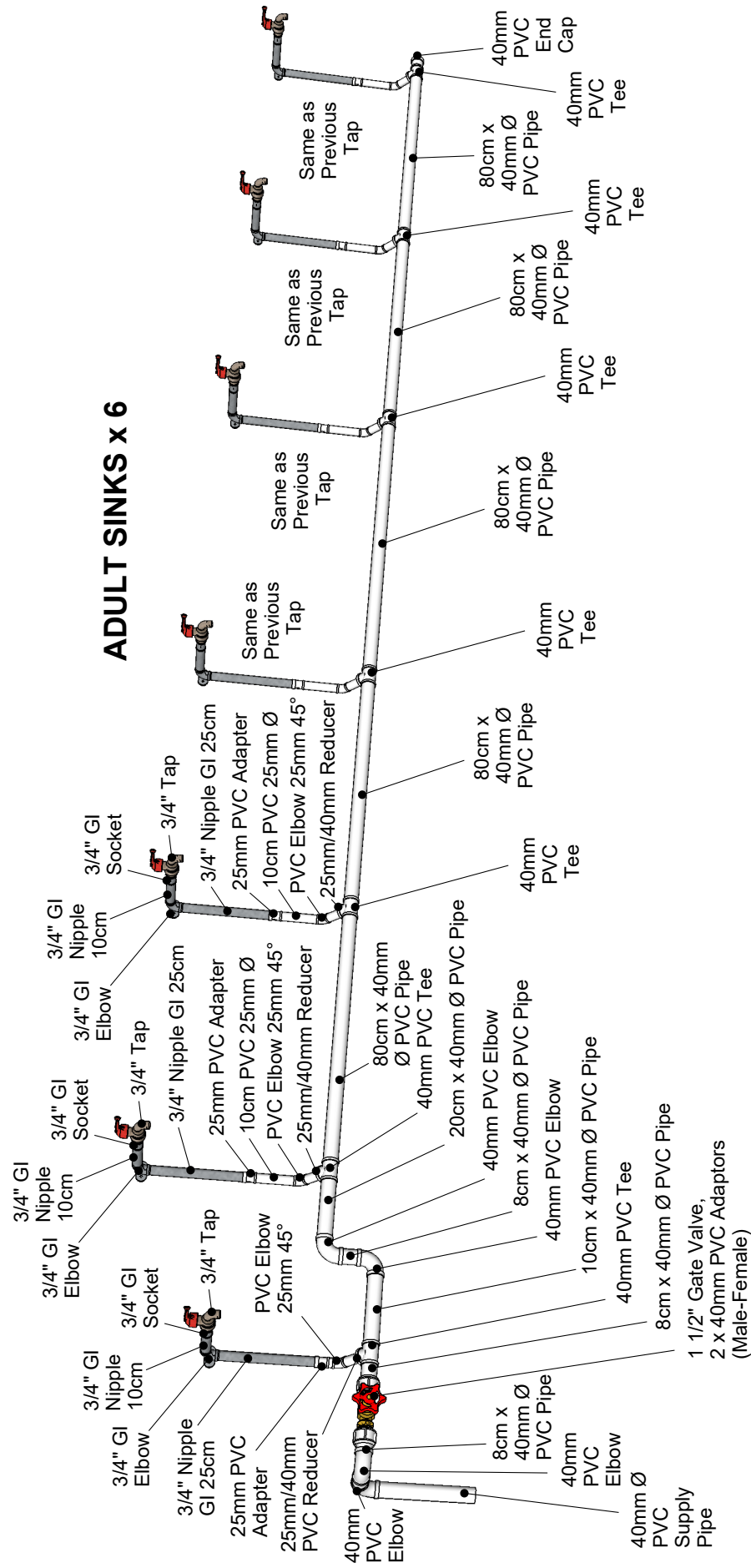
**DRAWN BY**  
 B. Harvey - 11/10/16  
**APPROVED BY**  
 M. Burt - 15/11/16  
**SCALE**  
 1:30

**UNITS**  
 metres  
**SHEET**  
 3 of 4  
**PUBLISHED**  
 15/11/16

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# Pipe Assembly Detail

## CHILD SINK x 1



### NOTES

1. Adult taps to be positioned at 1.10m. Children's at 0.85m.
2. Ensure that pipes are robustly secured to the container structure every 30cm.
3. In cold climates all water supply pipework should be adequately lagged.

#### TITLE

**WASH Block (20ft Container)**

Pipe Assembly Detail

#### PROJECT

Project Name, Country

#### DRAWN BY

B. Harvey - 11/10/16

#### APPROVED BY

M. Burt - 15/11/16

#### SCALE

1:25

#### UNITS

metres

#### SHEET

4 of 4

#### PUBLISHED

15/11/16



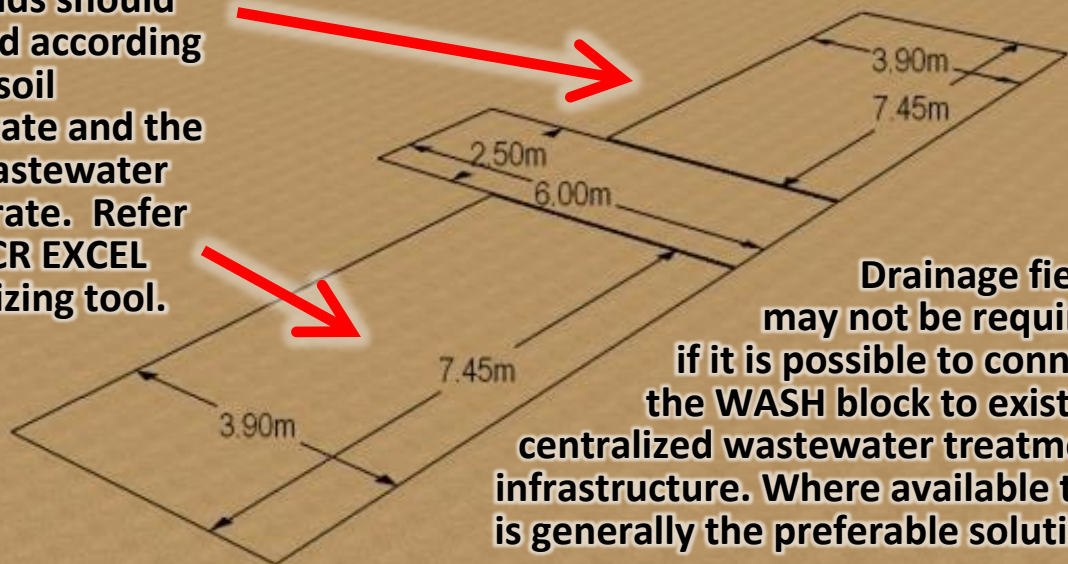
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# 1.

Area of 16m x 6m to be cleared and perfectly leveled.

Note that the size of the drainage fields should be calculated according to the local soil infiltration rate and the expected wastewater generation rate. Refer to the UNHCR EXCEL drain field sizing tool.



Drainage fields may not be required if it is possible to connect the WASH block to existing centralized wastewater treatment infrastructure. Where available this is generally the preferable solution.

# 2.

Ensure container is perfectly leveled

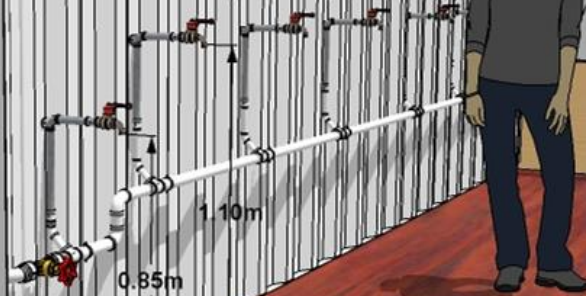
Install the 20ft shipping container between the two drainage fields.





Install seven (7) cold water taps along each side of the WASH block.

3.



Adult taps to be positioned at 1.10m. Children's at 0.85m

Ensure that pipes are robustly secured to the container structure every 30cm.

4.

$\frac{3}{4}$ " GI pipe secondary branches

40mm isolation valve

Ensure that pipes are robustly secured to the container structure every 30cm.

IN COLD CLIMATES ALL PIPEWORK SHOULD BE ADEQUATELY LAGGED



**Install the sink support structure fabricated from 20mm x 20mm x 2mm welded steel tube.**

**5.**

**Install non-slip floor tiles**

0.85m  
0.65m

**Adult sinks to be positioned at 0.85m. Children's at 0.65m.**

**Install the sinks and greywater collection pipework.**

**6.**

**40mm PVC drain pipe.**

**90mm PVC main drain pipe.**

**Ensure that pipes are robustly secured to the container structure every 30cm.**



**Prepare drain fields.**

**7.**

**Remove 30cm topsoil. Keep watered in a safe place as this needs to be replaced.**

**Note that the size of the drainage fields should be calculated according to the local soil infiltration rate and the expected wastewater generation rate. Refer to the UNHCR EXCEL drain field sizing tool.**

7.40m

3.90m

**Drain field pipes to be constructed from rigid 6" (160mm) PVC pipes with 12mm holes drilled in the 4 o'clock and 8 o'clock positions every 4 cm. Slotted pipes (or PVC pipes with slots cut with a saw) should not be used as the slots clog easily.**

**8.**

**Prepare the trenches a minimum of 40cm wide and 40cm deep with a spacing of 1m.**

1.00m

0.40m

1.00m

0.40m

1.00m

**Fill the trenches with a 40 cm deep bed of gravel of 15mm – 40mm.**

**On flat ground the trenches may set up as a series of parallel branches. On sloped ground the trenches should zig zag with each pipe parallel to the contour.**

**Ensure that the PVC pipe assembly is inclined away from the WASH block at an angle of 1:50**



9.



Cover with plastic sheeting and replace 30cm top soil.

10.



Install mirrors, lighting and disabled access if required.

## BILL OF QUANTITIES

Description	QTY
Shipping Container (20ft)	1 pcs
Non-Slip Floor Tiles	14 m <sup>2</sup>
Stainless Steel Sinks (90cm x 45cm)	14 pcs
Mirrors (80cm x 50cm)	14 pcs
Steel Tube 20mm x 20mm x 2mm	60 m
PVC Water Pipe 25mm PN10	4 m
PVC Water Pipe 40mm PN10	16 m
PVC Drainage Pipe 40mm PN6	12 m
PVC Drainage Pipe 90mm PN6	14 m
PVC Drainage Pipe 160mm PN6 (With 12mm Holes Every 4cm)	36 m
Pipe Wall Clamps 25mm	14 pcs
Pipe Wall Clamps 40mm	60 pcs
Pipe Wall Clamps 90mm	28 pcs
Gate Valve Brass 1¼" PN16	4 kg
PVC Adapters 40mm / 1¼" (Male – Female)	4 pcs
PVC 90° Elbow 40mm	8 pcs
PVC Reducer 40mm / 25mm (Male – Female)	14 pcs
PVC Tee 40mm	14 pcs
PVC 45° Elbow 25mm	14 pcs
PVC End Cap 40mm (Female)	2 pcs
PVC Adapters 25mm / ¾" (Male – Female)	14 pcs
Nipple 25cm GI ¾" (Male – Male)	14 pcs
Nipple 10cm GI ¾" (Male – Male)	14 pcs
GI Socket ¾"	14 pcs



GI Elbow 3/4"	14 pcs
3/4" Taps Brass PN16 ¼ Turn Ball Valve	14 pcs
Sink Drain Assembly (with Stainless Steel Drain Plate, Plug, and Demountable U-Bend Assembly) 40mm PVC	14 pcs
PVC Drainage 90° Elbow 40mm	42 pcs
PVC Drainage 45° Elbow 40mm	14 pcs
PVC Drainage 45° Reducing Tee 40mm – 90mm	14 pcs
PVC Drainage 90° Elbow 90mm	4 pcs
PVC Drainage End Cap 90mm (Female)	14 pcs
PVC Drainage Reducer 90mm – 160mm (Male - Female)	2 pcs
PVC Drainage Tee 160mm	6 pcs
PVC Drainage 90° Elbow 160mm	4 pcs
PVC Drainage End Cap 160mm (Female)	6 pcs
Gravel 15mm – 40mm	4.6 m <sup>3</sup>

## **SPECIFICATIONS FOR WASH INFRASTRUCTURE IN REFUGEE SETTINGS**

### **400 SCOPE**

- 400.1 These design guidelines specifically define the quality of materials and workmanship to be used when constructing WASH infrastructure in refugee settings. A description of principles of WASH interventions in addition to 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 WASH 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 WASH infrastructure including any pits, tanks, lagoons, sewerage or soakaway do not contaminate surface water or shallow groundwater sources.
- 402.2 All WASH infrastructure should 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 WASH 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 WASH infrastructure should meet the international minimum humanitarian standards (i.e. 200g/m<sup>2</sup> 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 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 for WASH 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 WASH FACILITY DOORS

- 408.1 Every 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 PRIVACY WALLS

- 409.1 Privacy walls should be installed completely around all female WASH 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 WASH 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 WASH blocks as there is a risk that men will congregate at these locations. Lighting for WASH 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 design of toilets 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 WASH 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 WASH facilities can greatly increase the dignity of users. UNHCR and WASH actors should ensure that all toilet and shower 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 SPECIFICATIONS OF COMMON CONSTRUCTION MATERIALS

- 415.1 Gravel used for constructing concrete footings and slabs must be clean and free from mud, dust and plant material. Rounded aggregates are preferred. If crushed stone aggregates are used then additional cement should be added (see table below). UNHCR and WASH actors must ensure that only aggregates between 12mm and 25mm are be used to prevent inter granular crack propagation across load bearing concrete structures (e.g. tapstand floor slabs, water reservoir roof slabs, and columns used in reinforced concrete water towers) and to ensure an adequate covering of steel reinforcement bars.
- 415.2 Sand used for water supply related concrete works 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 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.
- 415.5 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/mm<sup>2</sup>). Steel reinforcement should be placed as per the designs (typically 7/8 of the slab or wall thickness) to ensure the bars function correctly in tension. All bars should have at least 12mm concrete covering under every bar. All laps should be a minimum of 25cm.
- 415.6 Concrete mix strengths Mass concrete footings should be cast with a 1:3:6 concrete mixture with a minimum cement dosage of 240 kg/m<sup>3</sup>. Concrete slabs and drainage channels should be cast as single continuous structures using a 1:2:4 concrete mixture with a minimum cement dosage of 320kg/m<sup>3</sup>. Water retaining structures (reservoir walls and bases) should be cast using a waterproof 1:1.5:3 concrete mixture (note that 1:2:4 is not waterproof) with a minimum cement dosage of 380kg/m<sup>3</sup>. Additional cement should be added if hand mixing (see table below). Care should be taken to ensure that concrete mixtures are not over watered (bucket slump test should show no greater than ¼ reduction in the slump height). Cast concrete works should be immediately covered with plastic sheeting, straw, cement bags, sacking or leaves to keep the concrete moist and cool during the full curing period. All concrete should be well rodded (ideally vibrated) to remove air voids. The concrete should be cured with frequent watering at least twice daily for at least 10 days before use. The quantities of cement, sand and aggregate for 1m<sup>3</sup> of concrete can be found in the table below.

	Quantity of Cement in Kg					
Concrete Mix	Machine Mixing		Hand Mixing		Coarse Dry Sand (m³)	Aggregate 12mm – 25mm (m³)
	Gravel	Broken Stone	Gravel	Broken Stone		
1:1.5:3	370	390	380	400	0.42	0.84
1:2:4	290	310	300	320	0.45	0.90
1:3:6	190	210	200	220	0.46	0.92

Source: Indian Civil Engineer's Handbook (Khanna, 2001)

**415.7 Cement plasters** Interior and exterior plasters should be applied as three layers as follows:

- 6mm 1:4 splatterdash
- 10mm 1:3 rough finish
- 10mm 1:2 smooth float

Each layer should preferably be applied when the previously layer is still 'green' (not fully cured). Each layer should be thoroughly wetted and the previously layer keyed (scratched) to ensure proper bonding. Interior plasters of water retaining structures should be mixed with sikalite waterproofing compound (1kg per 50kg cement). The quantities of cement and sand for a 100m<sup>2</sup> of plaster can be found in the table below.

	100m <sup>2</sup> 6mm thick		100m <sup>2</sup> 12mm thick	
	Cement (kg)	Sand (m3)	Cement (kg)	Sand (m3)
1:4 splatterdash	274	0.766	- - -	- - -
1:3 rough finish	- - -	- - -	734	1.541
1:2 smooth float	- - -	- - -	979	1.371

Source: Indian Civil Engineer's Handbook (Khanna, 2001)

**415.8 Brick mortar strengths** Above ground general purpose load bearing brick walls used in normal building construction, exposed to weather and heat, should be laid with a 1:6 mortar mixture with a minimum cement dosage of 250 kg/m<sup>3</sup>. Below ground brick walls subject to soil pressure or seismic conditions should be laid with a 1:4 mortar mixture with a minimum cement dosage of 380 kg/m<sup>3</sup>. Joint thickness should be 8mm - 12mm. The quantity of mortar required can be calculated as 0.23 to 0.25 of the brick wall volume. The quantities of cement and sand for 1m<sup>3</sup> of wet mortar can be found in the table below.

	1:4	1:5	1:6	1:7
Cement (kg)	380	312	250	220
Sand (m3)	1.1	1.1	1.1	1.1

Source: Indian Civil Engineer's Handbook (Khanna, 2001)

## 416 SOAKAGE 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 SOAKAGE PIT SIZING BASED ON SOIL INFILTRATION RATES

- 417.1 The sizing of soakage pits, trenches and drain fields is dependent upon local site soil infiltration rates, the number of users and the quantity of waste water that is expected to be generated per person. Soakage pit dimensions should be determined by on-site soil infiltration tests (see Appendix 20 of Engineering in Emergencies. Alternatively refer to the table of typical soil infiltration rates on page 213 of the UNHCR WASH Manual). Soakage pits for wastewater from showers or septic tanks are likely to be much bigger than those for wastage from tapstands (see table below). In some cases communal shower blocks and septic tank installations may require drain fields rather than soakage pits.

	Clean Water (litres/m <sup>2</sup> /day)	Wastewater (Sewage and Sullage) (litres/m <sup>2</sup> /day)
Sand	720 – 2,400	33 - 50
Sandy Loam	480 – 720	24
Silt Loam	240 - 480	18
Clay Loam	120 - 240	8
Clay	24 - 120	Unsuitable

Source: Engineering in Emergencies (RedR, 2010)



## **418 ENVIRONMENTAL CONSIDERATIONS FOR SOURCING WOOD**

- 418.1 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.

## **419 DECOMMISSIONING**

- 419.1 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.

## UNHCR STANDARD DESIGNS FOR REFUGEE SETTINGS

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)
D-409/2015a	Household Pour Flush Toilet (SaTo Pan) and Bathing Unit
D-700/2015a	Emergency Communal Shower Block (Wood and Plastic)
D-701/2015a	Post Emergency Laundry Area (Washing Sinks and Drying Lines)
D-702/2015a	WASH Block Shipping Container (Sinks and Drain Field)
D-703/2015a	Laundry Block Shipping Container (Washing Machines, Dryers and Drain Field)

## USEFUL REFERENCES

- ◆ ACF (2005), 'Water, sanitation and hygiene for populations at risk – second edition'. ACF, Paris, France.  
[http://www.actioncontrelafaim.org/publications/fichiers/wsh\\_acf\\_0.pdf](http://www.actioncontrelafaim.org/publications/fichiers/wsh_acf_0.pdf)
- ◆ Bastable A. (2000). 'Guidelines for excreta disposal in emergencies. An Oxfam Technical Manual'. Oxfam GB, Oxford, UK.  
[http://ec.europa.eu/echo/files/evaluation/watsan2005/annex\\_files/OXFAM/OXF7%20-%20Guidelines%20for%20exceta%20disposal%20%20in%20emergencies.PDF](http://ec.europa.eu/echo/files/evaluation/watsan2005/annex_files/OXFAM/OXF7%20-%20Guidelines%20for%20exceta%20disposal%20%20in%20emergencies.PDF)
- ◆ CAWST (2011) 'Introduction to low-cost sanitation'. Centre for Affordable Water and Sanitation Technology CAWST, Calgary, Canada.  
[http://resources.cawst.org/system/files/Sanitation\\_Manual\\_2011-02\\_en.pdf](http://resources.cawst.org/system/files/Sanitation_Manual_2011-02_en.pdf)
- ◆ Franceys, Pickford & Reed (1992) 'Guide to the development of on-site sanitation'. World Health Organization, Geneva. [http://whqlibdoc.who.int/publications/1992/9241544430\\_eng.pdf](http://whqlibdoc.who.int/publications/1992/9241544430_eng.pdf)
- ◆ Harvey P. A (2007) 'Excreta disposal in emergencies: A field manual'. WEDC, Loughborough University, UK. <http://www.unhcr.org/4a3391c46.html>
- ◆ Harvey P. A., Baghri S. and Reed R. A. (2002) 'Emergency sanitation – assessment and programme design'. WEDC, Loughborough University, UK.  
<http://reliefweb.int/sites/reliefweb.int/files/resources/2533D212287DCAC6C1256D780035CC8D-lou-water-02.pdf>
- ◆ Lambert, R., and Davis, J. (2002), 'Engineering in emergencies 2nd Ed.', Register of Engineers for Disaster Relief (RedR), London.
- ◆ Obika A. (2004) 'Catalogue of low cost toilet options'. WEDC, Loughborough University, UK. <http://www ircwash.org/sites/default/files/Obika-2004-Catalogue.pdf>
- ◆ PEN (2010). 'Philippine emergency sanitation reference toolkit (excreta disposal)'. Philippine Ecosan Network, Manila.  
[http://www.sswm.info/sites/default/files/reference\\_attachments/PEN%202010%20Philippine%20Emergency%20Sanitation%20Reference%20Toolkit.pdf](http://www.sswm.info/sites/default/files/reference_attachments/PEN%202010%20Philippine%20Emergency%20Sanitation%20Reference%20Toolkit.pdf)
- ◆ Reed R. A. (2010) 'Emergency excreta disposal standards and options for Haiti'. DINEPA and Global WASH Cluster, Haiti.  
[http://wedc.lboro.ac.uk/resources/pubs/Emergency\\_EDS\\_and\\_options\\_for\\_Haiti.pdf](http://wedc.lboro.ac.uk/resources/pubs/Emergency_EDS_and_options_for_Haiti.pdf)
- ◆ Tilley, E (2008) 'Compendium of sanitation systems and technologies', SANDEC and EAWAG, Swiss Federal Institute of Aquatic Science and Technology, Dübendorf, Switzerland.  
[http://www.eawag.ch/forschung/sandec/publikationen/compendium\\_e/index\\_EN](http://www.eawag.ch/forschung/sandec/publikationen/compendium_e/index_EN)
- ◆ Van den Noortgate J., Maes P. (2010) 'Public health engineering in precarious situations – second edition'. MSF, Brussels.  
[http://refbooks.msf.org/msf\\_docs/en/public\\_health\\_en.pdf](http://refbooks.msf.org/msf_docs/en/public_health_en.pdf)

- ◆ USAID (1982) 'Designing aqua privies. Water for the world technical brief', USAID, Washington USA.  
<http://www.lifewater.org/resources/san1/san1d4.pdf>
- ◆ USAID (1982) 'Designing latrine pits. Water for the world technical brief', USAID, Washington USA.  
<http://wiki.watermissions.org/GetFile.aspx?Page=Simple%20Excreta%20and%20Washwater%20Disposal%20SAN1&File=san1c2.pdf>
- ◆ USAID (1982) 'Designing latrine slabs. Water for the world technical brief', USAID, Washington USA.  
<http://wiki.watermissions.org/GetFile.aspx?Page=Simple%20Excreta%20and%20Washwater%20Disposal%20SAN1&File=san1d1.pdf>
- ◆ USAID (1982) 'Simple methods of excreta disposal. Water for the world technical brief', USAID, Washington USA.  
[http://wiki.watermissions.org/\(S\(qmdltna0sc2kvjumvmak4z45\)\)/GetFile.aspx?Page=Simple%20Excreta%20and%20Washwater%20Disposal%20SAN1&File=san1m1.pdf](http://wiki.watermissions.org/(S(qmdltna0sc2kvjumvmak4z45))/GetFile.aspx?Page=Simple%20Excreta%20and%20Washwater%20Disposal%20SAN1&File=san1m1.pdf)
- ◆ WHO (2005) 'Emergency sanitation - planning'. Technical notes for emergencies #13'. World Health Organization, Geneva.  
[http://www.who.int/entity/water\\_sanitation\\_health/publications/2011/WHO\\_TN\\_13\\_Planning\\_for\\_excreta\\_disposal\\_in\\_emergencies.pdf](http://www.who.int/entity/water_sanitation_health/publications/2011/WHO_TN_13_Planning_for_excreta_disposal_in_emergencies.pdf)
- ◆ WHO (2005) 'Technical options for excreta disposal in emergencies'. Technical notes for emergencies #14'. World Health Organization, Geneva.  
[http://www.who.int/water\\_sanitation\\_health/publications/2011/tn14\\_tech\\_options\\_excreta\\_en.pdf?ua=1](http://www.who.int/water_sanitation_health/publications/2011/tn14_tech_options_excreta_en.pdf?ua=1)