UNHCR Standardized Designs for Refugee Settings
Post Emergency Tapstand with Drainage

FOREWORD
These post emergency tapstand 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 tapstand is based on a design shared by OXFAM GB.

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Alternative: Drainage channel may be replaced with 6" PVC drainage pipe inclined towards soak pit. Drainage pipe and soakage pit should be covered with plastic sheeting and 30cm compacted soil.

Soakage pit to be covered with plastic sheeting and 30cm compacted soil.

**NOTES**

1. Tapstand to be positioned centrally with tap spouts exactly 50cm above concrete surface.
2. Concrete surface to be finished with non-slip (lightly brushed) surface with 1% slope to soakage pit.
3. Soakage pit dimensions to be determined by on-site soil infiltration test (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).
NOTES
1. Mass concrete footings 1:3:6 (min 240kg/m3 cement dosage). Slab concrete 1:2:4 (min 320kg/m3 cement dosage).
2. 15cm compacted hardcore layer to be covered with 1mm sand blinding before pouring concrete.
3. Slab reinforcement to consist of high tensile mild steel 6mm weld mesh 20cm x 20cm positioned 3cm above compacted hardcore.
Area of 6m x 3m to be cleared and perfectly leveled.

Corner posts 10cm above ground and exactly the same level. This level will become the upper edge of the tapstand.
Excavate 30cm wide footing to a level 55cm below the top of the posts.

Excavate the slab foundation area and drainage channel trench to a level 35cm below the top of the posts.

The depth of the infiltration pit should be calculated based on the number of users and site soil infiltration capacity 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.
5. **ENSURE EXTERNAL WOODEN SHUTTERING IS PERFECTLY SQUARE AND LEVEL** (PERFORM A 3-4-5 TRIANGLE CHECK IN EACH CORNER)

- 15cm of crushed and **compacted** hardcore material covered with 1mm sand blinding.

6. **Tapstand assembly should be positioned centrally. Tap spouts should be exactly 65cm above compacted hardcore level.**

- **Gate valve to be positioned centrally in valve box shuttering.**

- **0.50 m³ footing concrete 20cm thick**
  - (1:3:6 cement dosage 240 kg/m³)
High tensile mild steel 6mm weld mesh 20cm x 20cm positioned 3cm above compacted hardcore.

1.1m$^3$ concrete 15cm thick slab with 20cm thick sides (1:2:4 cement dosage 320 kg/m$^3$).
1% slope towards infiltration pit with non-slip brushed finish.

Ensure slab is kept damp and out of direct sunlight for at least 7 days.
Soakage pit to be covered with plastic sheeting and 30cm compacted soil. Tap spouts should be exactly 50cm above concrete slab level.

Alternative: drainage channel may be replaced with 6” PVC drainage pipe inclined towards soakage pit.

Adapt design to include optional disability ramp if required.
<table>
<thead>
<tr>
<th>Description</th>
<th>QTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wooden Posts (65cm x 5cm x 5cm)</td>
<td>15 pcs</td>
</tr>
<tr>
<td>Wooden Planks (4m x 20cm x 2.5cm)</td>
<td>4 pcs</td>
</tr>
<tr>
<td>Wooden Planks (4m x 5cm x 2.5cm)</td>
<td>5 pcs</td>
</tr>
<tr>
<td>Nails (6cm Galvanized)</td>
<td>1 kg</td>
</tr>
<tr>
<td>High Tensile Steel Weld-Mesh Ø6mm 20cm x 20cm</td>
<td>10 m²</td>
</tr>
<tr>
<td>Plastic Sheeting</td>
<td>10 m²</td>
</tr>
<tr>
<td>Complete Tapstand Assembly (Tapstand, Taps x 6, Elbow, Pipe)</td>
<td>1 pc</td>
</tr>
<tr>
<td>Coarse Sand</td>
<td>0.9 m³</td>
</tr>
<tr>
<td>Coarse Gravel (6mm – 10mm)</td>
<td>1.5 m³</td>
</tr>
<tr>
<td>Cement (50kg sacks)</td>
<td>10 sacks</td>
</tr>
<tr>
<td>Compacted Hardcore Sub-Base</td>
<td>1.5 m³</td>
</tr>
</tbody>
</table>
1. Wooden Posts (pc) 5cm x 5cm x 65cm
   15

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

3. Wooden Planks (pc) 2.5cm x 5cm x 4m
   5

4. Nails 6cm (kg)
   1

5. Steel Weld-Mesh 6mmØ x 20cm x 20cm
   10m²

6. Plastic Sheeting
   10m²

7. Tapstand Assembly and Fittings (pc)
   1

8. Cement 50kg (sacks)
   10

9. Sand (m³)
   0.9

10. Gravel (m³)
    1.5

11. Compacted Hardcore Sub-Base (m³)
    1.5
SPECIFICATIONS FOR CONSTRUCTION OF WATER SUPPLY RELATED INFRASTRUCTURE IN REFUGEE SETTINGS

300 SCOPE
300.1 These design guidelines specifically define the quality of materials and workmanship to be used when constructing water supply related infrastructure in refugee settings. A description of principles of water supply programmes in refugee settings, in addition to technical options and their advantages and disadvantages, can be found in the UNHCR WASH Manual.

301 SITE SELECTION
301.1 A basic requirement is that the site selected for water supply related infrastructure is free from the risk of high winds, flooding, subsidence, or erosion.

302 PREVENTION OF SURFACE OR GROUNDWATER CONTAMINATION
302.1 UNHCR and WASH actors must ensure that all water supply related infrastructure including treatment systems and soakaway systems do not contaminate surface water or shallow groundwater sources. Risks are generally low and related to contamination from water treatment chemicals, water treatment by-products and sludges and contamination from wastewater.

302.2 All tapstands, or other water collection and usage points, should be equipped with adequately designed soakage systems 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.

302.3 In some situations temporary groundwater contamination from on-site soakage systems may not be of immediate concern if the groundwater is non-potable. An example of this can be found in areas where groundwater is heavily saline beyond drinking water health limits of 1,500μS/cm². In all cases, local legislation should be respected.

303 SPECIFICATIONS OF COMMON CONSTRUCTION MATERIALS
303.1 Gravel used for constructing concrete footings and slabs must be clean and free from mud, dust and plant material. UNHCR and WASH actors must ensure that only aggregates between 6mm and 10mm 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.

303.2 Sand used for water supply related concrete works should be coarse (no fines), clean and free from mud, dust and plant material.
303.3 Water should be non-saline and free from organic matter.

303.4 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. Mass concrete footings should be cast with a 1:3:6 concrete mixture with a minimum cement dosage of 240 kg/m$^3$. 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$^3$. 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. The concrete should be cured with frequent watering at least twice daily for at least 10 days before use.

303.5 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$^2$). Steel reinforcement should be placed as per the designs (to ensure the bars function correctly in tension) with at least 12mm concrete covering under every bar.

304 SOAKAGE PIT SIZING BASED ON SOIL INFILTRATION RATES

304.1 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.

<table>
<thead>
<tr>
<th>Soil Type</th>
<th>Clean Water (litres/m$^2$/day)</th>
<th>Wastewater (Sewage and Sullage) (litres/m$^2$/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sand</td>
<td>720 – 2,400</td>
<td>33 - 50</td>
</tr>
<tr>
<td>Sandy Loam</td>
<td>480 – 720</td>
<td>24</td>
</tr>
<tr>
<td>Silt Loam</td>
<td>240 - 480</td>
<td>18</td>
</tr>
<tr>
<td>Clay Loam</td>
<td>120 - 240</td>
<td>8</td>
</tr>
<tr>
<td>Clay</td>
<td>24 - 120</td>
<td>Unsuitable</td>
</tr>
</tbody>
</table>

Source: Engineering in Emergencies (RedR, 2010)

305 SLOPES FOR WATER COLLECTION POINTS AND DRAINAGE CHANNELS

305.1 All water collection surfaces and drainage channels should be inclined to ensure that there is no standing water at water points. In general a slope
of 1% should be sufficient to ensure that the water is gradually evacuated towards soakage pits.

306  SURFACE FINISHES AT PUBLIC WATER COLLECTION POINTS

306.1 All concrete surfaces at water collection points should be given a non-slip finish (the surfaces should be lightly brushed with a yard brush before the surface has cured) to ensure safe access by all users including the elderly, pregnant women, disabled users and small children. The surface should be sufficient to facilitate cleaning while also preventing slipping.

307  UNHCR STANDARD DESIGNS FOR WATER SUPPLY

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

<table>
<thead>
<tr>
<th>Drawing Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>D-300/2015a</td>
<td>Emergency Tapstand (Wooden Pallets) with Drainage</td>
</tr>
<tr>
<td>D-301/2015a</td>
<td>Tapstand Design with Drainage (Rectangular Concrete)</td>
</tr>
<tr>
<td>D-302/2015a</td>
<td>Handpump Apron with Drainage (Rectangular Concrete)</td>
</tr>
<tr>
<td>D-303/2015a</td>
<td>Hand Dug Well Apron (Circular Concrete) with Drainage</td>
</tr>
<tr>
<td>D-304/2015a</td>
<td>Borehole Design (Fractured Rock)</td>
</tr>
<tr>
<td>D-305/2015a</td>
<td>Borehole Design (Alluvial Aquifer)</td>
</tr>
<tr>
<td>D-306/2015a</td>
<td>Emergency Raised Water Platform (Sandbags)</td>
</tr>
<tr>
<td>D-307/2015a</td>
<td>Emergency Raised Water Platform (Concrete Rings)</td>
</tr>
<tr>
<td>D-308/2015a</td>
<td>Emergency Raised Water Platform (Corrugated Steel Rings)</td>
</tr>
<tr>
<td>D-309/2015a</td>
<td>Elevated Tower (Reinforced Concrete)</td>
</tr>
</tbody>
</table>
USEFUL REFERENCES

Emergency water supply

http://www.actioncontrelafaim.org/publications/fichiers/wsh_acf_0.pdf
http://www.odihpn.org/download/gpr1pdf
http://weced.lboro.ac.uk/resources/books/Emergency_Water_Sources_-_Complete.pdf
✦ Lambert, R., and Davis, J. (2002), 'Engineering in emergencies 2nd Ed.', Register of Engineers for Disaster Relief (RedR), London.

Surface water

✦ House, S., Reed, B. and Shaw, R., (1989) 'Selecting sources of water: WEDC technical brief #55'. WEDC, Loughborough University, UK.
http://www.lboro.ac.uk/well/resources/technical-briefs/55-water-source-selection.pdf
✦ WEDC (2012), 'Intakes from rivers: WEDC trial course unit'. WEDC, Loughborough University, UK.
http://weced.lboro.ac.uk/resources/units/EWS_Unit_5_Surface_Water_Intakes.pdf
http://www.watersanitationhygiene.org/Maintaining_Intakes_(USAID).pdf
✦ USAID (1984), 'Constructing intakes for streams and rivers', USAID, Washington USA.


Spring captures


Hand dug wells

Hand drilled wells

  [http://www.lboro.ac.uk/well/resources/technical-briefs/43-simple-drilling-methods.pdf](http://www.lboro.ac.uk/well/resources/technical-briefs/43-simple-drilling-methods.pdf)
Machine drilled wells


Rainwater harvesting


Water network design

Motorized water pumping

Handpumps

- [http://wedc.lboro.ac.uk/docs/research/WEJW2/Report_Uganda.pdf](http://wedc.lboro.ac.uk/docs/research/WEJW2/Report_Uganda.pdf)

Water storage

- USAID (1984), 'Methods of storing water', USAID, Washington USA. [https://www.lifewater.org/resources/rws5/rws5m.pdf](https://www.lifewater.org/resources/rws5/rws5m.pdf)


