Reservoir

# Main Dimension

* Foundation diameter 220 cm
* Outside Reservoir Diameter 1.72 m
* Inside reservoir diameter 1.42m
* Rebar Ring diameter 1.60 m → circonference = 5 m

|  |  |  |  |
| --- | --- | --- | --- |
| **Nb of molds** | **1** | **2** | **3** |
| Inside Height (m) | 80 | 180 | 280 |
| Outside Height (m) | 100 | 200 | 300 |
| Usable volume (m³) | 1.2 | 2.8 | 4.4 |
| Cement (quintal) | 6 | 8 | 10.5 |
| Rebar 8 mm (12m bar) | 6 | 6 | 6 |
| Rebar 6 mm (kg) | 20 | 40 | 60 |

# Construction Schedule:

The mason must wait 7 days before removing the inside steel mold and wait another 7 days to remove the top slab formwork (planks). Good planning is needed so that the mason:

1. Start with the reservoir slab & walls (5 working days)
2. Start the WP Slab while waiting for the wall curing (5 working days)
3. Build the top slab (2 working days)
4. Finish the WP while waiting for the top slab curing (5 working days)
5. Remove the reservoir formwork (1 day)

Total 1 month work

# Main remarque & step to supervise closely

This reservoir design uses as little material as possible; this means that there is not a huge safety margin: **the execution must flawless.** Pay special attention to the following points:

1. This reservoir needs perfect cure, the **pipeline with running water** must reach the site **before** construction start.
2. Inside form must be oiled with **cooking oil** as it will be in contact with potable water
3. The reservoir resistance to water pressure is mainly due to the rebar rings: take special care in **the tying of the rebar** and **in opposing the horizontal iron ring connections**
4. The connection between bottom slab and wall is prone to leakage : create **indentation in the slab** and **clean thoroughly** before casting
5. **Fill completely** the reservoir the day after casting and let **it cure underwater for 7 days minimum**

# Reservoir position

The reservoir is built for one WP only, as close as possible to it: The elevation between the faucet of the water point and the slab of the reservoir should be above 20 cm.



Connect the **overflow of the reservoir (50 mm)** to the cattle through if the distance is less than 50 m.

It is better to place the 2 evacuations (reservoir overflow & WP evacuation) separately into the cattle though wall rather than to use a Y.



From Reservoir

From WP

# Foundation

|  |  |
| --- | --- |
| Diameter 220 cm, 30 cm hard core stone, 5 cm lean concrete | |
| C:\Users\Actif\Documents\0 Ethiopie\8.Capi\Tank Sizing\Individual\Building\Foundation.jpg | |
| **Reservoir without DB:**  Inlets & outlets pipe on elbows (40 cm above lean concrete)  Inlet in PVC 25 mm , outlet in PVC 32 mm  Overflow / Washout 50 mm with coupling & elbow (toward cattle through) | |
| C:\Users\Actif\Documents\0 Ethiopie\8.Capi\Reservoir\Construction\Supp Documents\Image Res const\Inlet.jpg  Pipes 40cm above lean concrete  Reservoir  Inlet  Reservoir  Outlet  Overflow/Washout with coupling | **C:\Users\Actif\Documents\0 Ethiopie\6.Photo\02. Katcha Bira\Zegoba\Layo\IMG_2133.JPG**  All pipes protected with plastic |
| Overflow Coupling at future slab height |

# Slab

|  |  |
| --- | --- |
| C:\Users\Actif\Documents\0 Ethiopie\8.Capi\Tank Sizing\Individual\Building\Slab Bar.jpg | Rebar 8 mm  Spacing 15 cm  Bended on both side (height 25 cm)  Inlet and outlet pipe not represented |
| C:\Users\Actif\Documents\0 Ethiopie\8.Capi\Tank Sizing\Individual\Building\Slab.jpg | Place the outside formwork  Cast slab (thickness 10 cm )  On the outer 15 cm of the slab make some deep cross with the trowel to improve the future wall / slab connection  C:\Users\Actif\Documents\0 Ethiopie\6.Photo\04. Tambaro\Belela\Chefa\IMG_0061.JPG |

# Wall reinforcement

|  |  |
| --- | --- |
| C:\Users\Actif\Documents\0 Ethiopie\8.Capi\Tank Sizing\Individual\Building\Ins Mold.jpg | Remove outside form  Place inside form  Oil the inside form with **cooking oil**  C:\Users\Actif\Documents\0 Ethiopie\6.Photo\02. Katcha Bira\Zegoba\Layo\IMG_1967.JPG |
| C:\Users\Actif\Documents\0 Ethiopie\8.Capi\Tank Sizing\Individual\Building\Vbar.jpg | Place vertical bar 6mm  Spacing 15 cm  Vertical bar must be attached to slab rebar  Vertical bar height must be 25 cm over inside mold |
| C:\Users\Actif\Documents\0 Ethiopie\8.Capi\Tank Sizing\Individual\Building\Circle.jpg  **Take special care not to place the ring ends on top of each other** | Cut 6 mm horizontal bar : length = 5.25m  Bend them to form a round (1.6 m diameter)  Attach the two ends (25 cm overlap)  Place them **outside** the vertical rebar  C:\Users\Actif\Documents\0 Ethiopie\6.Photo\04. Tambaro\Belela\Chefa\IMG_2423.JPG |
| Horizontal circle spacing   |  |  |  |  | | --- | --- | --- | --- | | Nb of Mold | Reservoir 1 row | Reservoir 2 rows | Reservoir 3 rows | | Bottom row | 20 cm | 15 cm | 10 cm | | Midlle row |  | 20 cm | 15 cm | | Top row |  |  | 20 cm | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Rebar attachment with bending wire:   1. The rebar rings are the main elements that resit water pressure 2. The compaction must be quite powefu    * The rebars must be attached very strongly using figure 8 tie l | | C:\Users\Actif\Desktop\aid535795-v4-728px-Tie-Rebar-Step-10-Version-3.jpg | |
| 1. Place the wire diagonaly over the front bar | 1. Pass the wire behind the back bar | | 1. Tie the wire |
| C:\Users\Actif\Documents\0 Ethiopie\8.Capi\Reservoir\Construction\Supp Documents\Tying rebar\First.png | C:\Users\Actif\Documents\0 Ethiopie\8.Capi\Reservoir\Construction\Supp Documents\Tying rebar\cross.png | | C:\Users\Actif\Documents\0 Ethiopie\8.Capi\Reservoir\Construction\Supp Documents\Tying rebar\Figure8.png |
| **To tie the wire:** | | | |
| 1. Turn the pliers to bend the wire | 1. Rotate the pincer, against the main rebar to pull the wire with a lever effect | | **Repete step 1 and 2** until the two rebar are stongly fastened |
| C:\Users\Actif\Documents\0 Ethiopie\8.Capi\Reservoir\Construction\Supp Documents\Tying rebar\Turn.png | C:\Users\Actif\Documents\0 Ethiopie\8.Capi\Reservoir\Construction\Supp Documents\Tying rebar\Pull.png | |

# Casting the wall

|  |  |
| --- | --- |
| **The entire wall must be casted in one day.**  This step must started **early morning** to have fresh mason & labour and all the time to complete all the wall | |
| C:\Users\Actif\Documents\0 Ethiopie\6.Photo\04. Tambaro\Belela\Chefa\IMG_0061.JPG | **The connection Wall / bottom slab is the place most prone to leakage:**   * + - **Clean touroughly with large amount of water the slab before placing the outside form.** |
| C:\Users\Actif\Documents\0 Ethiopie\8.Capi\Tank Sizing\Individual\Building\Wall1.jpg | Oil the first outside formwork with burnt oil  Place it and start casting  **Careful: Use only small size gravel** |
| ① Cast the concrete: **one bucket per one bucket rotating**  around the mold (not all the concrete on the same side)  **Vibrate a lot** : The vibration teams follow the one who pour the concrete. Vibrate:  ② with a stick inside the concrete,  ③ by hitting the outside mold with a wooden hammer  ④ by hitting the inside mold with a wooden hammer  C:\Users\Actif\Documents\0 Ethiopie\6.Photo\02. Katcha Bira\Zegoba\Layo\IMG_1979.JPG  **④**  **②**  **①** | C:\Users\Actif\Documents\0 Ethiopie\6.Photo\02. Katcha Bira\Zegoba\Layo\IMG_1969.JPG  **③**  **②** |
| C:\Users\Actif\Documents\0 Ethiopie\8.Capi\Tank Sizing\Individual\Building\Wall2.jpg | When the first row is completed, installed the second outer formwork and continue casting  **All row must be casted the same day**  **The day after casting the concrete, fill the reservoir up to the top with water** |
| Let the concrete cure during **7 days** minimum  To remove the inside mould:  Start to remove the door using a crow bar as gently as you can.  Image result for crow bar | C:\Users\Actif\Documents\0 Ethiopie\6.Photo\02. Katcha Bira\Zegoba\Layo\IMG_2233.JPG |

# Cover

|  |  |
| --- | --- |
| Construct a cover formwork with timber  Cast the top slab using the outside form with slope toward the outside  For the door don’t forget :   * ① to sur-elevate it * ② to do an inside joint * ③ to build a back rest   **②**  C:\Users\Actif\Documents\0 Ethiopie\6.Photo\02. Katcha Bira\Zegoba\Layo\IMG_2561.JPG  **①**  **③**  Let the slab rest 7 days before removing the formwork | C:\Users\Actif\Documents\0 Ethiopie\8.Capi\Tank Sizing\Individual\Building\Cover.jpg |
| **Cut all inside pipes:**  Outlet : 3 cm height  Inlet : 15 cm height  Overflow : reservoir inside height – 5cm | |

# DB Reservoir: Pipes installation in foundation

|  |  |  |  |
| --- | --- | --- | --- |
| **Reservoir WP + DB** | | | |
| **C:\Users\Actif\Documents\0 Ethiopie\8.Capi\Reservoir\Construction\Supp Documents\Image Res DB\Inlet.jpg**  The DB inlet and outlets are made in PVC with a Tee and a GI drainage. The vertical **pipe length** is equal to the outside reservoir height + 50 cm. | | | C:\Users\Actif\Documents\0 Ethiopie\8.Capi\Tank Sizing\Individual\Building\Res DB\Outlet.jpg  If the DB has two connected outlets use two tees on the same horizontal pipes |
| C:\Users\Actif\Documents\0 Ethiopie\8.Capi\Reservoir\Construction\Supp Documents\Image Res DB\all pipes.jpg  Drainage  DB Outlets  DB Inlet  Reservoir Outlet  Overflow/  Washout  35 cm | | All pipes must be embedded in the reservoir foundation | |
| C:\Users\Actif\Documents\0 Ethiopie\8.Capi\Reservoir\Construction\Supp Documents\Image Res DB\all pipes.jpg  45 cm | | DB inlet & outlet placed in circle 45 cm from border and 20 cm aparts | |
| Take care to position all pipes properly   * Reservoir overflow near to the manhole door * Db inlet and outlet on the opposite side | | | |
| Db  Inlet & outlets position | | | |
| Up to 4 outlets pipes  (Including the one that goes in the reservoir) | Up to 9outlets pipes  (Including the one that goes in the reservoir) | | |

# DB Reservoir: pipe inside slabs

|  |  |  |
| --- | --- | --- |
| C:\Users\Actif\Documents\0 Ethiopie\8.Capi\Tank Sizing\Individual\Building\Res DB\Cover.jpg  DB Outlet  DB Outlet to reservoir  DB Inlet | | **Before casting the top slab reservoir:**  Make sure that inlet and outlet pipes go through the cover  Add an outlet to go into the reservoir (can be placed on the formwork timber)    Outlet to reservoir  Inlet & outlets from foundation  Planks |
|  | |  |
| C:\Users\Actif\Documents\0 Ethiopie\8.Capi\Reservoir\Construction\Supp Documents\Image Res DB\Tube DB.jpg  Tee and elbow for DB Outlet  Coupling to reservoir outlet  Tee for DB Inlet | | **When the top slab reservoir is finished:**  Place Tee and elbow to form the DB outlet  Place a coupling for reservoir outlet / Washout |
| C:\Users\Actif\Documents\0 Ethiopie\8.Capi\Reservoir\Construction\Supp Documents\Image Res DB\DB Slab.jpg | | Use a formwork for back of the DB  Cast a slab to cover tees and elbows  Slab slope towards outlet to reservoir (washout)  C:\Users\Actif\Documents\0 Ethiopie\6.Photo\02. Katcha Bira\Zegoba\Layo\IMG_2231.JPG |
| **For Big DBs:**  More than 4 outlets  Or  Inlet ≥ 50 mm  **Use half circle DB** | C:\Users\Actif\Documents\0 Ethiopie\8.Capi\Reservoir\Construction\Supp Documents\Image Res DB\Half DB.jpg | |
| C:\Users\Actif\Documents\0 Ethiopie\6.Photo\02. Katcha Bira\Zegoba\Layo\IMG_2341.JPG | Use a circular formwork for back wall of DB  Height of DB 50 cm  Build a concrete slab cover (10 cm thick) with small door (sur-elevated) | |
| Place a tee on the DB inlet, the tee height must be exaclty at outlets height | C:\Users\Actif\Documents\0 Ethiopie\6.Photo\02. Katcha Bira\Zegoba\Layo\IMG_2553.JPG | |
| **Removing the planks formwork**  You can build the DB before removing the formwork  But the mason must take **extra care not to break** the pipes passing through the reservoir |  | |

# Reservoir Design



