BUILDING OF MONOLITHIC CONCRETE SLAB FOR FILTERS (FALSE CONCRETE BOTTOM)

TECHNICAL SPECIFICATION

INDEX

1 INTRODUCTION TO MONOLITHIC CONCRETE SLAB (FALSE CONCRETE BOTTOM)

The Monolithic Concrete Slab (False Concrete Bottom) is a new concept developed by Salas, to be used under the conditions defined in Section 2.

The product Monolithic Concrete Slab is a horizontal reinforced concrete structure, based on polypropylene lost formwork. This structure is linked to the filter floor by means of reinforced concrete columns of 160 mm diameter, PVC pipe formed Class 4 minimum. So there are no beams or concrete sealing joints.

The Monolithic Concrete Slab executed in base on the following elements:

• Prefabricated: Lost formwork trays, dimension 0.60m x 1.00m built in polypropylene, filter nozzles pre-assembled and control torque adjusted. BFP65 model in ABS / Polypropylene with gaskets, PVC, columns, plastic spacers for steel mesh.

• Placing in place (reinforced concrete), according to the guideline provided by Salas in these specifications.

Civil Engineering Contractors must strictly follow the instructions included in this document.

2 APLICATION SCOPE

The MONOLITHIC CONCRETE SLAB is mainly intended to provide water treatment facilities and water filtration particularly for human consumption. For this main application must be in compliance with health regulations in force in the country where it is installed.

The Monolithic Concrete Slab is intended to:

• Support the submerged filter media.
• Ensure drainage function and fluid distribution.
• Support the vertical loads uniformly distributed and applied alternately in both directions (up and down). The values of application of such loads are indicated in the guide plans and calculation reports submitted by Salas to the Civil Engineering contractor.

3 SPECIFIC TECHNICAL REQUIREMENTS

Three main conditions are required:

• A good leveling of the Monolithic Concrete Slab, defined by the tolerances shown in the execution plans and in these specifications (sees Section 5.1). Horizontality is a main condition to ensure the good operation of the filters.
• A controlled cleaning before placement and fixation of each formwork (see Section 5.2).
• A total absence of leaks of backwashing fluids (air and water) will be controlled at the time of reception tests. This absence of leaks allows backwashing air and water spread to the desired locations, with the mass flows indicated by the procedure.

To obtain an absolute absence of leaks, make sure of:

1. A correct fixation of the plastic formworks on the floor.
2. A proper vibration of concrete during placing around the filtering nozzles.

The accomplishment of these conditions is required for the proper performance of the filters. Failure in level tolerances of horizontality and / or presence of leaks will result in rejection of the work.

4 SUPPLY OF MATERIALS TO BE USED.

4.1 Materials Supplied by Salas.

Salas assure the supply of the necessary elements for the correct execution of the Monolithic Concrete Slab (False Concrete Bottom) i.e.

- The polypropylene lost formworks.
- Self-adhesive reinforced tapes (optional).
- The ABS/Polypropylene/Engage filtering nozzles provide with their caps and gaskets.
- Plastic steel mesh spacers 3 cm high (optional).
- PVC pipes Class 4 minimum, to be used as lost formwork for the support columns(optional)..
- Stainless steel AISI 304 beams for perimeter support (optional).

All these parts will be supplied in amount enough to build the filter units.

4.2 Materials supplied by the Civil Engineering Contractor.

The Civil Engineering Company must supply all the necessary materials to obtain the correct execution of the work. (Iron mesh, concrete, and all the necessary material for the formwork placement)

4.2.1 Efforts calculation.

The Monolithic Concrete Slab supports the same efforts than traditional filtering slabs.

- Downward efforts: 4.500 daN/m^2 (during filtration)
- Upward efforts: 2.500 daN/m^2 (during backwash)

4.2.2 Concrete for Monolithic Concrete Slab construction.

To comply with the application conditions defined in section 2, the materials must observe local regulations in force, particularly if the filter is designed to produce drinking water.

In the same way, additives and adjuvants eventually used to compose concrete, must be submitted to approval of Project Manager and the Civil Engineering Company must certify that the composition is consistent with the authorized list of approved components

In addition, the placed concrete will be permanently submerged in water that may contain chlorine (<2 mg / l) and / or ozone (<0.5 mg / l) until setting.

The chosen concrete must be consistent with the physic-chemical characteristics of water to be treated.

- The concrete used must support a minimum strength of 30 MPa.
- Maximum size of granulated components shall be 16 mm. Use of more than one size is preferred (i.e. sand: 0/5 mm granulated # 1: 5/12 mm, granulated # 2: 12/16 mm).
- Recommended Flexibility: Sinking in the Abrams cone 10 to 14 cm. for a good coating of plastic pieces
- Minimum dosage of cement: 350 kg per m^3 of concrete.
- Ratio water / cement ≤ 0,5

4.2.3 Steel reference.

Steel ADN-420.

4.2.4 Control of materials.

The composition of the concrete as well as the quality of the Steel mesh should be communicated to Salas before its use. Salas reserves the right of control them at every stage of construction of the Monolithic Concrete Slab.

The following documents will be required for control in each placing set.

- Concrete composition.
- Technical data sheet of the components of concrete.
- Compliance certificates for sanitary approval if required by Salas.
- Test reports of essays of granulated added (sand, gravel).
- Test reports on cylindrical probes: 3 x 2 for each series in 7 and 28 days strength.
- Ratio water / cement each placing.
- Sinking essays of concrete during placing.
- Technical files of delivered concrete.
- Reports of the nature and quality of steel.

5 EXECUTION OF MONOLITHIC CONCRETE SLAB.

Civil Engineering Company is aware that the use of **expanded polystyrene is prohibited** in the construction of filters boxes, filtering batteries and in all works done in direct or indirect connection with filters.

5.1 Reception of filter box.

Before the execution of **Monolithic Concrete Slab**, Civil Engineering Company must verify that the structure of the boxes the following tests. **Obligatory.**

- Absence of leaks test:

"This condition must be fulfilled if there are not apparent losses".

- **Tolerances** on length and width of filter boxes.

Dimension	Tolerances
< 5 m	-5+10 mm
From 5 to 10 m	-5+20 mm
> 10 m	-5+30 mm

- **Tolerances of horizontality** of the floor of each filter box (± 10 mm), regardless of the box dimensions.

- **Floor appearance**: the area of formwork installation must be smooth, clean and horizontal (plane deviation under 2 meters rule 5 mm).

If the floor of the filter boxes is not under the mentioned tolerances, the Civil Engineering Company must do the necessary corrections to comply with them.

If the tests are approved, the box of the filter is able to begin the construction phases of the Monolithic Concrete Slab (see Section 5.2).

5.2 Monolithic Concrete Slab execution.

Schedule of execution:

a) Check the location of Steel bars that must be built up in the box floor.
b) Check the location of Steel bars that must be built up in perimeter walls of the box.
c) Assemble the Stainless Steel beams to support the plastic formwork to perimeter walls (if applicable).
d) Place and built up the steel bars to support the efforts as described in Items a and b. **Perform a random check of the steel bars** with the aid of a calibration device equipped with a dynamometer. **The reference effort shall be the effort of the bar with the bigger load calculated**.
e) Increase the roughness on the perimeter location of the Monolithic Slab on the walls to increase the adherence of different age concretes.
f) Suck up the filtering box floor to eliminate all small pieces and dust. The dimensions of the residual dust should be less than or equal to 1 mm.
g) Place column and slab lost formworks simultaneously. In this point is very important to check the correct level of them. **The level tolerance of each filter lost formwork is ± 3 mm. Regardless of the length and width of the filter.**
h) Place the closing Stainless Steel angles on perimeter column holes.
i) Place the self-adhesive reinforced tape over formwork joints to ensure sealing while concrete placing.
j) Place the steel mesh on its proper location over formwork.
k) Bend the vertical steel bars on columns to link them with horizontal steel mesh.
l) Place the filtering nozzles in the holes on plastic lost formwork
m) Elevate steel mesh and put the plastic spacers and link the steel mesh to the perimeter steel bars and columns.
n) Carry out the checks defined in Section 6.1 below.

o) Clean thoroughly by sucking the areas between the Plastic Formworks and floor and walls of the filter box.
p) Put the adherence bridge in the wall where will be contact between old and new concrete.
q) Placing of concrete: Concrete must be transported under conditions that not allow segregation of the components, or beginning to set before placement. The height of the discharge should not exceed 0.4 m for the placing of concrete in Monolithic Concrete Slab (False Monolithic Bottom). **Placing of concrete in only one point is not allowed. It must be placed uniformly over the total area.**

   Place and vibrate columns concrete, then place over the work forms. The concrete should be stirred with a vibrating needle of suitable size.

   Work gently around the filter nozzles to obtain a quality job. The concrete placed will have the same level maximum of the level of filter nozzles caps.

   Wait until water comes out of the concrete and evaporate to do the final adjust of the surface. In case of using self-compacting concrete is not necessary vibration and manual finishing.
r) After concrete setting flood the Monolithic Concrete Slab with 0,05m of water to allow concrete curing.

Note: Caps of filtering nozzles must be located in its place during all concrete placing and curing operations.

5.3 Final stages (removal of nozzles caps and charge of the sand)

Civil Engineering Company is in charge of this task.

The operation of removal of the covers comprises the following steps:

1. Drain curing water from the filter.
2. Suck up all the Monolithic Concrete Slab of each filter (sucking is preferred than blowing as it prevents dust to be deposited further).
3. Remove filter nozzles caps.
4. Suck up slurry particles from the removal of the caps.
5. Fill with water 0.30 m above the filter nozzles to limit the action of ultraviolet rays on the plastic materials.
6. Air tests with 0.30 m of water over the Monolithic Concrete Slab to verify uniformity in the bubbling and sealing of the false bottom.
7. If these tests are satisfactory, go to step 8, otherwise failures must be corrected.
8. Load of the filtering media.

6 CONTROLS

The following controls should mandatory in all executions of Monolithic Concrete Slabs.

6.1 Controls before concrete placing.

Before any concrete placing, Civil Engineering Company must verify without failure.

- Proper placement of structural steel bars and meshes.
- Proper placement of the plastic lost work forms and correct sealing of the joints.
- Proper placement of the nozzles and filter caps.
- General cleaning of the surface.

Repair all anomalies observed before concrete placing.

6.2 Control of concrete resistance.

Concrete tests will be run under the rules in an approved laboratory, and must provide results at least equal to resistances showed in the calculations, see Section 4.2.3.

Salas reserves the right to make same controls at any time during concrete placing of Monolithic Concrete Slabs.

6.3 Check after execution.

- Cleaning of nozzles. They can have traces of concrete.
- Physical damage of nozzles.
- Level of nozzles. **Tolerance ± 3 mm**. ***Regardless of the length and width of the filter.***

7 ATTACHMENTS

- *Link http://www.salassrl.com*
- *Horizontal sections DBF-101-11-rev04*
- *Implementation Plans (provided by Civil Engineering Company)*
- *Calculation Report of structural analysis (provided by Civil Engineering Company)*
- *Sketch of geometric data of the floor (provided by Civil Engineering Company)*
- *Sketch of detail of the stages of implementation (provided by Civil Engineering Company)*