cefil DW

Installation Manual

This manual on the installation of PVC pool linings is intended exclusively for professional installers.

The recommendations and installation techniques shown in the manual can be applied to a wide variety of supporting shells: Cefil PVC liners can be installed on tiles, ceramics, concrete, etc.

Cefil PVC liners are compatible with many different materials, and feature excellent performance and a long lifetime. This makes them the best alternative to waterproof sealing for both public and private swimming pools.

1

General Recommendations

The tips and recommendations given here apply not just to pools but also to other elements such as shells, shaping components and accessories.

1.1. Pool

1.1.1. Pool Construction Regulations

Before starting work on a pool, check that it complies with the relevant regulations on underground work and meets trade standards.

If the pool is built leak-tight the hydrostatic pressure resulting from the pool's own weight or from fixed loads applied must be balanced. This makes the work more expensive, as a 50-60 cm thick reinforced concrete coping is required.

There are two alternatives to coping construction. The more effective of the two is to build in suitable drainage around the base of the work area. The second is to connect the pool to a soak-away drain via a water extractor pump.

This system is widely used in lightweight work such as swimming pools because it is economical.

Either of these systems will prevent any infiltration of ground water which could affect the performance, appearance and lifetime of the pool lining.

CEFIL PVC provides a practical, simple way of transforming or renovating pools, but some preliminary work is required before sealing can take place.

As a general rule, any cracks or irregularities in the surface should be filled in, and any other problems such as broken, cracked or protruding tiles should be corrected. Felt or biocide-treated separating screens can be used in this conditioning work. All components which are to be sealed must be checked, and any which are not suitable for use with liners must be replaced.

If the pool to be renovated already has a liner, it must be removed before the new liner is fitted. Do not attempt to renovate or patch the liner, even if the pool was built according to the instructions for sealing given above.

1.1.2. Supporting Shells

There are two essential elements in pool construction: the coping and the walls.

The coping should be made of reinforced concrete (with a dosage of at least 350 kg) at least 12 cm thick, with a smoothed top finishing layer for protection.

Protective layers which are too fine or are incorporated into the coping are not recommended, as they do not have the required smooth appearance.

The pool walls and bottom should be made of materials compatible with CEFIL PVC liners.

The pool bottom must be completely flat and level to a tolerance of 1 cm / 10 m, so that the pool width elements can be installed with a plumb-line on smooth surfaces. They walls must also be built and installed with a plumb-line, and should have no cracks or chips measuring more than 2 mm.

The following construction materials may be used.

- REINFORCED CONCRETE: this should be covered with a flat, smooth plaster coat. If oil is used in formwork, it must be neutralised when the plaster coat is applied.

- PREFABRICATED REINFORCED CONCRETE PANELS: these should be plaster coated after assembly;

- MASONRY with horizontal and vertical joins: this must be covered with a smooth plaster coat.

- METAL PANELS: these must be properly levelled on fitting and solidly secured or sealed to the coping. They may be flat or curved. The steel used should be stainless, galvanised or hot coated with CEFIL PVC. Aluminium alloys may also be used. If panels are corrosion treated the treatment used should be compatible with CEFIL PVC liners.

WOOD PANELS: these should be mounted on and secured to the coping. Any treatment applied should be compatible with the liners. Tar and asphalt based products must NOT be used to treat this wood.

- PANELS or BLOCKS of thermoplastics (PE, PVC, PS) or compounds (PRFV) mounted on and secured to the coping.

When choosing a material, take into account the risk of migration of pigments and/ or plastic coatings which may be added to basic resins. If such migration is likely, a separating layer should be incorporated on the pool walls and bottom.

Finally, remember that it will help conserve CEFIL PVC liners if the walls and bottom are treated (disinfection, preventive treatment with biocide) prior to their assembly and installation.

1.1.3. Corners & Edges

Proper construction of walls and coping is essential if a pool is to be adequately waterproof. The dihedral angle between the walls and the bottom should be at least 8.5°. Any smaller angles should be corrected before liners are fitted.

Joins between vertical walls may be sharp-angled, rounded or on cut-off faces.

Sharp angles should also be used at the foot of walls and on edges.

It is easier to apply reinforced linings when sharp angles are used.

If the pool has steps, the angles formed by the treads and the bottom of the risers should also be sharp, while the angles at the top of each step should be slightly rounded (max. radius 5 mm).

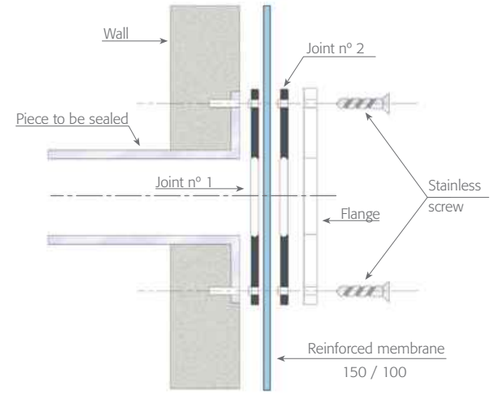
2

Accessories

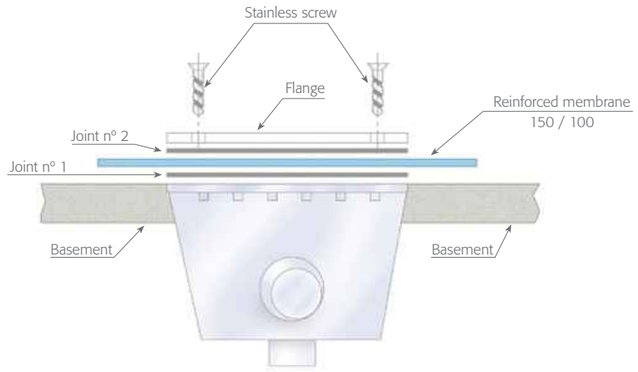
All accessories intended to pass through the shell and lining must have two leak-tight seals and a fixing flange (see Fig. 1). If possible, these components should be fitted to the walls and bottom of the pool on completion (without the seals and flanges).

The first seal should be fitted on the component to be sealed before the reinforced lining is fitted. The second seal, which goes on top of the lining, and the fixing flange should be fitted as the pool is filled. Ensure that sealing is completed before the water reaches the components involved. Once the flanges are fitted, the part of the lining inside the flange should be cut.

The counter-flange on the bottom plug must be fitted at a height of around 30 cm.



a) Discharge pipe



b) Bottom plug

Figure 1: Method of assembly of all pieces to be sealed

COMPONENTS TO BE SEALED

The following pool components need to be sealed. Types compatible with liners should be used in all cases.

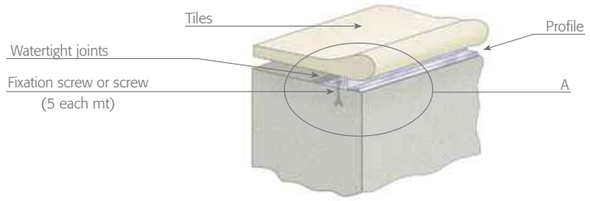
- skimmer(s);
- bottom plug(s);
- brush connection(s) & discharge connection(s);
- Sprayer(s), window(s);
- "against current" device;
- any accessory which protrudes through the shell and liner.

2.1. Liner Fitting Accessories

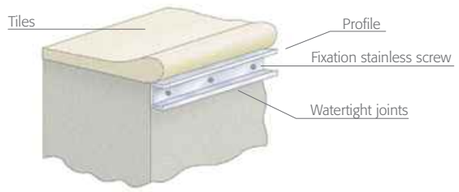
2.1.1. HUNG FITTING

Any of the following special sections may be used with this fitting system:

- horizontal sections beaded onto the plaster facing of the pool under the rim.
- sections attached to the vertical wall of the pool (especially recommended for refurbishment work on pools with rims).



a) Fixation Hung on tiles

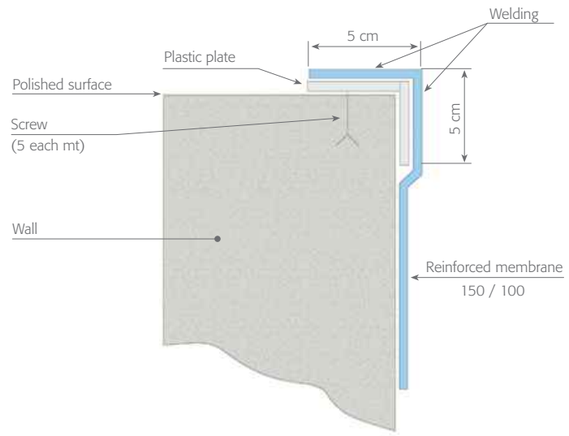


b) Fixation Hung on the wall

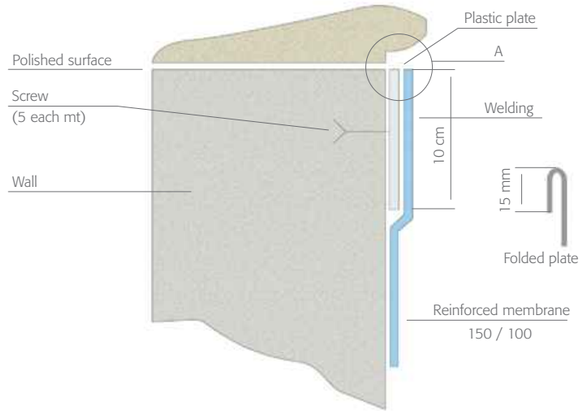
Figure 2: Method of fixation type "hung"

2.1.2. SQUARE PLATE SECTIONS

If hot laminated PVC-coated steel square ("plastic coated plate") sections are used, the manufacturer's recommendations must be observed and the indications in Fig. 3 must be followed.



a) Fixation on polished surface



c) Fixation on vertical wall (renewals)

Figure 3 : Method of fixation on plastic plate

3

Technology

3.1. Measurements. Simulations

Measuring is one of the most important stages of pool construction. Any measurements over 2 m should be taken by two people to minimise the risk of error due to undesired movement.

Measurement tolerances should be –0/ +5 mm for all readings taken on shells and on liner areas which must be cut. These measurements can be used to prepare drawings for cutting operations and simulations.

The following points must be considered when cutting liners:

- available width and length of rolls;
- overlaps required for welds;
- the location, shape and desired appearance of the pool.

3.2 Cutting

As a general rule, start by locating the outside face which will be in contact with the water. Then mark the cuts to be made and cut along the lines marked. Scissors may be used for small cuts, and a Stanley knife and ruler for larger cuts. Make intricately shaped cuts directly on the relevant supporting shells (cones, steps, free forms, etc.).

On non reversible or varnished liners, the outer face should be marked when the liner is manufactured.

3.3. Welding Techniques

All welds must be made on clean, dry areas, so all traces of water or detergent must be removed.

3.3.1. Cold Welding

This procedure is generally used only for flat welds. It calls for the use of THF (tetrahydrofurane) solvent, which must be applied with a brush or applicator. Solvents should not, however, be used on varnished or printed liners.

Widths should first be fitted together with a 5 cm overlap over their whole length, and spot welded with at 0.5 m intervals. The necessary quantity of THF should then be applied with a brush or applicator over lengths of around 0.5 m. and a sandbag should immediately be placed on the welded area.

To help the weld to take, keep the sandbag in place while the adjacent length is being welded.

MATERIALS REQUIRED (1)

The materials needed to seal a pool with CEFIL PVC liners fall into two groups: tools and auxiliary products. A general list of each follows.

• Tools

- brush;
- mixed water & dust industrial vacuum unit;
- concrete scraper or spatula;
- triple measuring tape;
- double 10 m tape measure;
- scissors and Stanley knife for straight and curved sheets;
- 0.8 and 2 m stainless steel upholsterer's rules;
- tracing cord (ensure compatibility with the liner pigments);
- plumb-line;
- large spirit level (approx. 80 cm);
- clean white cloths;
- flat natural silk brushes (30 - 50 mm) with unvarnished wood handle;
- solvent dispenser (THF);

MATERIALS REQUIRED (2)

- Container for applying liquid PVC;
- pencils (NOT ball-point or felt-tip pens);
- 20 litre sandbags made of fabric or natural PE;
- 3 G 1.5 PVC extension cable;
- electrical power supply with 30 mA trip switch;
- wire brush;
- tracing point or screwdriver;
- pumice stone;
- standard, well equipped toolbox;
- hot-air type welder with a range of flat nozzles (15 – 40 mm) and a press roller for sticking silicone rubber linings. This device should include a power regulator to control the air temperature at the nozzle exit (400 – 600 °C);
- spares for welder;
- protective equipment (gauntlets, goggles, mask);
- punch.

A little solvent may flow out after application and pressing. If too much solvent is spilt, the appearance of the liner may suffer some alteration.

Welds must be at least 3 cm wide, and should be applied at a speed of around 3 m/min (though this may vary depending on ambient temperature and humidity), using 15 – 20 g of solvent per linear metre of weld.

REMEMBER: Do not weld in the rain or in highly humid conditions. Precautions should be taken when the temperature is low.

Observe all relevant health and safety requirements when storing and using THF.

3.3.2. Hot Welding

For hot welding, widths must be fitted together with a 5 cm overlap over their whole length, and spot welded at intervals of 0.5 m. The hot air outlet must then be moved over the assembled widths slowly and regularly, while glue is simultaneously applied to the surface with the press roller. Welds must be at least 2.5 cm wide, and should be applied at a speed of 0.5 m/min. The temperature at the air outlet should be around 450° C, though both hot air temperature and speed may need to be adjusted depending on ambient temperature and humidity.

3.4. Checking of Welds

3.4.1. Checks

Both hot and cold welds need to be checked one by one over their full lengths. To do this, take lengths of around 1 m at a time and attempt to insert a tracing point or screwdriver all along the weld to check for any weak points or gaps. This check can also be performed by passing the hot end of the 20 mm tube of the welding iron over the weld (at around 10 m/min).

3.4.2. Touching Up

Any gaps in the weld should be touched up by hot welding as the check is performed.

As a precautionary measure, a further check should be run after touching up is completed.

3.4.3. Finishing and Confirmation of Welds

This involves fitting a PVC bead in solution onto the clean, dry edges of the welds. This should be done very quickly to prevent any contamination. The PVC bead in solution, which should be the same colour as the liner, is slipped by capillary force into the slot in the liner to provide a perfect leak-tight finish. Do not pour water in until it is completely dry (this may take from a few minutes to several hours, depending on atmospheric conditions)

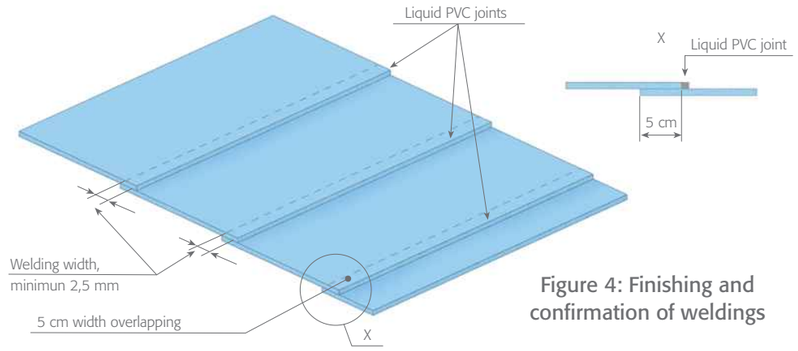


Figure 4: Finishing and confirmation of weldings

MATERIALS REQUIRED (3)

- **Auxiliary products**
  - solvent: THF (tetrahydrofurane) for cold welding, at around 25 g per linear metre of weld or 1 1/100 m2 to 2 1/100 m2 of pool surface area when laid flat;

    NOTE: THF must be used in accordance with health & safety regulations.
  - Liquid PVC (solution) for finishing joins, at around 1 kg per 100 m2 of pool surface area, or 25 g/ linear metre of join.;
  - cleaning solvent (ethyl acetate). Do not use on varnished or printed liners;
  - long, flat-head aluminium expansion edge trims (Ø = 5 mm, L = 25 mm); expect to use around 5 trims per metre of fixing;
  - sheets of plastic-covered plate (2m x 1m);
  - steel thickness = 0.6 mm ± 0.1 mm;
  - PVC coating 0.8 mm ± 0.2 mm on one side, anti-corrosion lacquer on the other;
  - fixing sections (as per sketch in Fig. 2);
  - fixing strips to suit the sections used;
  - locking rings where necessary;
  - Heat-set PVC corner-pieces (inside & outside);
  - adhesive compatible with liners for use on concrete supporting shell;
  - biocide and/ or fungicide solution compatible with PVC liners.

4

Fitting Technique

4.1. Fitters

Upkeep of rolls of liner, measurement and the fitting of the various widths once they are put together are jobs for two people. One of them should be a technician qualified to perform the welding operations required to fit the liners together.

4.2. Preparations

Rolls of liner should be stored flat and taken to the work site in their original packaging at the time of installation. They should be kept flat in a clean, dry place. If possible, use rolls from the same manufacturing batch. Otherwise, check by daylight that the colours match.

First, wash and dry the walls and bottom of the pool. Then run a last visual and tactile check to ensure that all surfaces are smooth and clean. Polish, cover or smooth any defects found and then check and clean the fixing sections.

All components which are to be sealed must be checked and cleaned to eliminate any particles of mortar which might have settled on them during the cleaning of the screw holes. The first joint of each section must be glued before it is sealed (see Fig. 1).

Vertical areas and pool bottoms must be treated with a suitable biocide as per the manufacturer's instructions.

4.3. Fitting of Walls

Fitting of walls may vary depending on whether the fixing system uses special sections (see 2.1.1.) or plastic coated plate (see 2.1.2.), and on whether the walls are flat or not.

4.3.1. Fitting of flat walls using liners with hung sections

Whenever possible, fit a single complete panel per side. Unroll the liner widths horizontally to one or two widths, depending on the height of the walls. If several widths are used lay them flat and put them together first, so that the top one overlaps the one below. Fitting a single complete panel by horizontal widths means that shorter weld lengths are required. It also makes for a more visually attractive final result.

GENERAL RECOMMENDATIONS

CEFIL PVC liners lose flexibility at low temperatures and stretch very little under traction, so precautions should be taken when the outside temperature and that of the supporting shell falls below 10 ºC.

Solvent evaporation is very low below 10 ºC, so welding speeds should be reduced when working at low temperatures.

Since the membranes tend to dilate somewhat, the tension of the widths prior to joining together should be adjusted to suit the ambient temperature at the time of fitting, in line with the manufacturer's recommendations.

At temperatures below 10 ºC the pool should be covered and/ or heated during fitting.

Liners should not be fitted in rain or snow unless protection is provided.

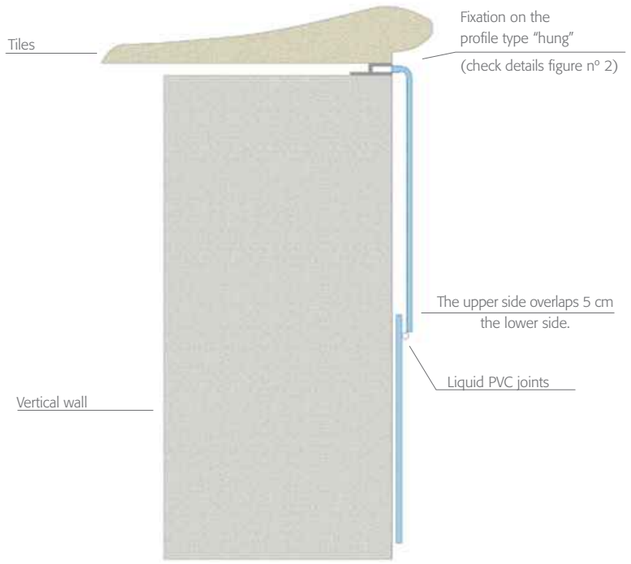


Figure 5: Welding of vertical widths on a flat wall

At the bottom of the widths thus assembled a heel of around 15 cm should be left. This heel is attached to the top or bottom of the bottom liner (see Fig. 6).

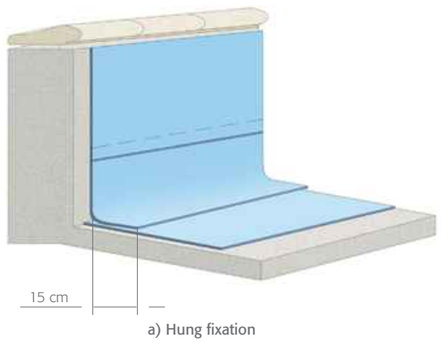


Figure 6: Application on flat walls

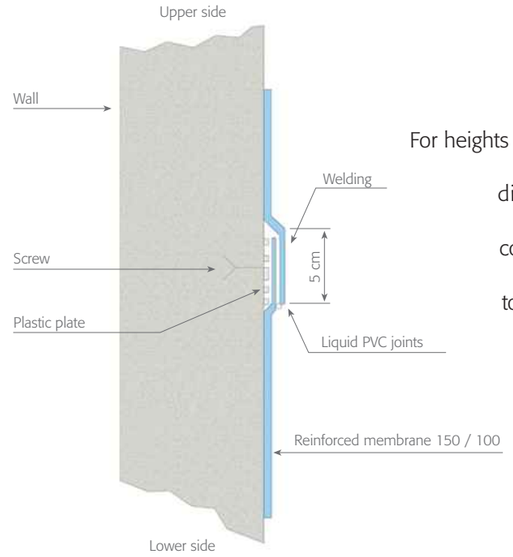


Figure 7: Intermediate mechanical fixation

For heights of 4 m or more, intermediate fixings with plastic coated plates may be used to keep the liner tight against the wall.

4.3.2. Fitting of flat walls with liners fixed to plastic coated plates (see 2.1.2.)

Proceed as per 4.3.1 above, except that when the panel is pre-assembled the bottom width (skirt bottom) must be welded to the plastic plate. The whole assembly must be tensioned (at approx. 1% of its total height) while the plastic plate is being attached to the coping.

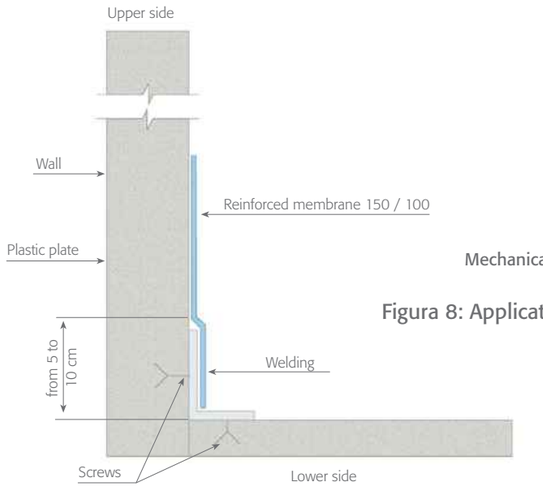


Figura 8: Application on flat walls

4.3.3. Fitting of curved walls

This system applies when one of the walls is joined to a concave or convex free-form shape.

The heel on the liner of the vertical panel must be placed below the pool bottom liner with a maximum overlap of 10 cm. Slits must be made in the heel, and the edging must be removed as required by the shape of the wall.

When a pool contains free-form curved elements, this fitting technique should be used for all its walls.

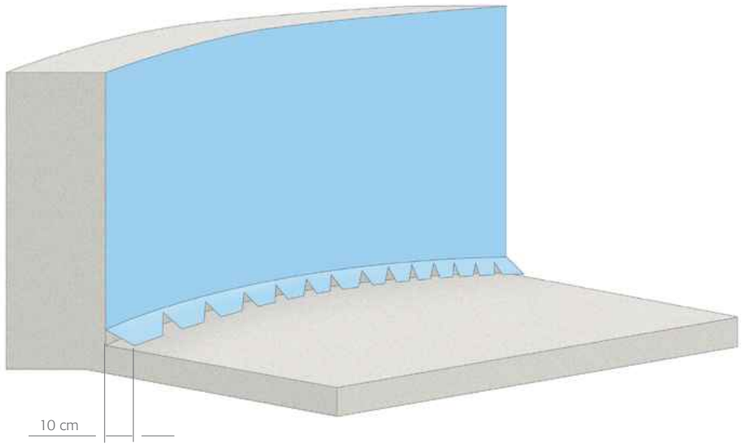


Figure 9: Application on a non flat wall

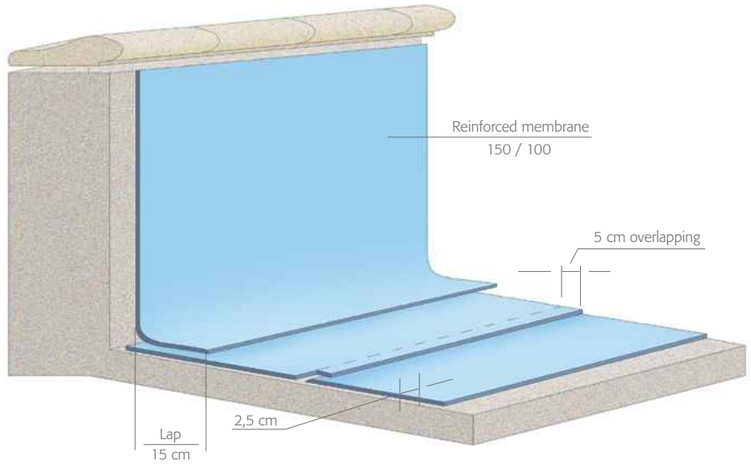
4.4. Fitting of flat bottoms

Fitting methods vary depending on whether the fixing system uses special sections (see 2.1.1.) or plastic plate (see 2.1.2.), and on whether the walls are flat or not.

4.4.1. Non fixed flat bottoms

For hung walls on sections assembled as per 4.3.1 above, the bottom widths must be cut to a length of 2.5 cm less than the width of the pool so that they can be assembled taut.

Slate-type overlaps between successive transverse widths must also be taken into account to prevent dust from accumulating in the corners of the welds.



(check figure 6)

Figure 10: Flat and not fixed bottom

4.4.2. Flat bottoms fixed with plastic plates

For walls fixed to the bottom with plastic edging pieces bottom widths must be cut 5 cm bigger on each side than the width of the pool bottom.

This also results in slate type overlaps (see 4.4.1 above), so the widths must be welded along the bottom outline on the plastic plates and tensioned by approximately 1% of their total width.

INTRICATE SHAPES

Due to the low stretchability of CEFIL PVC liners, concave and convex shapes on walls and bottoms or around accessories can only be produced by numerous cuts and welds, which substantially affect the appearance of the finished product.

MISCELLANEOUS

For pools fitted with drainage ducts and channels, follow the specific instructions of the manufacturer.

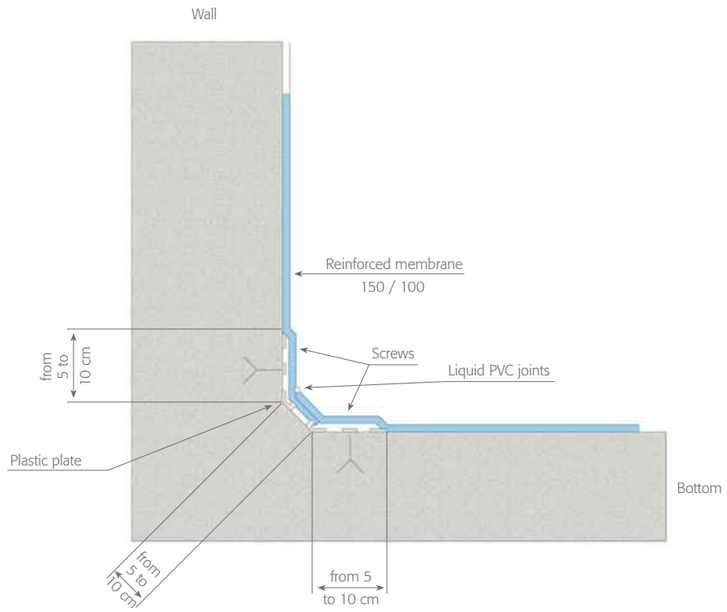


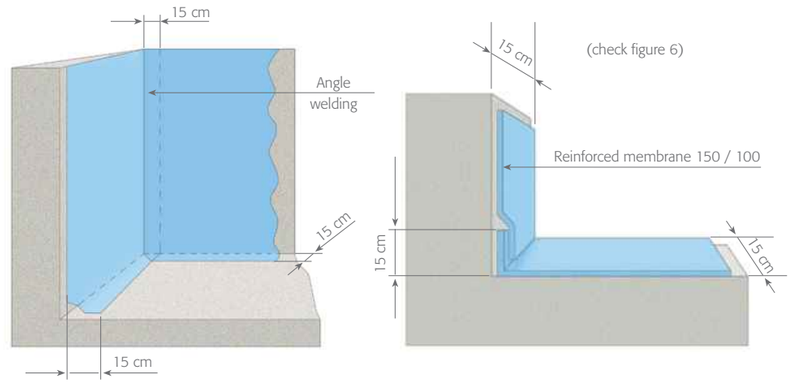
Figure 11: Flat bottom on plastic plate

4.5. Joining walls at corners

Joining methods vary depending on whether the fixing system uses special sections (see 2.1.1.) or plastic plate (see 2.1.2.).

4.5.1. Hung section walls

Corner welds must be carried out as follow (see Fig. 12).

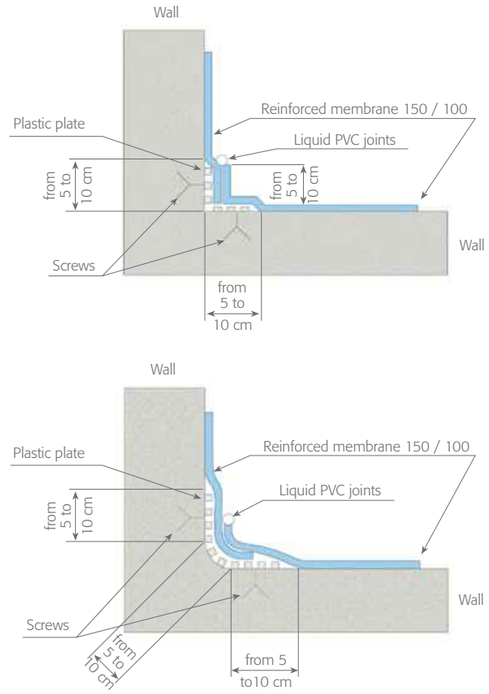


a) Front view b) Upper view

Figure 12: Application on a vertical angle with a profile type HUNG

4.5.2. Walls fixed on plastic plates

Corner welds must be carried out as follows (see Fig. 13).



a) Straight angle

b) Vertical angle with plastic plates

Figure 13: Vertical angle with plastic plates

4.4.3. Flat bottoms with curved walls

In this case the bottom widths should be cut exactly to the shape of the curved outline at the foot of the walls, ensuring that the cut bottom covers all slits by at least 10 mm. Then join the widths with slate-type overlaps (see 4.4.1.).

PRIOR CLEANING

Before filling the pool sweep, or preferably vacuum, the liner, then wash the whole of the surface with soap and water. Eliminate any stains or marks with a non aggressive cleaner. Take particular care with varnished or printed liners.

4.6. Assembling pool bottom & walls

4.6.1. Joining bottom to flat walls

For bottoms fixed in place with plastic plates, join as described in 4.3.2 and 4.5.2 above.

For bottoms not yet fixed (see 4.4.1.) proceed as follows to eliminate any risk of slippage during filling.

a) First fix the pool bottom or wall heel in place with edge trims (5 per linear metre) using whichever of the methods shown in Fig. 14 is appropriate in each case.

b) Fold the heel over the pool bottom (or vice versa) to conceal the edge trims and move the liner off the wall by around 2 cm. This creates a space in the corner between the wall and the bottom which serves to keep the CEFIL PVC liner taut as the pool is filled with water. Since the liner is reinforced and does not stretch, filling will not eliminate any folds left by incorrect fitting.

c) Weld the heel of the wall to the bottom, or vice versa.

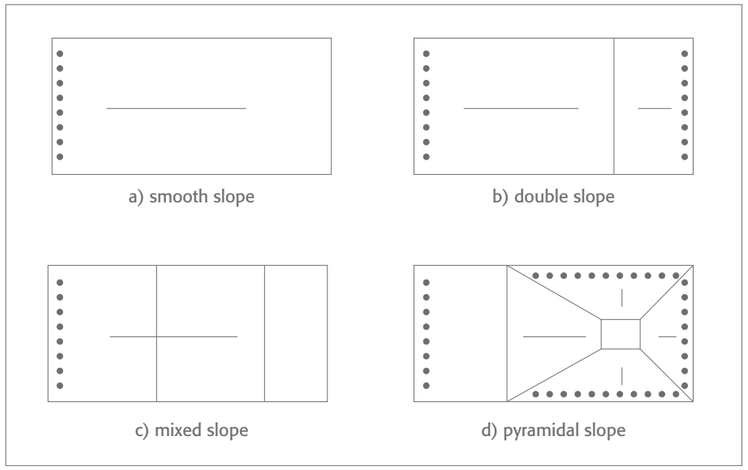


Figure 14: Mechanical fication on the slopes

Although this is not the only possible fixing and joining system, it is the most recommendable for flat bottoms, especially in pools which are used by many people, and in covered pools or pools in spas.

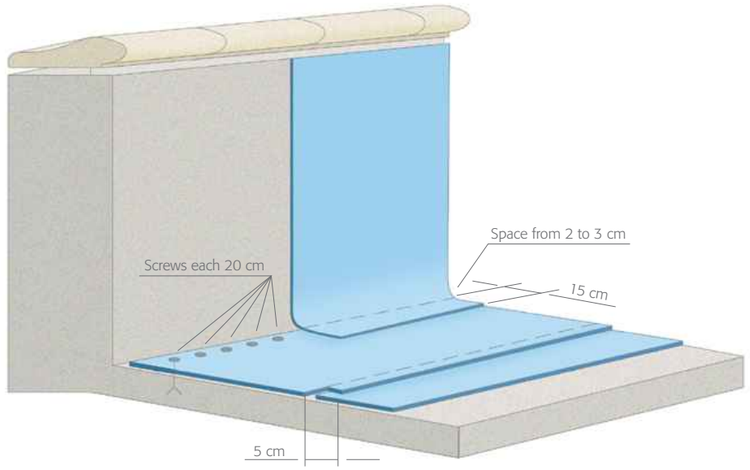


figure 15: Welding wall/bottom (straight wall)

4.6.2. Joining the bottom to curved walls

Fit the walls as per 4.3.3 above and the bottom as per 4.4.3. Then weld the pre-tensioned wall heel onto the edge of the pool via a pre-fitted strip of liner with edging trims. Then fold the pool bottom over the heel and weld it in place.

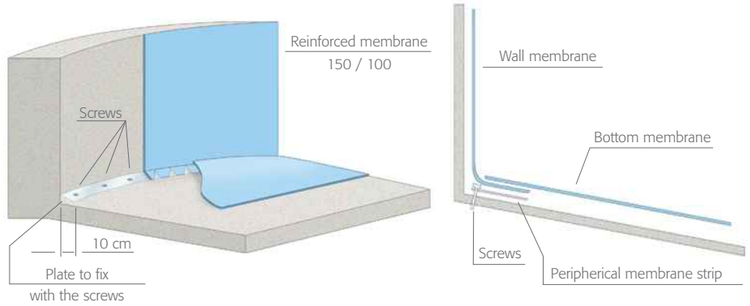


Figure 16: Flat bottom on curved wall

FILLING THE POOL

First flush out the conduits through which water is piped into the pool. Then fill the pool with suitable water which contains no metal salts, with

- if possible: TH < 20 °F
- essential: 7 < pH < 7.8

The water used to fill the pool should contain no biological contamination. If the water used is not taken from the mains supply, it should be analysed and the results taken into account before filling.

Use a chlorine solution, anti-algae product or similar to disinfect the water from the commencement of filling.

If the pool is fitted with a salt electrolysis system, do not add the salt until it is full.

cefil DW

ck

CEPLASTIK S.L.
Polígono Industrial de Júndiz · Calle Júndiz s/n · 01010 Vitoria-Gasteiz (España)
Tel. nacional: 945 29 03 72 Tel. export: + 34 945 29 02 16 Fax: + 34 945 29 03 48
e-mail: vinilika@ceplastik.com · www.ceplastik.com

Rev.: 000/02