Flowcrete

for the world at your feet

Flowchem VE Systems

Table of contents

Table of contents

1. INTRODUCTION

This manual is a guide for applicators in laying Flowcrete anti-corrosion Systems. Compliance with the procedures should ensure that end-users are provided with an anti-corrosion system having the benefits that are described in the *Flowcrete Corrosion Protection Flowchem VE Systems data sheets*. On site operations are in the applicators' area of expertise and remain their responsibility.

The manual contains recommendations based upon our knowledge of Flowcrete anti-corrosion Systems, extensive laboratory testing, and more than 10 years of successful specification.

2. GRADES

2.1 Flooring

Flowchem VE HD (15mm)

Finish :	*highly profiled*
Applied thickness :	*15 mm*
Slip resistance :	*wet or dry*
Max. service temperature :	*see chemical resistance guide*

Flowchem VE HD (10mm)

Finish :	*profiled*
Applied thickness :	*10 mm*
Slip resistance :	*wet or dry*
Max. service temperature :	*see chemical resistance guide*

Flowchem VE HD (5mm)

Finish :	*smooth to profiled*
Applied thickness :	*5 mm*
Slip resistance :	*wet or dry*
Max. service temperature :	*see chemical resistance guide*

Floor grades are supplied as pre-weighed, five component Systems. A horizontal System consists of :

Component A_1:	Flowchem VE Primer
Component A :	Flowchem VE H-Resin
Component B :	Flowchem VE Accelerator
Component C :	Flowchem VE Curing Agent
Component D :	Flowchem VE HD (15, 10 or 5mm) acid washed, dry, selected quartz granulate.

2.2 Vertical / Coving

Flowchem VE V-05

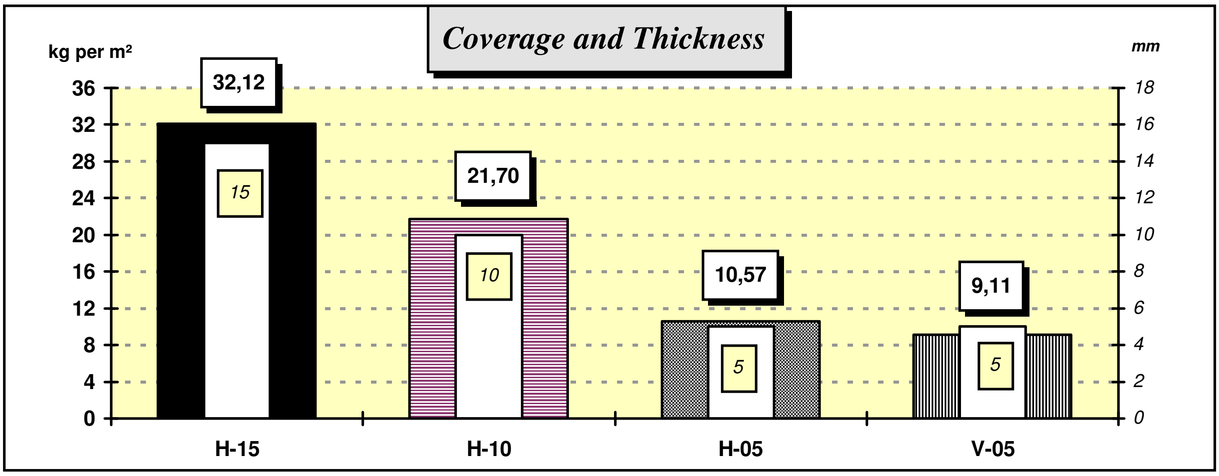
Finish :	*smooth to profiled*
Applied thickness :	*5 mm*
Max. service temperature :	*see chemical resistance guide*

Use only for skirting, coves, plinths, curbs, drain and sump linings and other vertical surfaces. This grade is supplied as a pre-weighed, 5 component System in a similar way to the flooring grades. The vertical System consists of :

Component A_1:	Flowchem VE Primer
Component A :	Flowchem VE V-Resin
Component B :	Flowchem VE Curing Agent
Component D :	Flowchem VE V-05 acid washed, dry, selected quartz-micro bead-mixture.

3. ESTIMATING

Coverage data and rates of laying are based on site experience and must only be used as a guide since details and conditions on each site may have a considerable influence on the estimates.



Graph 1: Coverage versus applied thickness

3.1 Coverage

The graph provides details of coverage related to applied thickness for all flooring and vertical grades. A 5% spillage factor has been included. Very porous or uneven substrates will reduce the coverage.

The following example illustrates the use of the graph in conjunction with the information provided in each section on pack weight.

Example:

Question: *An horizontal area of 200 m²: covered with Flowchem VE HD (15mm)*
+150 m curbs; 25 cm high, 20 cm footings: covered with Flowchem VE-V-05.

Answer: *The graph shows for the Flowchem VE HD (15mm) a coverage rate of 32.12 kg/m². Therefore, 200 m² will require 200 m² x 32.12 kg/m² = 6,424 kg Flowchem VE HD (15mm)*

The curbs have a surface area of (0.25 m + 0.2 m) x 150 m = 67.50 m². The graph indicates for Flowchem VE V-05 a coverage rate of 9.11 kg/m². Therefore, in this example, the 67.50 m² will require 67.50 m² x 8.96 kg/m² = 615 kg Flowchem VE V-05.

3.2 Laying rates

Site conditions influence laying rates. In an 8 hour day, an experienced 5 man team with :
- 1 man mixing
- 1 man labouring
- 3 man trowelling/laying

could be expected to cover, on a prepared substrate (having no problems) :

- Flowchem VE HD (15mm)	± 110 m²
- Flowchem VE HD (10mm)	± 120 m²
- Flowchem VE HD (5mm)	± 130 m²
- Flowchem VE V-05	± 50 m²

* excluding grinding.

4. SITE STORAGE

4.1 General

All of the components that are used to make Flowcrete anti-corrosion applications - and the ancillary products that are used in the surface preparation and laying - must be stored **under cover, raised clear of the floor and in a dry area**. This is especially important for Component D to prevent it from becoming damp or wet and unsuitable for use.

The ideal storage temperature lies in the range between 10 - 20 °C. **Components A_1, A, B and C must not be allowed to freeze or stand in the sun.** Their maximum storage temperatures are:

- Component A_1 and A: 25°C
- Component B and C: 25°C
- Component D: not relevant

Exposure to direct sunlight or other intense heat sources will cause uneven temperature gradients in the stored material; such product must not be used until the temperature has become uniform, otherwise application inconsistencies may arise.

Provided these storage conditions are maintained, the components have a shelf life of:

- Component A_1 and A: 5 months
- Component B and C: 5 months
- Component D: unlimited

Do not exceed the shelf life without reference of the distributor and/or Flowcrete.

4.2 Cold temperatures

When site temperatures are below 4 °C some form of additional heat is recommended. This is particularly important for Flowchem VE Systems in product use and workability (viscosity of the resin).

When heating is required, it is preferable to keep the material in a heated room to ensure even temperatures are realised. If this is not practical some form of portable heating is recommended at the mixing area. On large contracts some form of “tent” will make raising the temperature more efficient. All components should be heated, with care being taken to avoid uneven temperatures.

4.3 Hot temperatures

When temperatures during application are expected to be above 30 °C some form of air conditioned storage is recommended. Keeping the materials at 20 - 25 °C will reduce the possibilities of flash setting and other defects.

Coverage against direct sun heat in the application area is also necessary to reduce flash setting and other defects.

4.4 Safety notes

It is extremely important to keep Component B (accelerator) and Component C (curing agent) always separated during storage and application. If these components would mix themselves in their pure form, through leakage or other, a danger for explosion is imminent.

5. ABOUT CONCRETE... (✓)

5.1 What every floor designer should know

During the design stage of most buildings, little if any attention is given to floors on grade. Owners and their architects and engineers are concerned primarily with space utilisation, functioning utilities, energy conservation, adequate clearances and aesthetics. The quality of concrete floors on grade is usually taken for granted. As a result the owner often ends up with a floor that is inferior to the one he expected.

5.2 Understanding the behaviour of concrete floors

What makes concrete floors curl, crack, settle unevenly, dust, erode or scale?
A basic understanding of concrete as a material can help avoid the causes of undesirable floor performance.

5.2.1 Water-cement ratio

Concrete is made of two major components, cement paste and aggregate; the properties of hardened concrete depend on the quality of the cement paste. Cement paste is a mixture of Portland cement and water. The quality of cement paste varies with the ratio of water to cement. The more water per kg of cement , the weaker the hardened concrete will be. Weak concrete is more permeable and erodes more easily than strong concrete. Unfortunately the water-cement ratio is difficult to control directly, so indirect methods such as concrete slump tests are used as indicators of water content.

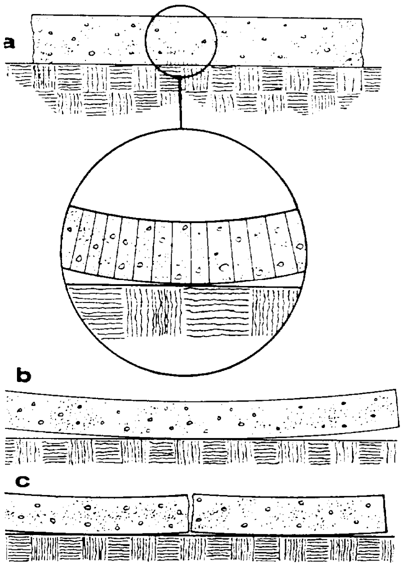
5.2.2 Bleeding

A characteristic of fresh concrete that can also affect the performance of floors is bleeding. A certain amount of time must elapse before the cement and water combine chemically to develop hardened concrete. During this period, the aggregate particles and cement grains are partly suspended in water. Because cement and aggregate are heavier than the water they displace, they tend to sink or settle. As the solid particles move downward, the displaced water moves upward and appears at the surface. This process is referred to as bleeding and the water that appears at the surface is called bleed water. Is the process of bleeding good or bad? If the bleed water leaves the concrete - by evaporation or by some physical or mechanical means - the total amount of water in the concrete is reduced, resulting in a lower water-cement ratio and thereby improving the quality of concrete. However, if bleed water does not leave the surface, an increase in the water-cement ratio will result near the concrete surface. Thus the weakest, most permeable, and least wear-resistant concrete will be the top surface where the best concrete is needed. Therefore, to be a positive factor in the hardened concrete, bleed water must leave the concrete surface.

5.2.3 Shrinkage

Another characteristic of concrete that plays an important role in the design and performance of concrete floors is shrinkage. Concrete shrinks as this free water evaporates. Concrete that dries until it is in equilibrium with air, having a relative humidity of 50 percent, will shrink about 0,5 mm per meter (0.05 percent). Actually the amount of shrinkage depends on many factors, but 0,5 mm per meter is a representative number for an average concrete. The most important factor affecting shrinkage is the total amount of water in the mix. The more water in the mix, the greater the shrinkage. Therefore, to minimize shrinkage, the total amount of water in the mix must be reduced.

5.2.4 Curling of slabs



Slabs on grade do not shrink uniformly from top to bottom. The top dries out more rapidly than the bottom and tends to shrink more, and thus every vertical segment of slab becomes slightly wedge-shaped (see Fig. 1).

This phenomenon is often called curling. Curling induces tensile stresses in the top part of the slab and if these stresses exceed the tensile strength of the concrete, cracks will appear.

Fig 1. After curing, a concrete slab on grade begins to dry from the top: **(a)** each vertical segment tends to narrow at the top and become wedge-shaped; **(b)** then the slab tends to curl ; **(c)** when curling stresses exceed the concrete tensile strength, the slab cracks

5.2.5 Curing

The process of keeping concrete from drying while it is hardening and gaining strength is called curing. If concrete is permitted to dry before most of the cement has combined chemically with water (before cement has hydrated), the concrete begins to shrink sooner than if the drying has been prevented until most of the cement has hydrated.
To minimize shrinkage and cracking, two most important precautions should be taken:

- Minimize the total water content of the mix. Note that the words “minimize shrinkage” are used; even well cured low-slump concrete will shrink, so it is advisable to plan to accommodate shrinkage.
- Prevent evaporation of the free water in the mix until most of the cement has hydrated. Concrete should always be cured as long it is practical but never less than 3 days at normal temperatures (approximately 70° F = 21° C).

5.3 Minimising problems with floors on grade

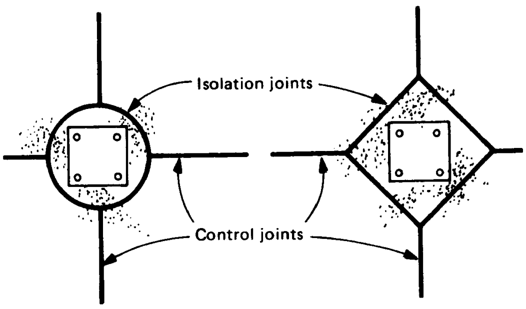
The functions of a floor are to provide a smooth, easily cleaned and maintained wearing surface and to transmit the loads to the soil beneath the floor.
The following elements determine proper floor performance:

5.3.1 Subbase

Floors on grade are considered to be unreinforced for structural purposes, even though they may contain reinforcing mats or welded wire fabric (mesh). The floor should be supported uniformly by the soil beneath it ; that is, there must be no hard spots or soft spots. Floor slabs should not be expected to bridge over soft spots or across loose backfill over underground pipes.
A granular subbase about 4 inches (100 mm) thick is suggested where a uniform subgrade cannot otherwise be achieved economically.

5.3.2 Isolation joints

Even with uniformly compacted soil beneath a concrete floor slab, floor settlement is likely to differ from that of the abutting wall and column foundations. To accommodate such differential settlement, it is necessary to isolate the floor slab from the walls and columns.
Joints between a floor slab and walls or columns are often referred to as expansion joints, but in reality they are isolation joints. (Expansion of floor slabs is generally less than the initial shrinkage, so it is seldom necessary to provide for expansion).



Isolation joints should be located between slabs on grade and walls, and around columns or other parts of a structure that have separate foundations. Isolation joints around columns should be circular or diamond shaped so that the corners meet the control joints. Otherwise cracks will emanate from the corners.

Fig 2. Isolation joints around columns should be circular or diamond shaped and thick enough to permit differential movement.

5.3.3 Control Joints

To accommodate concrete shrinkage, control joints should be provided. Control joints can be sealed and maintained more easily than random cracks.
There are rules of thumb for estimating joint spacings. For example, the spacing should be equal to 24 to 36 times the thickness in millimetres, the multiplier depends on the amount of water in the concrete.
For high-slump concrete with maximum aggregate size less than 20 mm, a multiplier of 24 is recommended.
For low-slump concrete with larger aggregates, a multiplier of 36 might be used.
Control joints should be preplanned so that the panels are nearly square; control joints should be located at all re-entrant corners.

Control joints can be formed by :

- Saw cutting the hardened concrete (see Figure 3 a)
- Using tongue-and-groove forms (see Figure 3 b)
- Inserting plastic or hardboard strips into the concrete before finishing
- Placing smooth dowel bars (coated to prevent bond) across a joint plane (see Figure 4)

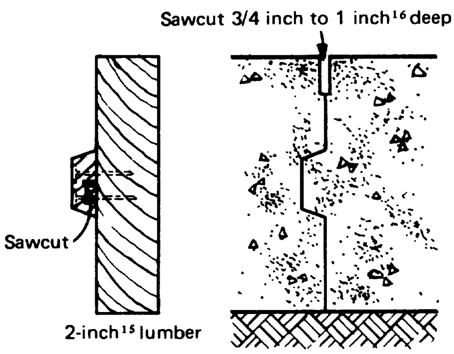


Fig. 3 a Saw cutting the hardened concrete

¾ inch to 1 inch deep = 20 to 25 millimetres
2-inch lumber = 50 millimetres

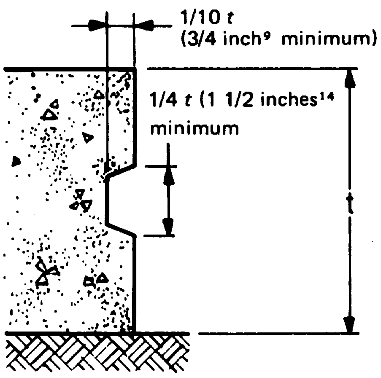


Fig. 3 b This tongue-and-groove joint is formed by wood bulkheads. For slabs 5 to 8 inches (125 to 200mm) thick, bevelled 1- by 2 inch (25 by 50mm) strips can be used to form key. Sawcut permits key to swell slightly without cracking concrete.

t = slab thickness
¾ inch = 20 millimetres
1 ½ inch = 38 millimetres

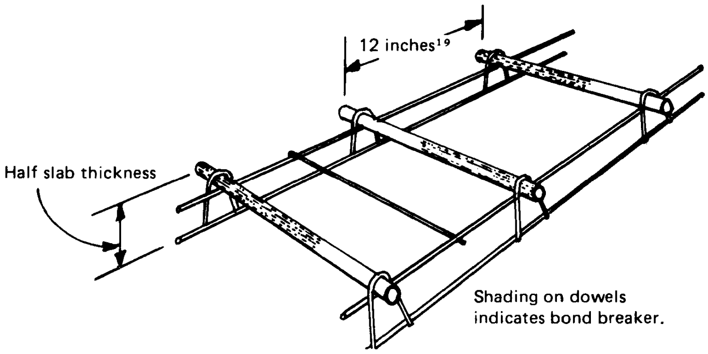


Fig. 4 Control joint is located over midpoints of dowels in this dowel bar assembly that rests on subbase. Dowels must be parallel to one another, and their diameters are typically about 1/8 slab thickness.
Approximately 60 percent of the length of each bar is coated with a bond breaker.

12 inches = 300 millimetres

It is important that control joints permit some horizontal movement between adjacent panels, but no differential vertical movement should occur. For sawed joints, the dept of the saw cut should be 1/5 to 1/4 the slab thickness. Loads are transferred across the joint by interlocking irregular surfaces caused by the crack beneath the saw cut. The action is called aggregate interlock. Shallower cuts may not weaken the slab sufficiently to cause the crack to occur at the joint. Deeper cuts may result in insufficient aggregate interlock between adjacent panels to transfer loads without differential vertical movements. Similar depths (1/5 to 1/4 the slab thickness) of plastic or hardboard strips are recommended.

5.3.4 Slab thickness

A floor slab must be thick enough to transmit loads to the soil without cracking. The required slab thickness can be determined from published charts that relate loading condition (wheel loads, point loads, or uniformly distributed loads, with or without aisleways), concrete quality, subsoil quality and slab thickness. The normal thickness of industrial or commercial floors on ground is commonly between 5 and 9 inches (125 and 225 mm).

5.3.5 Surface finish

The wearing surface of a commercial or industrial floor should be hard, smooth and impermeable. Hardness of the surface is obtained by steel trowelling, even if it is done with help of trowelling machines. With a low water-cement ratio and proper finishing (including trowelling), such a surface can be achieved.

5.3.6 Surface tolerances

No floor is perfectly flat; there are always some deviations. Many specifications for floors call for a surface tolerance of not more than 1/8 inch as measured below a 10-foot (3 mm below a 3 meter) straightedge. Few floors meet such a stringent tolerance, although most floors do function well with respect to flatness. To prevent misunderstandings at the time of final inspection, it is recommended that a preconstruction meeting be held to review the critical tolerances and the basis for acceptance or rejection.

5.3.7 Durability

Some floors must withstand repeated freeze-thaw cycles, particularly when they come in contact with de-ice salts. Such floors should be made with air-entrained concrete with an air content of about 5 percent.

It has been said that:
" good concrete is made from cement, aggregate and water ;
poor concrete is made from exactly the same materials ! "

(✔) Extracted from Concrete Construction magazine,
The Aberdeen Group, 426 S. Westgate, Addison, IL 60101

6. PREPARATION OF SUBSTRATES

6.1 Substrates

6.1.1 Suitable

The following substrates are known to be suitable for receiving Flowcrete anti-corrosion Systems subject to correct preparation procedures :

- Concrete
- Polymer-modified sand/cement screeds
- Granolithic concrete
- Cementitious terrazzo surfacing
- Previously laid Flowcrete Systems.

6.1.2 Suitable for Flowchem VE Metal Coatings

For the following substrates, which are not suitable for Flowcrete anti-corrosion Systems, a special series of Flowchem VE Metal Coatings are developed:

- Carbon steel
- Stainless steel
- for other ferro and non-ferro metals, please contact distributor and/or Flowcrete.

6.1.3 Unsuitable

Known to be unsuitable are:

- Reinforced sand/cement screeds
- Asphalt/bitumen
- Smooth or non-porous bricks, tiles
- Magnetised
- Wood (except exterior grade plywood)
- Aerated concrete blocks

6.2 Design and preparation of concrete substrates

6.2.1 Floor base/slab

In general, concrete bases and screed should be constructed in accordance with **BS8204 : Part 1 : 1987 : Code of practice for concrete bases and screeds to receive in-situ flooring**, and established engineering practices including provisions for movement joints and membranes, where necessary.

6.2.2 Expansion joints (see Figures 1 and 2)

All expansion and crack propagation joints formed in the floor base **must** be carried through the Flowcrete System and it is advisable, when forming expansion joints around columns and equipment set in the floor, to include radial corners to avoid stress-creating angles. A minimum 5 cm radius is advised.

Experience has shown that it is normally advantageous to form expansion joints in the base floor around areas, which may be subjected to thermal or vibration movement in service.

Typical situations include:

- Boundaries between different floors or flooring materials
- Load supporting columns set in the floor
- Vessel sealing rings
- Areas around ovens, freezers and other process equipment

6.2.3 Damp proof membranes

A damp proof membrane is essential where rising moisture may cause the concrete to remain damp for prolonged periods and adversely affect the bond to the Flowcrete Corrosion Protection System.

Flowcrete Corrosion Protection Systems, although effectively impermeable to liquids, must not be used as a substitute for a membrane or vapour barrier.

Where a damp-proof membrane is used, it must be incorporated within the base concrete and not laid directly beneath the Flowcrete Corrosion Protection System.

6.2.4 Screeds

Topping screeds for concrete are often used as substrates for Flowcrete Corrosion Protection Systems, where additional falls etc. are required. These can be of two types:

a. Fine concrete
b. Polymer modified sand/cement

It is recommended that screeds in areas subjected to hot water spillage should contain a fine aggregate.

6.2.5 Preparation/General requirements

Floor bases and screeds, which are to receive a Flowcrete Corrosion Protection System, should be of sufficient strength.
They should show a minimum compression strength of 25 N/mm² and an adhesion strength of 2.5 MPa.

Waterproofing additives should not be included in screeds unless their compatibility with Flowcrete Corrosion Protection Systems has been checked.

Any laitance present on the concrete surface must be removed by mechanical methods (see below) before a Flowcrete Corrosion Protection System is applied, otherwise delamination will occur. For this reason, it is recommended that a wooden float is used to finish a new screed as steel trowels invariably produce excessive laitance. Existing screeds may be contaminated with mould-release oils, chemical spillage or previously applied coatings. Contaminated concrete must be removed before the application of an Flowcrete Corrosion Protection System if a good bond is to be obtained.

Preferred methods of removing contamination are:
- Blastrac or similar equipment
- Air-impact hammer (scrabbler) provided that the sub-floor is not damaged
- Concrete surface planer
- Grit blasting
- Wire-brush scarifier
- Surface grinder
- Drum sander
- Ultra-high pressure water blasting
- Flame spalling may be satisfactory in some situations

Acid etching is not reliable **and is not recommended.**

After treatment, all dust and loose particles should be removed from the whole surface including grooves and cracks. Vacuum cleaning is the most effective method.

6.2.6 Moisture

Standing water must be removed completely by using an industrial vacuum cleaner followed by drying with a hot-air blower, infrared heater or flame gun.

The concrete/screed must not be damp. A reading of 10 or less on a “Protimeter” Surveymaster is required. In case of damp surface a special primer must used (please contact Flowcrete Corrosion Protection representative).

The substrate temperature should be at least 3°C above dew point during application.

6.2.7 Holes/Cracks

Any holes or cracks greater than about 25 mm deep should be filled in with concrete or Flowcrete Corrosion Protection System. Smaller irregularities will be filled or sealed during the application of the Flowcrete Corrosion Protection System.

6.2.8 Tolerances

Flowcrete Corrosion Protection Systems, in general, should not be relied upon to improve the tolerances of flatness levels in the substrate. The substrate should be applied to the appropriate tolerances prior to the application of the Flowcrete Corrosion Protection System.

6.2.9 Falls

These should be formed in the concrete/screed in accordance with good building practice or, in the case of polymer-modified screeds, to the manufacturer's instructions with special attention being paid to minimum thickness.

When there are severe limitations on time, Flowcrete Corrosion Protection Systems themselves may be used to form falls or fill in deep holes.

6.2.10 Coves

These should be formed in fine concrete to the same standard as the screeds.

6.2.11 Areas around ovens

Areas subject to high temperatures and thermal cycling need special attention. You should first consult the *Flowchem VE Systems Chemical Corrosion Resistance Guide* to see what the max. temperature can be. If not the oven area should be isolated from the surrounding floor by an expansion joint. In good practice it is advisable to lay clay tiles in this oven area with a heat shield immediately under the ovens.

6.2.12 Cold rooms

The areas within a cold room should be isolated from the surrounding floor by an expansion joint. Within a cold room the Concrete Society recommends that bays have an aspect ratio as close to one as possible. The bay joints must be carried through the Flowcrete System. In cases where the concrete floor is not laid onto the insulation layer additional movement joints may be necessary.

6.2.13 Edge details

Wherever a free edge of the Flowcrete Corrosion Protection Systems will occur, for example, around the perimeter, along channels or expansion joints, at doorways and around machinery plinths and columns, extra anchorage must be provided to help distribute mechanical and thermal stresses arising from shrinkage and temperature changes.

6.2.14 Other substrates

Where appropriate, the foregoing recommendations for concrete substrates also apply to other suitable substrate materials.

An additional special point is:

- **Previously laid Flowcrete Systems** - the substrate must be sound and the previously laid System well bonded to it and free from chemical attack or contamination. The surface should be roughened with a drum sander or scarifier and all dust removed. New Flowcrete Corrosion Protection System can then be laid in the normal way.

6.3 Planning and laying

It is necessary to plan and mark out bay lines noting the following:

- Day joints and sometimes, other bay lines, will show in the finished area. Wherever possible, these should be positioned so that they will be hidden by plant to be installed on the floor. The position of bay lines should be agreed with the client before commencing the application of the Flowcrete Corrosion Protection System.
- Bay widths should not exceed 5 m otherwise excessive trowelling becomes almost inevitable resulting in an inferior surface appearance.
- Bay lengths are determined by the area to be applied between breaks. This depends on the grade, the size of the laying team, mixing equipment and the temperatures of the atmosphere and the substrate.
- To ensure a neat appearance, bay lines should be straight and formed with polyethylene-film-coated timber strips slightly thicker than the required thickness of the Flowcrete Corrosion Protection System.
- As a visual aid to achieve the correct thickness and a level surface, the area to be covered by individual mixes is marked by chalk lines on the substrate.

6.4 Detailed illustrations

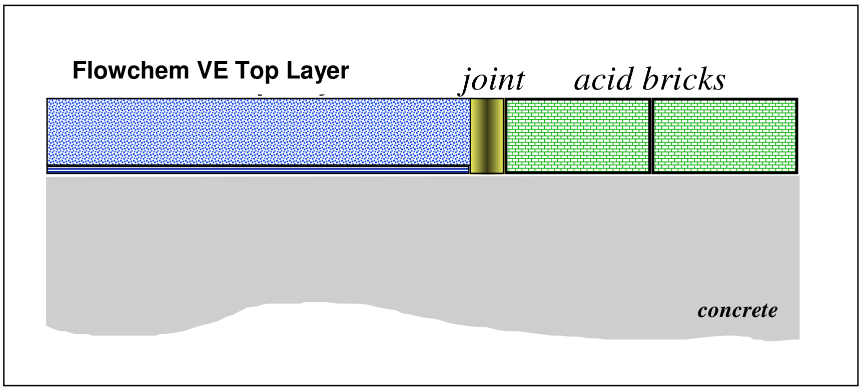


Figure 1 : Bridge between Flowchem VE System and acid bricks

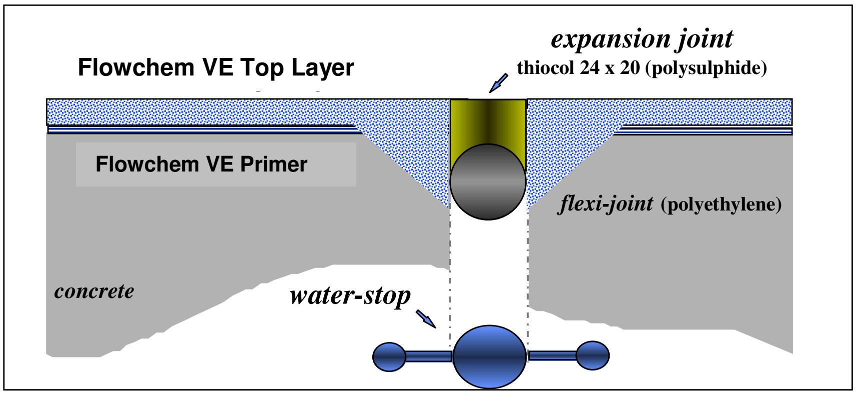


Figure 2: Induced expansion joint.

6.4 Detailed illustrations (continued)

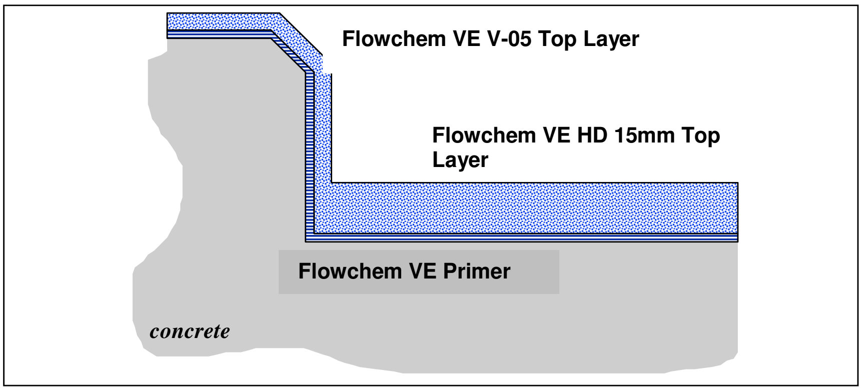


Figure 3: Protection and integration of curbs and comparable concrete structures.

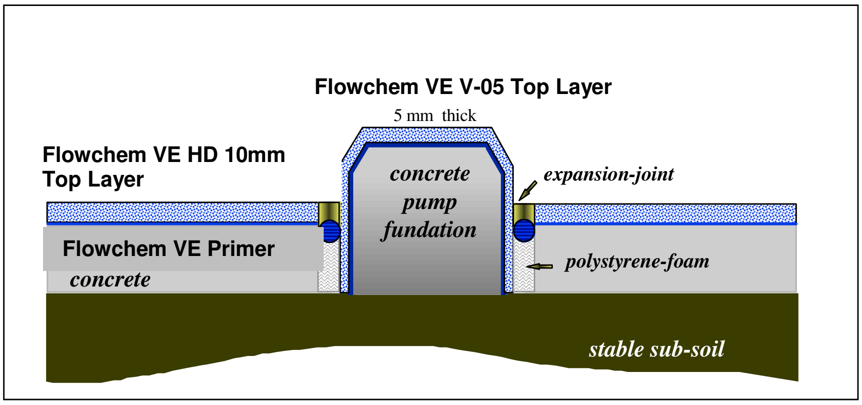


Figure 4: Protection and integration of pump foundations.

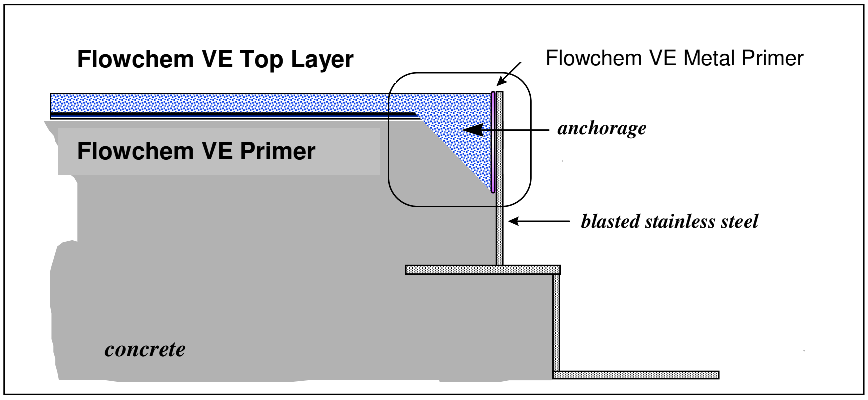


Figure 5 : Bridge between Flowchem VE System and stainless steel structures.

7. PRIMING

Prepared concrete substrates are to varying degrees porous. If Flowcrete Corrosion Protection Systems are applied directly to prepared concrete, the porosity of the concrete should be checked. If the primer is absorbed completely by the concrete substrate, a second primer layer should be applied.

Note: A poor quality or contaminated substrate cannot be made satisfactory by priming.

7.1 Primer

The primer is based upon a 3 component system, being:

1. Component A_1: Flowchem Primer
2. Component B: Flowchem VE -Accelerator
3. Component C: flowchem VE -Curing Agent.

7.1.1 Limitations

The primer should not be applied onto :

- **Damp substrates** - a reading of 10 or less on a "Protimeter" Surveymaster indicates a satisfactory substrate.
- **Weak substrates** - the average pull-off strength shall be minimal 1 N/mm² while no individual readings shall be less than 0.75 N/mm².

7.1.2 Mixing

- **Conditioning of the resin:** Add 0.3 % (weight) of Accelerator (Component B) to an adequate quantity of Primer resin (Component A_1) in a mixing pail. Blend it by using a Helical "Epi" type mixer operated at 1500-2000 rpm for 2 to 3 minutes. Component A_1 + Component B = A_1B-mix.

- **Preparation of the primer:** Add 2 % (weight) of Curing Agent (Component C) to an adequate quantity of A_1B-mix in a mixing pail. Blend it by using a Helical "Epi" type hand mixer operated at 1500-2000 rpm for 2 to 3 minutes. A_1B-mix + Component C = A_1BC-mix.

The primer is now ready for use and for application on your prepared, dry and clean substrate.

7.1.3 Application

Pour the mixed material into an industrial paint tray and apply by roller taking care to avoid ponding. Apply the material around the edges of areas and into the grooves (chases) by brush to ensure even spreading and no ponding.

The primer should be allowed to cure until polymerisation. In case of a vertical application with the Flowchem VE V-05 a tacky primer will speed up the application of the top layer. When leaving the primed surface for more than 24 hours, re-priming is advisable to ensure a good bond between the substrate and top layer.

Note: If 1 kg or more mixed material is left in the mixing container for more than the actual gel time, the resin will react strongly giving off considerable heat. This should be avoided but if it does occur the container should be placed outside until reaction is complete.

8. MIXING

8.1 Equipment

The following mixing plant has been found suitable for Flowcrete Corrosion Protection Systems :

8.1.1 Mixers

For small quantities: **Hand mixer** (a.o. Beba) can be used to mix quantities up to 40 kg of material.

For larger quantities: **Action forced pan mixer** (a.o. Creteangle or Zyclos) can be used to mix up to 200 kg of material, depending of the type of pan mixer you are going to use. A pan mixer with a capacity of 100-150 kg (a.o. Creteangle FE or Zyclos 250) can easily supply a team of 8 workers, taking into consideration that 1 worker is full time at the mixing unit and a second supplies the workers on the sight.

Other mixers should be checked for efficiency before use.

8.2 Mixing procedure

8.2.1 Conditioning of the resin

Add 0.3 % (weight) of Accelerator (Component B) to an adequate quantity of Resin (Component A) in a mixing pail. Blend it by using a Helical "Epi" type mixer operated at 1500-2000 rpm for 2 to 3 minutes. Component A + Component B = AB-mix.

8.2.2 Preparation of the resin

Add 2 % (weight) of Curing Agent (Component C) to an adequate quantity of AB-mix in a mixing pail. Blend it by using a Helical "Epi" type hand mixer operated at 1500-2000 rpm for 2 to 3 minutes. AB-mix + Component C = ABC-mix.

8.2.3 Preparation of the mortar

a) Position your mixer as near to the working area as possible.

b) Ensure that the components are at temperature in the range 10-28 °C, preferably 18-22 °C. For lower and higher temperatures, please contact Flowcrete.

c) Pour Quartz-granulate (Component D) into the Action forced pan mixer and switch on for 1 minute.

d) Add the conditioned and prepared ABC-mix.

e) Mix the components well. During mixing the components will get slightly warm. This is advantageous when the components are cold as they will warm during mixing.

f) However, when the stored components are already warm, over-mixing must be avoided as the chemical curing reaction will proceed at too fast a rate leading to decreased working time when trowelling.

g) When finally mixed, immediately discharge the product onto the substrate to be coated.

Notes:

1) *It is important that the Flowcrete Corosion Protection System top layer is placed quickly on the primed substrate and that mixing of the subsequent batch starts straight away. This ensures good uniformity between mixes. To ensure the time between mixes is kept to a minimum the mixer should either :*
   - have two mixing buckets which are rotated.
   or,
   - have the facility to tip the mix contents into a separate container for transportation
2) *to the application area i.e. wheelbarrow.*
3) *Incorrect mixing i.e. too short or too long a mixing time may cause:*
   - *poor aggregate dispersion*
   - *excessive trowel marking*
   - *pimples or blisters in the cured surface*

4) *Spillages of components onto the substrate to be coated must be avoided.*
5) *Scrape out the mixing vessel and paddles between each mix and thoroughly clean them whenever mixing ceases for 10 minutes or longer. Solvents such as styrene, acetone may be used for cleaning. Care must be taken to ensure solvents do not spill into components, mixes or onto the prepared surface or coated surface. Solvents must be used strictly according to the manufacturer's instructions. The use of solvents when applying Flowcrete Corrosion Protection Systems must be minimal, in any case, great care must be exercised.*
6) *You should always close off canisters or drums that are used during the application to avoid, water, dust and other to fall into the resin or side products.*

9. APPLICATION

9.1 General

Flowcrete Corrosion Protection Systems are trowel applied and finished; steel trowels should be used in most operations. The trowel design is not important except in that an operative's specific needs are met.

a) Insure that the primer has been correctly applied and that is has cured. If the substrate is that porous that the primer has been sucked in, it is advisable to apply another primer layer to insure a good bond.

b) Insure that all ingredients are all at the correct temperature and mix them well according to the instructions given. Be careful not to use products who are too old and past their expiration date.

c) Spread the mix as quickly as possible over the area to be laid prior to the trowelling.

d) Trowel out the mix as quickly as possible, pushing the material firmly up to the edge of previously laid Flowcrete System to ensure a good bond.

Note: If 24 hours elapses between adjacent areas, the edge of the previously laid Flowcrete System must be roughened and an anchoring groove cut in the substrate adjacent to the joint.

e) While a wet edge remains, lay the next mix and proceed in a continuous operation to ensure good marriage between each mix and to reduce the tendency for the position of individual mixes to be visually apparent on the cured surface.

f) A little styrene monomer solvent should be used to finish the area and to polish its surface into a closed barrier. The styrene should not be splashed onto the Flowcrete mortar but should be used to wet or dampen the trowel that is used. If too much styrene solvent is used you will create soft spots that will cure either quicker or slower and over-trowelling results in gloss variations and impaired slip resistance.

g) When a bay has been laid, run a knife-edge blade down the edge of the Flowcrete System to effect the removal of the polyethylene film covered wood strips without damaging the Flowcrete Corrosion Protection System.

h) Make sure the Flowcrete Corrosion Protection System has completely cured before handing the area over for the next phase in a construction work.

10. HEALTH AND SAFETY

10.1 Health and safety

Reference is made to the Material Safety Data Sheets:

- Flowchem VE Vinyl Ester Resin
- Flowchem VE Accelerator
- Flowchem VE Curing Agent

The following specific measures must be followed:

10.2 Protective equipment

All personnel handling Flowcrete Corrosion Protection Systems should wear eye protection, protective clothing and gloves. Personnel engaged in grinding, polishing and grouting should observe strict use of proper protective measures.

10.3 Treatment of spillage's

Ensure suitable personal protection during the removal of the spillages.

10.3.1 Component A_1 and A: Flowchem VE Primer and Flowchem VE Resin

Plug the leak. Collect liquid into suitable containers. Dam up the liquid spill. Absorb spillages onto sand, earth or any similar absorbent material. Transfer to a container for disposal. Do not discharge into the sewer. Wash the spillage area clean with water and detergent.

10.3.2 Component B and C: Flowchem VE Accelerator and Flowchem VE Curing Agent

Plug the leak. Collect liquid into suitable containers. Dam up the liquid spill. Start with disposal only in the presence of experts. Absorb spillages onto sand, earth or any similar absorbent material. Take collected spill to manufacturer/competent authority. Wash clothing and equipment after handling.

10.4 Disposal

Disposal should be in accordance with local, state or national legislation. Bury on an authorised landfill site or incinerate under approved controlled conditions, using incinerators suitable for the disposal of chemical waste.

Copyright

Warranty

Whilst all reasonable care is taken in compiling technical data on the company's products, all recommendations or suggestions regarding the use of such products are made without guarantee since the conditions of use are beyond the control of Flowcrete. It is the customer's responsibility to satisfy him that each product is fit for the purpose for which he intends to use it and that the actual conditions of use are suitable.

The warranties for the Flowcrete products are defined in the documents:

- "Flowcrete Warranty Statement"
- "Flowcrete Warranty Request"
- "Flowcrete Limited Warranty".