FormulaForte

Patent-protected system of chemical curing[2] and aesthetical improvement of concrete surfaces.

1605, 1610, 1620, 1630

System characteristics

FormulaForte system is the world's unique combination of preparations applied on concrete surfaces. These preparations penetrate deeply into concrete and ensure that the floor cures due to the chemical transformation of soft particles to highly resistant compounds; in addition, they ensure the long-term and permanent enhancement of the compactness and hydrophobicity of the surface by filling open pores with C-H-S gel. And finally, they provide for improved aesthetical properties due to increased floor surface gloss. Surfaces with integrated polymer silicates in phase of smoothing inhibit defects formed due to spraying the surface with water and increase the physico-mechanical parameters of the upper layers of the floor.

The treated surfaces resist surface abrasion have reduced dust and absorption capacity, and are easier to clean. ***FormulaForte*** system can be used with or without mechanical surface treatments such as grinding, shot blasting, etc. Due to repeated maintenance using cleaning machines, a smooth, reinforcing film is created on the substrate surface, which increases the aesthetical value of the floor. The preparation can be applied to stabilize impaired concrete surfaces.

Function and system advantages:

- Curing and enhancing the abrasion resistance.
- Considerable reduction of dustiness.
- Long-term crystallization.
- Deep penetration.
- Minimized down times.
- Durability.
- Chemical curing[2].
- Technology of pure silicates.
- Enhanced resistance to stains.
- Reduced tire marks.

Chemical curing[2]

The process of chemical curing **includes two** concurrent **processes, i.e.** –

1) **transformation** of the liquid phase of the active component to **rigid silicate C-S-H** gel in the pores of the treated material accelerated by an organometallic catalyst.
2) **transformation** of particles with a low hardness to **particles with a considerably higher hardness**.

To 1) The process of sealing the surface with C-H-S gel is based on the chemical reaction of compounds originating from hydrated concrete and a unique combination of pure silicates accelerated by a system of organometallic catalyst. During the reaction the pore structures of the concrete are "sealed" with C-H-S siliceous gel. The chemical reaction is supported by water ingress, so each washing or spraying with water is followed by another dissolving of active components in the already loaded floor. The chemical reaction can thus take place in considerable depths and be started repeatedly. This reaction is controlled and accelerated by means of a catalytic system of the latest generation which, when compared to non-catalyzed systems, provides for a considerably higher transformation of liquid silicate to an amorphous gel structure, filling both micro- and macropores of the cement composite. Since the catalytic system is activated by moisture, all further wetting of the cement product, e.g., by washing, drenching with rain, etc. will cause repeated activation of the catalytic system. Thus, another penetration into the depth will follow and the surface layers will continually receive more and more resistant treatment.

To 2) The process of particle transformation and curing is ensured by the active chemical components which are involved in the reaction, primarily with the low resistant particles from the surface of the cement product. The given reaction results in the transformation of low hardness particles to granite particles featuring a considerably higher hardness than the original ones. This selective chemical reaction takes place not only on the surface of the micro/macroparticles but is apparent at the very molecular level. It results in observable surface hardening, non-dusting surface layers of the product and considerably higher hardness and resistance of the surface to wear due to abrasion, impact loads, etc. In addition, untreated micro and macro particles mostly feature an easy solubility that can be described as washing the particles out of the surface or releasing dust. With the ***FormulaForte*** product applied, most particles not resistant to water are transformed to water resistant ones. The resulting surface is much less absorptive, the particles are not washed out, and this fact influences the construction durability not only in interiors but particularly during exposure on exteriors where the surface is attacked by chemical and defrosting substances.

Long-term crystallization

Moisture due to repeated washing of the surface initiates another starts of the chemical reaction, penetration of the crystals to the depth, and thus increases the effectiveness. A higher surface gloss can be achieved by repeated surface cleaning during the operation. Usual time to achieve such effect will take 45-60 days.

Technology of pure silicates

Most competitive products use standard silicates containing sodium, potassium or lithium atoms for the production. The curing of such materials induces concurrent chemical reactions accompanied by the formation of undesirable salts with the above-mentioned atoms. It results in lower treatment efficiency, defective structure, as well as in aesthetical problems such as blooms and surface bleaching which takes place until the salts are washed out of the building construction. But pure silicates do not form such salts, thereby considerably enhancing the surface treatment and eliminating risk of defects and surface bleaching.

Scientifically confirmed effects

The leading laboratories have confirmed the effects of ***FormulaForte*** preparations in terms of enhanced resistance of the concrete to abrasion, reduced absorption capacity and increased compression strength.

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System advantages

Deep penetration

The unique formulation based on the technology of pure silicates comprising a highly reactive catalytic system allows for a far deeper and faster penetration than other similar systems.

Durability

The system is based on basic inorganic substances and reacts to the concrete layer. Thanks to this property, it does not peel or scratch, is UV stable, tolerant to moisture, does not yellow or otherwise change its colour.

Curing and enhancing the abrasion resistance

When compared to other poured potassium and sodium-based systems, the Chemical Curing System^2 ensures a considerably higher level of effective and perceptible curing, and thus the associated enhancement of abrasion resistance of the floor.

Considerable reduction of dustiness

In standard concrete, the microparticles separate from the basic concrete matrix. These particles are subsequently carried up to the surface where they cause that the floor to become dusty. ***FormulaForte*** System seals the surface structure and concrete micropores, thereby primarily preventing the release of such microparticles. In addition, the Chemical Curing System allows for a chemical transformation of these microparticles to granite particles with a higher hardness.

Enhanced resistance to stains

The deep penetration and reduced absorption capacity (hydrophobization) of the surface are accompanied by an enhanced resistance to stains because the penetration of oil and other contaminants into the surface is limited.

Simple and fast application

The system will reduce the application time and costs when compared to concrete grinding and polishing. When compared to other impregnation preparations, its application is safer and easier, because it eliminates the need to clean the salts/blooms after the application. Most floors can be used immediately after drying.

Reduced tire marks

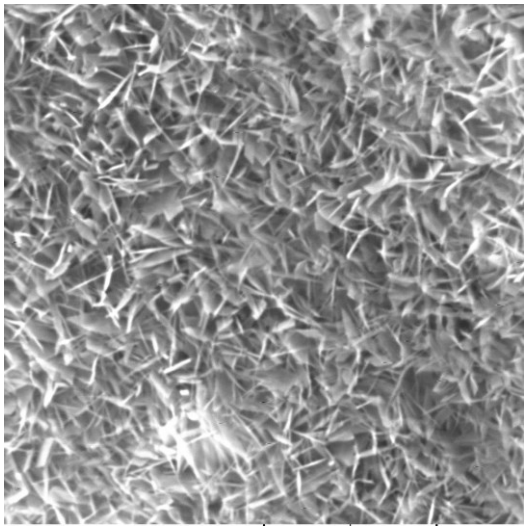
Tire marks on the concrete result primarily from an impaired and rough concrete surface that subsequently abrades the tires, and the rubber remains attached to the concrete surface. Surfaces treated with ***FormulaForte*** have a smooth surface and the formation of marks is minimized.

Minimized down times

The minimum need of preparatory work and fast penetration and drying will ensure that the floor can be loaded soon after the application. Thanks to the clean application, compliance with hygienic criteria and absence of harmful chemical substances in the product, it is also possible to treat the floors during the operation.

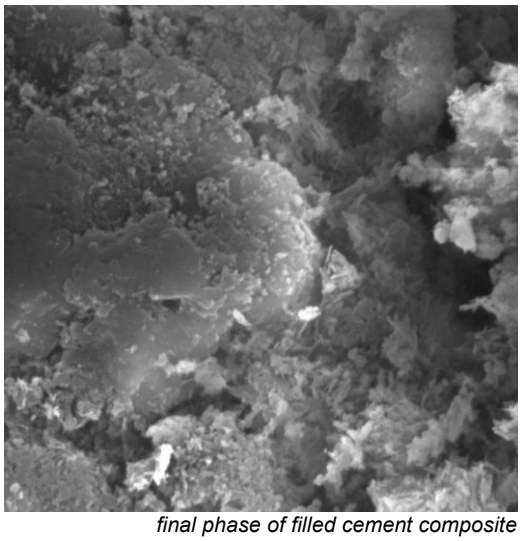
Extremely favourable price-to-performance ratio

When compared to other floor repair systems (screeding, coatings), the ***FormulaForte*** system is much less expensive and also requires less time to prepare and apply. In addition, it considerably reduces maintenance and cleaning costs.



first phase of creation of silica system

phase of filling up of porous structure



final phase of filled cement composite

System products

FormulaForte 1605 Integral

- ✓ **silicate polymers** uniquely **integrate pure silicates** sized nanoparticles **into the polymer liquid** with minimized surface tension for increasing penetration into the capillary structure.
- ✓ **lubricates** the surface for easier and more efficient smoothing **without necessity of water spray.**
- ✓ r**educes the occurrence of capillary cracks** due to chemical reaction with the **additive ASA** contained in Fortedur.
- ✓ **accelerates** the total smoothing time.
- ✓ **simplifies** smoothing and improves the quality of the resulting surface due to extended workability (from 15 to 30 min).
- ✓ reduces the evaporation rate, and thus helps in smoothing for outdoor spaces (when there is a drought, sunny or windy weather).
- ✓ **reduces the consumption** of devices and the effort while smoothing.
- ✓ **increases abrasion resistance** floor due to the synergistic interaction with amorphous silica used in additive **Silica Effect** contained in the *Fortedur.*

- ✓ due to pure silicates creates tougher, **less absorbing surfaces more resistant to stains** increases impact resistance and surface hardness.

FormulaForte 1610 Hard

- ✓ provides curing, hydrophobization and aesthetical improvement of the surface.
- ✓ can be used separately or combined with ***FormulaForte 1630 Shine*** to achieve a maximum gloss.
- ✓ *includes* ***the technology of pure silicates and long-term crystallization.***

FormulaForte 1620 SuperHard

- ✓ provides maximum curing, consolidation and hydrophobization of the surface.
- ✓ in order to achieve the aesthetical effect and desirable gloss, it shall be used in combination with ***FormulaForte 1630 Shine.***
- ✓ *includes* ***the technology of pure silicates and long-term crystallization.***
  includes the technology of ***Chemical Curing***[2]

FormulaForte 1630 Shine

- ✓ provides achieving the maximum gloss, hydrophobization and final sealing of the surface.

System compositions

Surface usage

- High curing
  - 1-2 coats of ***FormulaForte 1610 Hard***
- High curing + maximum gloss
  - 1-2 coats of ***FormulaForte 1610 Hard***
  - 1 coat of ***FormulaForte 1630 Shine***
- *Chemical curing*[2] + maximum gloss
  - 1-2 coats of ***FormulaForte 1620 SuperHard***
  - 1 coat of ***FormulaForte 1630 Shine***

New surfaces

- High curing
  - **Application *FormulaForte 1605 Integral* while smoothing the surface.**
  - 1 coat of cover coating (curing), e.g., ***Fortecoat*** *1425*

Substrate preparation

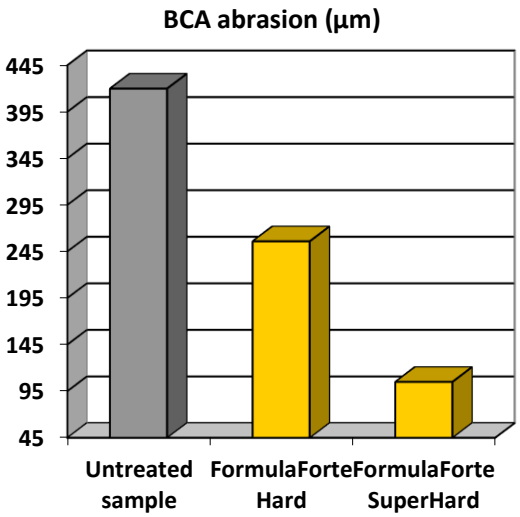
The substrate shall be dry, stabilized, and free of loose particles, paints and grease (e.g., grinding followed by dust removal). Successful application is conditioned by the mechanical and chemical cleaning of the substrate. The product can be applied on smoothened concrete, cement shakes, polymer-cement screeding, ground and driven concretes. When the surface has been treated with a cover coating (curing), the application shall not be done before six months have expired, or the coating shall be removed. When the surface has been contaminated with an acid, it shall be neutralized and rinsed.
Test the substrate absorption capacity using water spray. All surface areas should feature the same absorption capacity. Otherwise, the floor shall be cleaned, and the surface contamination shall be removed. Persons, vehicles, property, equipment, and adjacent surfaces shall be protected against contact with the preparations. Polyethylene or other suitable protective materials shall be used.

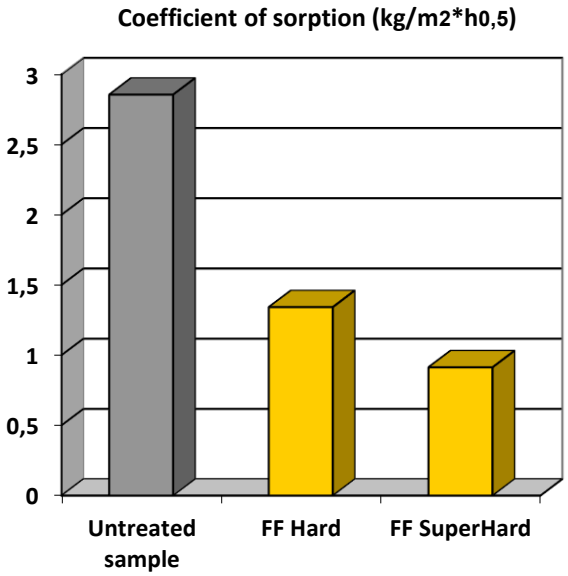
Equipment

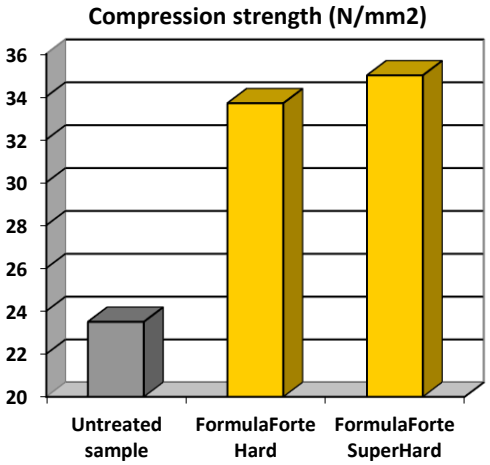
Low-pressure sprayer (non-atomizing), wide brush, low-hair microfiber mop, rubber squeegee.

Application temperature

Both air and substrate temperatures should be between 4 °C and 38 °C.







Testing area

With respect to the variety of possible infill concretes, the reaction of ***FormulaForte*** on the substrate shall always be tested on an area of 1 sq. m for a period of 24 hours. The testing area shall not show any signs of blooms or other undesirable anomalies and should be accessible for the whole time of the project.

Application of *FormulaForte Hard, Shine* on old substrates

1. Remove any dirt, dust, paints, cover coatings. Allow the clean surface to dry.
2. For resistant stains, the surface may be lightly ground, e.g. with a diamond containing pad.
3. Next apply a coat of ***FormulaForte Hard*** using a low-pressure spray gun or by pouring and spreading with a wide brush so that no pools are created, and the preparation simultaneously forms **a compact wet layer** on the surface.
4. If some areas start drying out, apply an additional quantity of the preparation, or move the material from an area containing a greater amount of the preparation using the brush. The properly treated substrate is distinguished by **no pools or areas with untreated surface**.
5. **Once the product starts to become gelatinized/stuck** (after 15-90 minutes depending on the temperature), level the preparation using a microfiber mop.
6. For surfaces with a higher absorption capacity, it is ideal to apply the preparation in two coats; to ensure that the first coat has dried, an interval shall be required prior to the second one being applied.
7. **For lower temperatures,** longer intervals between the applications of individual coats shall be required. But for higher temperatures, the intervals shall be shorter. Attention: **In case of high temperatures,** the coat might dry very quickly. To ensure a successful application, the application procedures shall be done quickly.
8. Once the floor dries (2-6 hours), the ***FormulaForte Shine*** preparation can be applied by repeating steps 3-5. Based on the sufficient application of the ***FormulaForte Hard*** preparation, the consumption of ***FormulaForte Shine*** will be minimized.
9. Until the floor is dry, it shall be protected against damage.

Application of *FormulaForte SuperHard, Shine* on old substrates

1. Remove any dirt, dust, paints, cover coatings. Allow the clean surface to dry.
2. For resistant stains, the surface may be lightly ground, e.g., with a diamond containing pad.
3. Next apply one coat of ***FormulaForte SuperHard*** using a low-pressure spray gun or by pouring and spreading with a wide brush so that no pools are created and the preparation simultaneously forms **a compact wet layer** on the surface.
4. If some areas start drying out, apply an additional quantity of the preparation, or move the material from an area containing more preparation using a brush. The properly treated substrate is distinguished by **no pools or areas with untreated surface.**
5. Allow 1.5 hour for absorption of the preparation, and while still wet, **wash it thoroughly with clean water**, preferably by means of automatic washing equipment. All excess solution and water shall be removed according to the applicable disposal instructions. **Failure to follow this procedure shall result in the formation of a white powder coating on the surface.**
6. To ensure maximum preparation curing, it is ideal to apply the preparation in two coats; to ensure that the first coat has dried, an interval shall be required prior to the second one being applied.
7. **For a high absorption capacity** indicating a potentially troublesome concrete, it is appropriate to apply an intermediate coat of the ***FormulaForte Hard*** preparation to reduce the consumption of ***FormulaForte Shine***.
8. Once the floor dries (1-3 hours), the ***FormulaForte Shine*** preparation can be applied using a low-pressure spray gun or by pouring and spreading with a wide brush so that no pools are created, and the preparation simultaneously forms a compact wet layer on the surface.
9. If some areas start drying out, apply an additional quantity of ***FormulaForte Shine*** or move the material from an area containing more preparation using a brush. The properly treated substrate is distinguished by no pools or areas with untreated surface.
10. Once the preparation starts to become gelatinized /stuck (after 15-90 minutes depending on the temperature), level the ***FormulaForte Shine*** preparation using a microfiber mop.
11. **For lower temperatures,** the application intervals between coats shall be longer. But for higher temperatures, they shall be shorter. Attention: **In case of high temperatures,** the coat might dry very quickly. To ensure a successful application, the application procedures shall be done quickly.
12. Until the floor is dry, it shall be protected against damage.

Application *FormulaForte 1605 Integral* on a new concrete

1. The product is applied before smoothing and additionally at the same time while smoothing ideally in combination with the Fortedur in order to obtain the best possible result.
2. The first application in quantity of 0.05-0.10 l/m^2 is applied before smoothing the surface by trowel machine with a shield. This phase is necessary for the substrate densification.
3. The second and, if necessary, the next applications should be used during the final phase of smoothing by trowel machine with blades to simplify the work. The total amount of the preparation must not exceed 0.4 l/m^2.
4. The product should be applied by low-pressure spray so that no puddles are formed, and concurrently a film of preparation remains.
5. The product must be incorporated into the surface by mechanical smoothing.
6. After fondling the surface (1-2 hours) there should be applied a topcoat – e.g., the *Fortecoat 1425*.

Maintenance

To obtain a sufficient gloss, the floor shall be washed frequently. Use washing agents with neutral or higher pH not containing any sulphates and hydroxides. To recover the gloss, clean the floor using a white pad. Although the preparations enhance the resistance to stains, some concentrated acids may cause stains. If stains remain on the surface, they shall be removed as soon as possible.

Tool cleaning

All applied tools shall be thoroughly rinsed with water.

Packing

FormulaForte 1605 Integral, 1610 Hard, 1620 SuperHard, 1630 Shine are delivered in a 20 l PE canister.

Statement of Properties

The properties of the ***FormulaForte*** product are in accordance with the set of declared properties listed in the declaration of properties number ED 323 according to EN 1504-2 and EN 1504-9. The declaration of properties is in accordance with Regulation (EU) No. 305/2011.

Storage and handling conditions
The preparations shall be stored in original closed packages, in dry and well-ventilated areas, out of direct sunlight, at a temperature between +5 and +25 °C. Prior to the application the content shall be shaken and stirred.

Warranty period
The warranty period shall cover 36 months from the production date when the preparations are stored in a dry cold area. The solution contains water, so during transport and storage it shall not be exposed to frost.

Safety and health protection
FormulaForte Integral, Hard, Shine is a water-based material that is not dangerous in the course of normal application. During work, protective goggles, working clothes and gloves shall always be worn. In case of eye contact, rinse the eyes for at least 15 minutes under running water. In case of skin contact, wash the affected place with water and soap.

Do not use any sprayers that could atomize the preparation and possibly cause aspiration. Avoid any contact with glass or other surface finishes; if contaminated, wash them immediately with water.

FormulaForte SuperHard contains soluble fluorosilicates that shall not be drained into the sewage system or storm sewers.
For their disposal the following instructions shall be followed: After the floor is treated using the ***FormulaForte SuperHard*** solution, all excess solution and water used for washing shall be suctioned off so that no solution traces are left on the surface. For solution storage and preparation, use polyethylene or plastic containers that can be closed with a lid for transport. To neutralize the solution, lime (hydrated lime) shall be added to any residual liquid. The hydrated lime and the solution shall be properly mixed and subsequently left untouched for a period of 24 hours. Then the mixture shall be checked using a litmus paper whether it has been neutralized (pH 7 or higher). To neutralize 10 litres of solution, about 2 kilograms of hydrated lime will be needed. The pH value shall always be checked to find out whether the thorough neutralization has taken place. The reaction with lime will result in the formation of a white precipitate of calcium fluorosilicate that may be placed at a landfill. The remaining liquid may be drained into the sewerage system using ample water. During solution handling and disposal, the applicable health and safety instructions shall be followed. For other information, please refer to the material safety data sheet.

Warning
Before the application, please check our web page www.fortemix.com to be sure that you have the latest technical documentation.

Technical parameters

Product type	**1605 Integral**	**1610 Hard**	**1620 SuperHard**	**1630 Shine**
Delivered state	liquid	liquid	liquid	liquid
Abrasion resistance	enhancement by up 32 %	enhancement by up 39 %	enhancement by up 75 %	-
Compression strength	enhancement by up 21 %	enhancement by up 42 %	enhancement by up 49 %	-
Depth of water ingress	reduction by up to 33 %	reduction by up to 53 %	reduction by up to 68 %	-
Resistance to water and chemical defrosting agents Treated surface (g) Untreated surface (g)	 waste, max. 250 waste, max. 1300			-
Depth of ingress (mm)	Up to 2	Up to 12	Up to 12	1 - 2
Drying time (hrs at 20 °C)	0.2 - 0.5	2 – 6	1 - 3	2 - 4
Density (kg/m^3)	1050	1050	1050	1050
Consumption 1 coat (l/m^2)	0.05 – 0.20	0.05 – 0.25	0.05 – 0.25	0.05 – 0.25

Fortemix company is not liable for damages resulting from failure to comply with instructions and recommendations of manufacturer.