

Exposed aggregate concrete surfaces for decorative applications

Surface finishing techniques and decorative concrete - EUPAVE

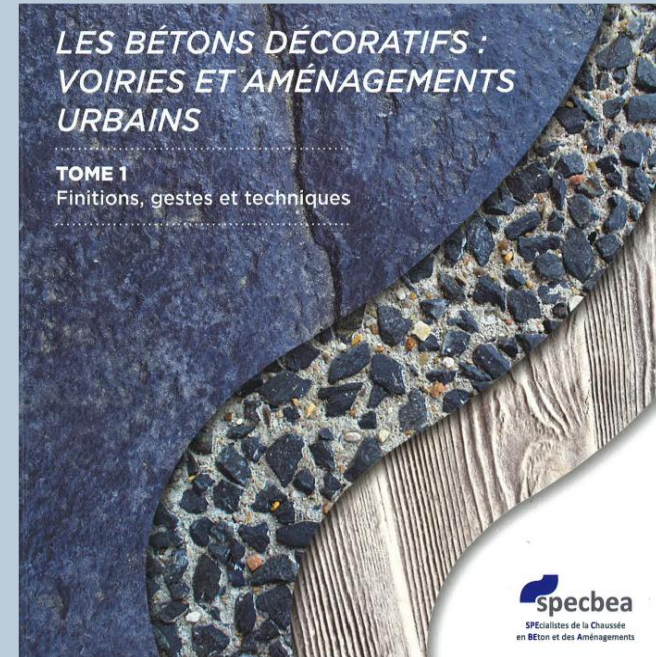
Brussels, 20.05.2026

Ir. Arch. Nathalie Balfroid - Febelcem



Decorative concrete

- Massive applications in France
- Publications
- Rapidly growing market in Belgium



Coloured exposed aggregate concrete (EAC)

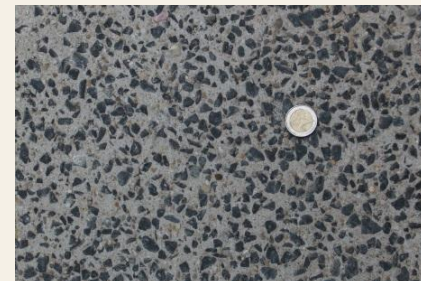
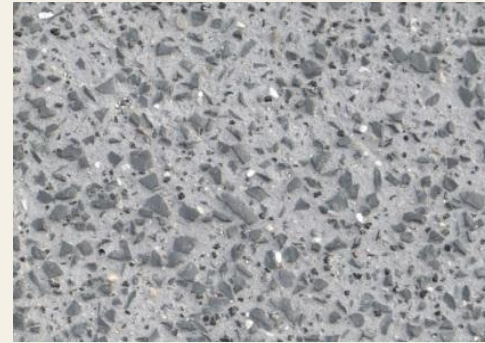
- Public spaces, urban environment,...
- Traditional benefits X visual aspects



Coloured EAC

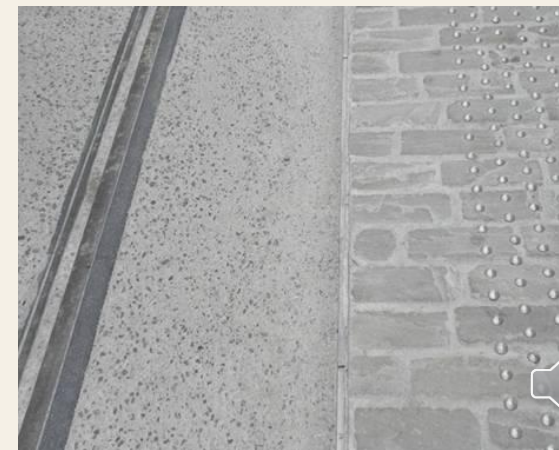
Mortar + coarse aggregates

- Variation in stone size and density
- Aggregates and mortar can match or contrast



Coloured EAC

- Strong paving solution
- Combines easily with other materials



Reflective Pavements for Urban Cooling

Light coloured surface



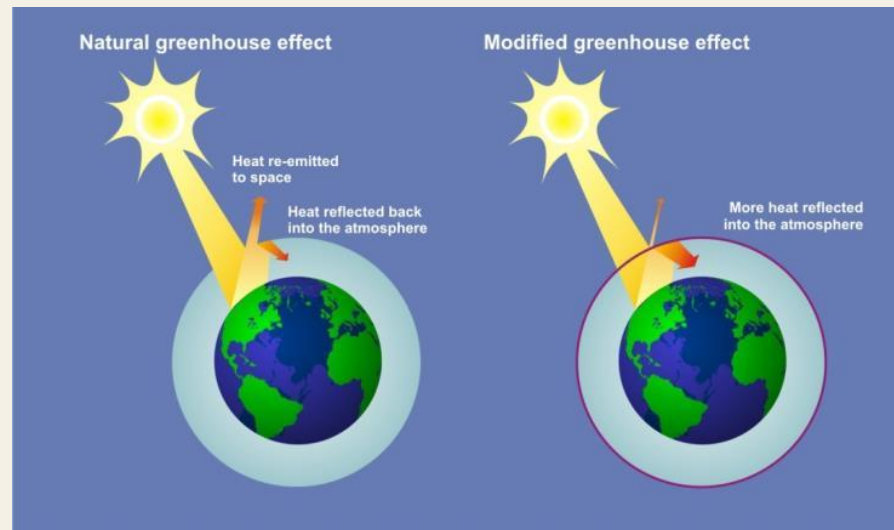
Increasing reflection (albedo)



Retarding the greenhouse gas effect

According to studies at Univ. Berkely (California, U.S.) :

-38 kg CO₂/m² for a Δ_{albedo} of 0,15



Reflective Pavements for Urban Cooling

Reflective surfaces

- Concrete – small scale elements – light coloured asphalt – coatings
- Reduced heat absorption by the structure
- Reductions from 4 to 20°C – dry conditions

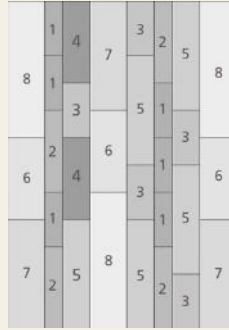
Pervious pavements

- Cooling through evaporation of water at the surface
- Combination with grass vegetation
- Reductions from 1 to 6°C – wet conditions

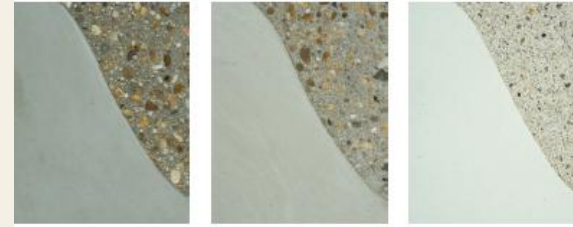
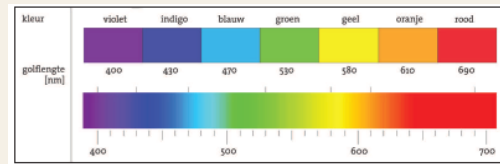


Contemporary Public Spaces

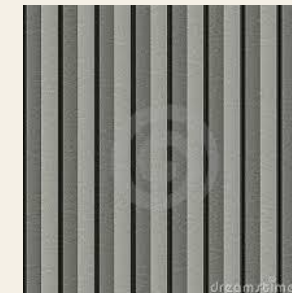
SHAPES & PATTERNS



COLORS & SHADES



TEXTURES



Shapes & Patterns



Shapes & Patterns

Place de la Dingue, Charleroi, BE



	1	4		3	2		
8	1		7		5		8
		3		5	1		
6	2		6		1		6
	1			3		1	5
7	2	5	8	5	2		7
						3	



Shapes & Patterns

Aalst, Hof ten Rozen



Charleroi, Quai de Flandres



Shapes & Patterns

Pôle Marexhe, Herstal, BE



Shapes & Patterns

Brugge, Stationsplein, BE



Shapes & Patterns

- Aspects of concrete technology
 - Slab geometry
 - Peak stresses (acute angles, manholes,...)
 - Risk for cracks by sympathy
 - Risk for curling
- Solutions
 - Use of reinforcement (steel meshes – fibres)
 - Isolation joints
 - Anchorage of slabs (between slabs, slab with base layer)



Colours & shades



Colours & shades

Pigmentation in mortar



Dark red 4% red pigment

Light red 2% red pigment

2% pigment "terra-cotta" colour



Colours & shades

Matching the environment



Colours & shades



Colours & shades

Light shaded concrete without pigments

- grey cement
- quartz sand (e.g. Lommel sand)

Test slabs

Rhine sand + seasand - CEM III/A

Rhine sand + seasand - CEM III/B

Rhine sand+ quartz sand - CEM III/A



Mechelen, Spreeuwenhoek – test slabs

Textures



Textures – exposed aggregate concrete

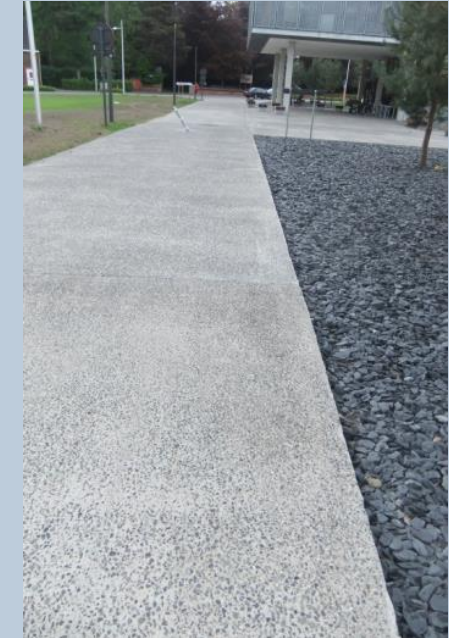
Design and constructions factors

- Size of the stones (Dmax) and grading curve
- Type of setting retarder
- Consistence of the concrete
- Time of washing out
- Way of compacting



Textures – exposed aggregate concrete

Porphyry + (black) limestone



Textures – exposed aggregate concrete

- White limestone
- Non-vibrated concrete : high density of stones at the surface



Working the grading curve

Suitable for pedestrian areas

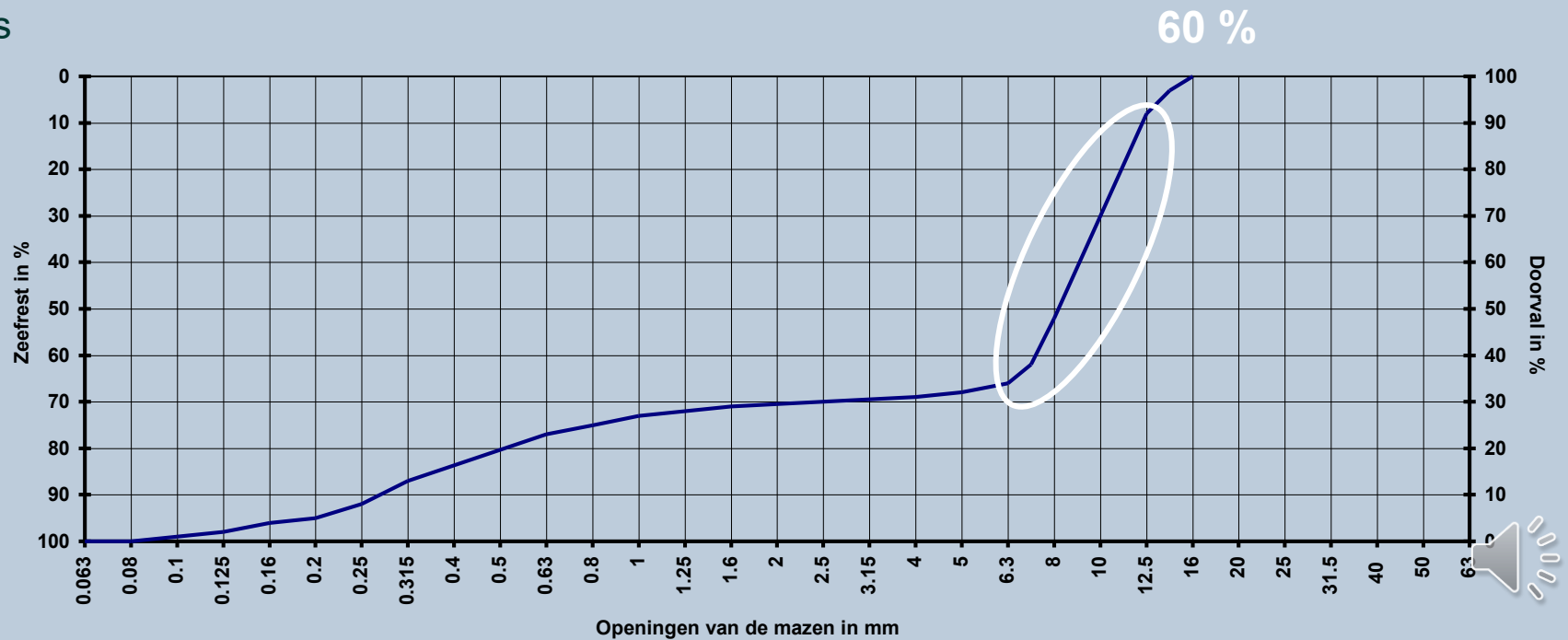
- Large amount of stones at the surface
- $D_{max} = 10, 14, 16, 20 \text{ mm}$
- Discontinuous mix: many aggregates of identical size
- No vibration prevents aggregates from sinking below the surface



Working the grading curve

- discontinuous concrete mix
- high amount of larger stones

Grading curve
Concrete 0/14



Textures – brushed concrete

Suitable for residential areas

- Limited traffic– Extremely long service lives
- Limited speed – no problem of rolling noise



Textures – brushed concrete

Suitable for local and secondary network



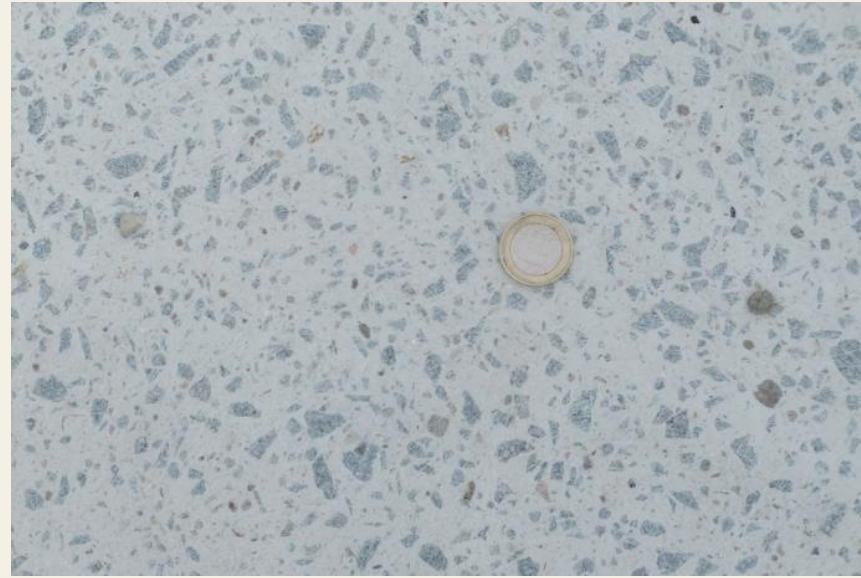
Textures – “half-troweling”

- Risk of unprotected concrete surface between moment of pouring concrete and moment of trowel finishing
- Alternative way : burlap drag on wet concrete



Textures – polishing

- On hardened concrete = removal of 2 to 3 mm
- Different degrees of polishing
- Contrast between stones and mortar becomes visible
- Beware of too slippery surfaces



Aalst : Hof ten Rozen



Textures – shot blasting

- Intensity can be adjusted (choice of material, impact angle, speed of machine)
- Mostly finishing in strips – problem of overlapping
- Uniform execution without longitudinal strips is possible with a special machine



Genk : Fruitmarkt



Textures – Brush-hammering

- Aesthetical and/or functional
- Rustic look



Turnhout, Warande



Textures - diamond grinding

Improvement of surface characteristics

- evenness
- Reduction of rolling noise
- Improvement of skid resistance

Less appropriate for an aesthetical finishing
(homogeneity, overlapping of strips)



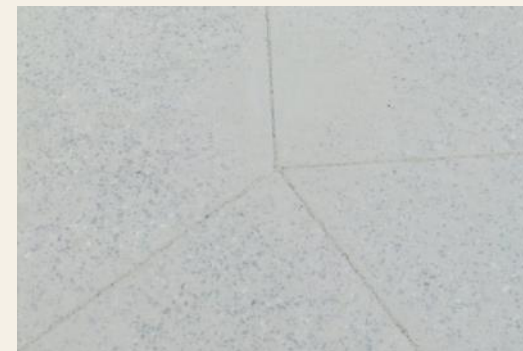
Textures – fine milling



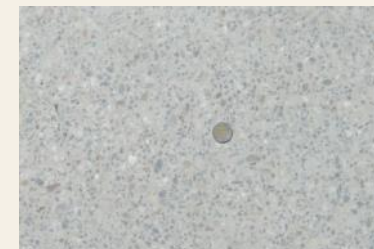
All-in on place... Cadixplein

In situ cast & Precast

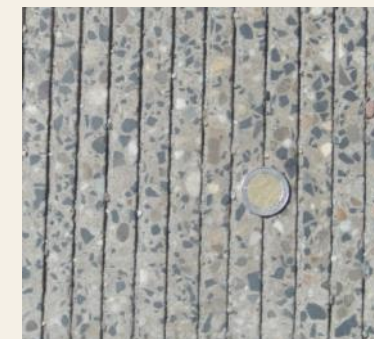
- Crushed gravel
- Basalt
- Sand coloured colouring agent



Joint pattern



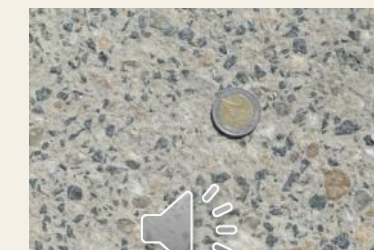
Polished



Fine grooved

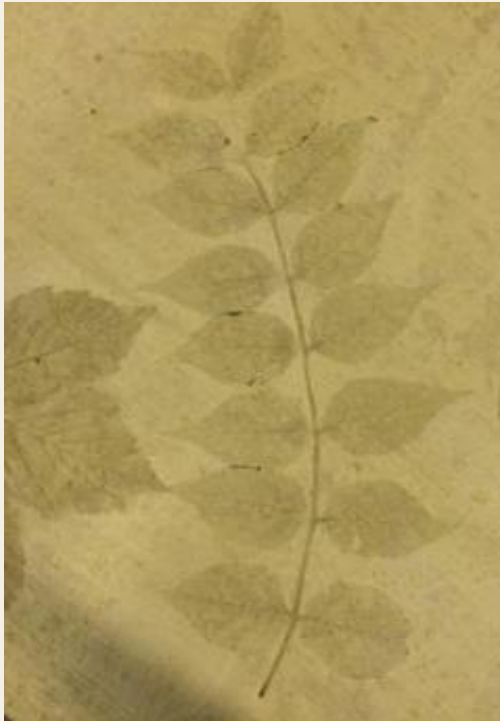


Seed shapes

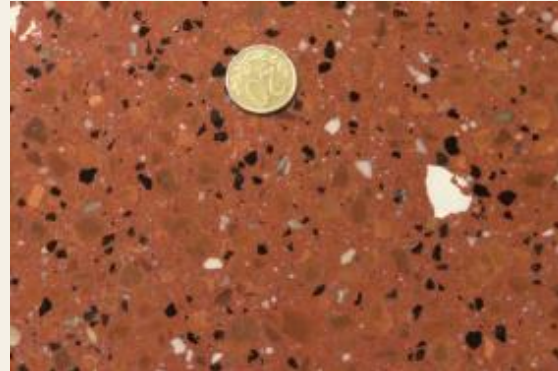
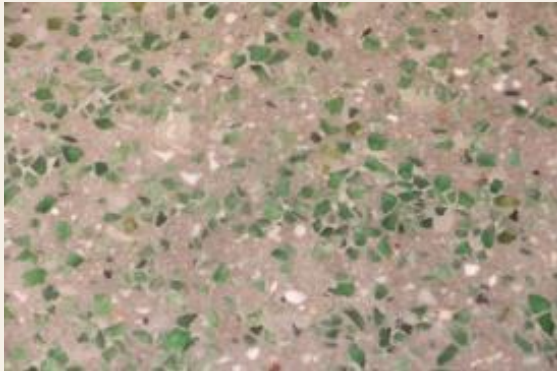


Hammered

Open to creativity...



Open to creativity...



Open to creativity...



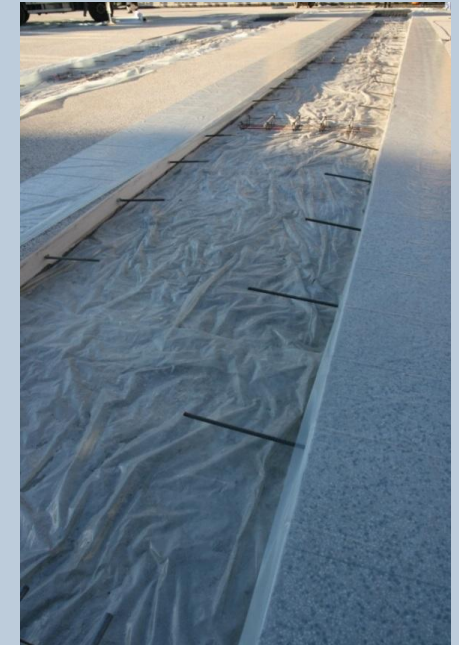
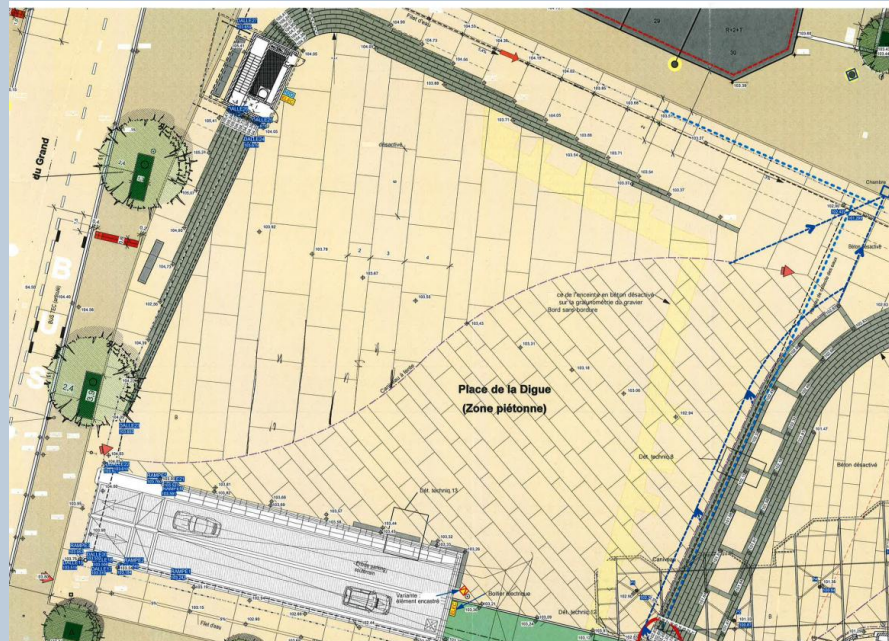
From Design to Construction

Standard specifications & rules -> starting point

Additional specs are essential

Key focus areas:

- Concrete mix
- Joints
- Surface finish (aggregate exposure)





From Design to Construction

Early communication between owner, designer and contractor



DEFINING AESTHETICS

- Define the desired look
- Inspiration from surroundings
- Aim for harmony — not replication



DEFINING COMPOSITION

- Coarse aggregates
 - Aggregate type(s)
 - Grading curve
 - % type 1/type 2
- Mortar
 - Cement
 - Sand
 - Pigments

Testing on slab samples in the lab



TESTING ON SITE

- 1m x 1 m test slabs
- Site conditions
- Final materials

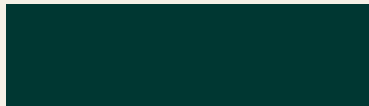


BENCHMARK FOR FINAL APPROVAL



From Design to Construction

Single Layer System

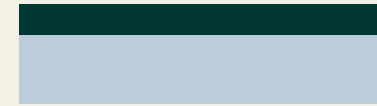


E.g. 20 cm

- Single mix
- Fast build

- Costly materials → full thickness

Double Layer System



E.g. 5 cm top+
15 cm bottom

- Controlled finishing
- Costly materials saving
- Recycled aggregates bottom layer

- “Wet on wet” casting
- Two concrete mixes

PROS

CONS



From Design to Construction

Double Layer System



Conclusions

- Decorative concrete is a rapidly growing market in Belgium
- Supports high design flexibility (colour & texture)
- Meets essential concrete durability requirements
- Increasing shift toward decorative, sustainable, and climate-resilient urban areas
- Effective communication between all stakeholders is essential



FEBELCEMI

Many thanks to Luc Rens for his valuable input and material for this presentation.

Federatie van de Belgische Cementnijverheid vzw
Fédération de l'industrie cimentière belge asbl

