

Concrete surface treatment techniques

Part 2: fine and micromilling – bush hammering – shotblasting – honed and polished concrete

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Introduction

- OBJECTIVE of (Mechanical) treatments of the hardened concrete surface = to improve certain surface characteristics without jeopardizing other ones
 - Evenness
 - Skid resistance
 - Noise
- E.g. :
 - improving evenness while maintaining (or improving) skid resistance
 - improving noise while maintaining (or improving) skid resistance

Introduction

- Solving surface problems – a few examples



Too slippery trowel finished surface



Rolling noise for an EAC surface due to (too) large coarse aggregates in the concrete mixture

Introduction

- Another objective = AESTHETICS
 - Mainly applied in public spaces: parks, pedestrian areas, squares,...
 - Why?
 - Revitalize and beautify the city
 - Highlight the heritage
 - Rethink the urban landscape
 - Redevelop the city
 - Return public space to the citizens
 - Renovate and beautify, while respecting the existing character of the site
 - Maintain and improve the city's image
- [Ref: A. Joly, SPECBEA, ppt for the World of Concrete, Paris, 2018]*

Introduction

- Another objective = AESTHETICS



[Ref: A. Joly, SPECBEA, ppt for the World of Concrete, Paris, 2018]

Fine milling and micro milling



Fine milling and micro milling

- Possible goals
 - To increase evenness while maintaining skid resistance
 - To lower the rolling noise
 - To improve skid resistance
 - To prepare a concrete surface before covering with other layers (create bond)



Fine milling and micro milling

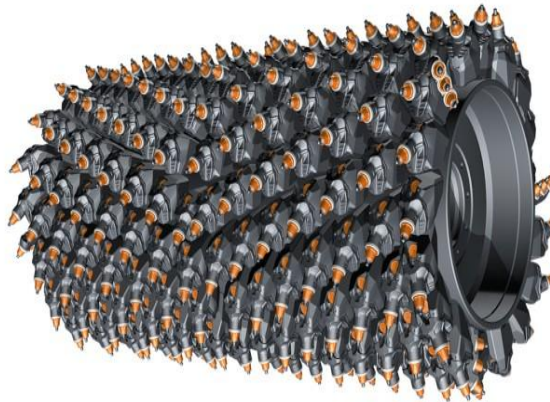
- Equipment
 - Adapted cold milling machine with increased number of cutting tools
 - Horizontal rotating drum with self-leveling system
 - Water spray system for dust suppression



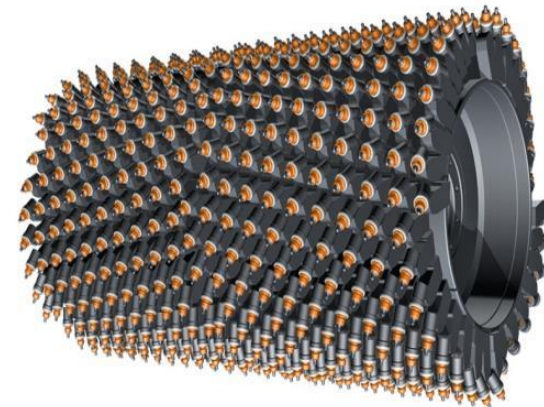
Fine milling and micro milling

- Difference between “fine” and “micro”

Fine milling drum: for high demands on profile (e.g. removal of surface courses, corrective milling work on road profiles)
Milling width: up to max. 80 mm, **tool spacing: 8 - 10 mm**



Micro-fine milling drum: For the highest demands on profile (e.g. increase in surface grip by roughening road surfaces, Preparation milling for surface treatment and cold paving of this layers, Removal of road markings)
Milling width: up to max. 30 mm, **tool spacing: 3 - 6 mm**



Source: Wirtgen

Fine milling and micro milling

- Execution
 - In parallel and straight strips in longitudinal direction
 - Without causing damage to the surface and/or to transverse and longitudinal joints
 - Removal of milled material
 - High-pressure cleaning of the surface after execution



Fine milling and micro milling

- Execution
 - Milling depth: to be specified in the contractual documents
 - Distance between milled grooves
 - Fine milling ≤ 8 mm
 - Micro milling ≤ 6 mm



Fine milling and micro milling

- Applications of fine milling
 - Mainly on secondary and local roads



Fine milling and micro milling

- Applications of fine milling
 - Mainly on secondary and local roads



Fine milling and micro milling

- Applications of micro milling
 - A more accurate way of surface finishing:
interesting for bicycle paths



Bush hammering

- Goal =
 - To improve skid resistance while maintaining evenness
 - To remove a superficial mortar layer (as a remedial technique for a failed exposed aggregate concrete surface)



Bush hammering

- Equipment
 - Either:
 - A horizontal disk machine, equipped with a hammer system attached via rotating points (pivots)



Bush hammering

- Equipment
 - Or:
 - One or more discs on a vertical shaft, equipped with star-shaped arranged tools fitted with hammer heads
 - Equipped with a spraying system
 - Equipped with an extraction system

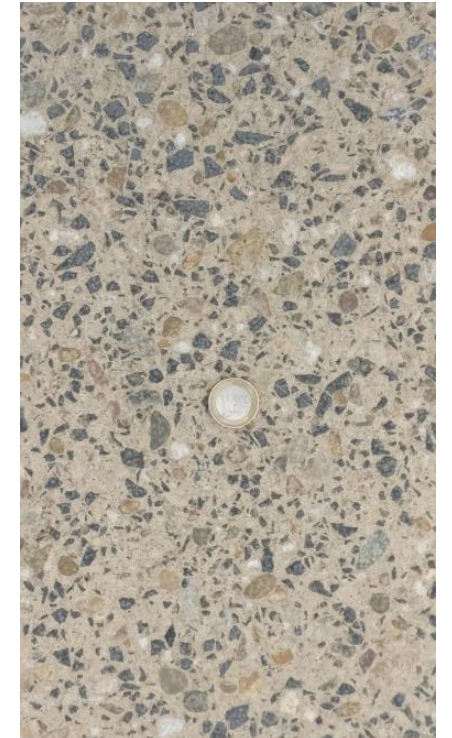


Bush hammering

- Applications: mainly public space (rustique look)



Dinant – Place J. Patenier



Antwerpen – tramway at Cadixplein



BÉTON BOUCHARDÉ

[Ref: A. Joly, SPECBEA, ppt for the World of Concrete, Paris, 2018]





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Shotblasting



Shotblasting

- Goals =
 - To improve skid resistance while maintaining evenness
 - To prepare a concrete surface before covering with other other layers (create bond)
 - To remove a superficial mortar layer (as a remedial technique for an exposed aggregate concrete surface with insufficient texture depth)
 - As a decorative surface



Shotblasting

- **Equipment**

- Heavy-duty blasting with high-speed steel (or sand) shot
- Extraction system with recovery of steel (or sand) shot and dust

- **Execution**

- Steel, sand or other blast material
- The result depends on the blasting material, intensity, angle, and travel speed
- Evacuation of the removed material (mortar, dust)
- Stone skeleton may appear (slightly) at the surface
- Beware of overlapping of the strips



Shotblasting



Polishing - Honing

- Removing 2 to 4 mm of top surface
- Mainly interior applications but more and more exterior pavements
- Mostly decorative applications; sometimes also to improve existing surfaces



Polishing - Honing

- Material
 - Horizontally rotating disk



[Ref: A. Joly, SPECBEA, ppt for the World of Concrete, Paris, 2018]

Polishing - Honing

- Attention to slip resistance!
 - Honed concrete = matte surface; polished concrete = shiny surface
 - Limit to a “coarse grain”
 - Check with SRT Pendulum



Polishing - Honing

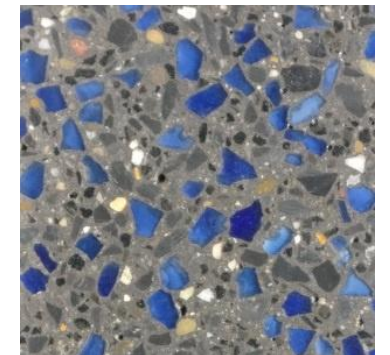
Brussels - Atomiumplein



Antwerp - Cadixplein



Design samples





BÉTON **PONCÉ**

[Ref: A. Joly, SPECBEA, ppt for the World of Concrete, Paris, 2018]



BANDE **PONCÉ**

Quartier de la Lombardie- Rouen

[Ref: A. Joly, SPECBEA, ppt for the World of Concrete, Paris, 2018]

Concluding remarks

- Proper design choices and high-quality execution provide the best guarantees for a high-quality and/or aesthetical surface with properties that remain highly consistent throughout its lifespan.
- When the surface characteristics no longer meet requirements, there are various mechanical treatment techniques available that make it possible to extend the service life of the concrete pavement without having to overlay or replace it.

Thank you for your attention



[Ref: K. Liekens, Tractebel Engineering – Antwerpen, Zuidpark]