


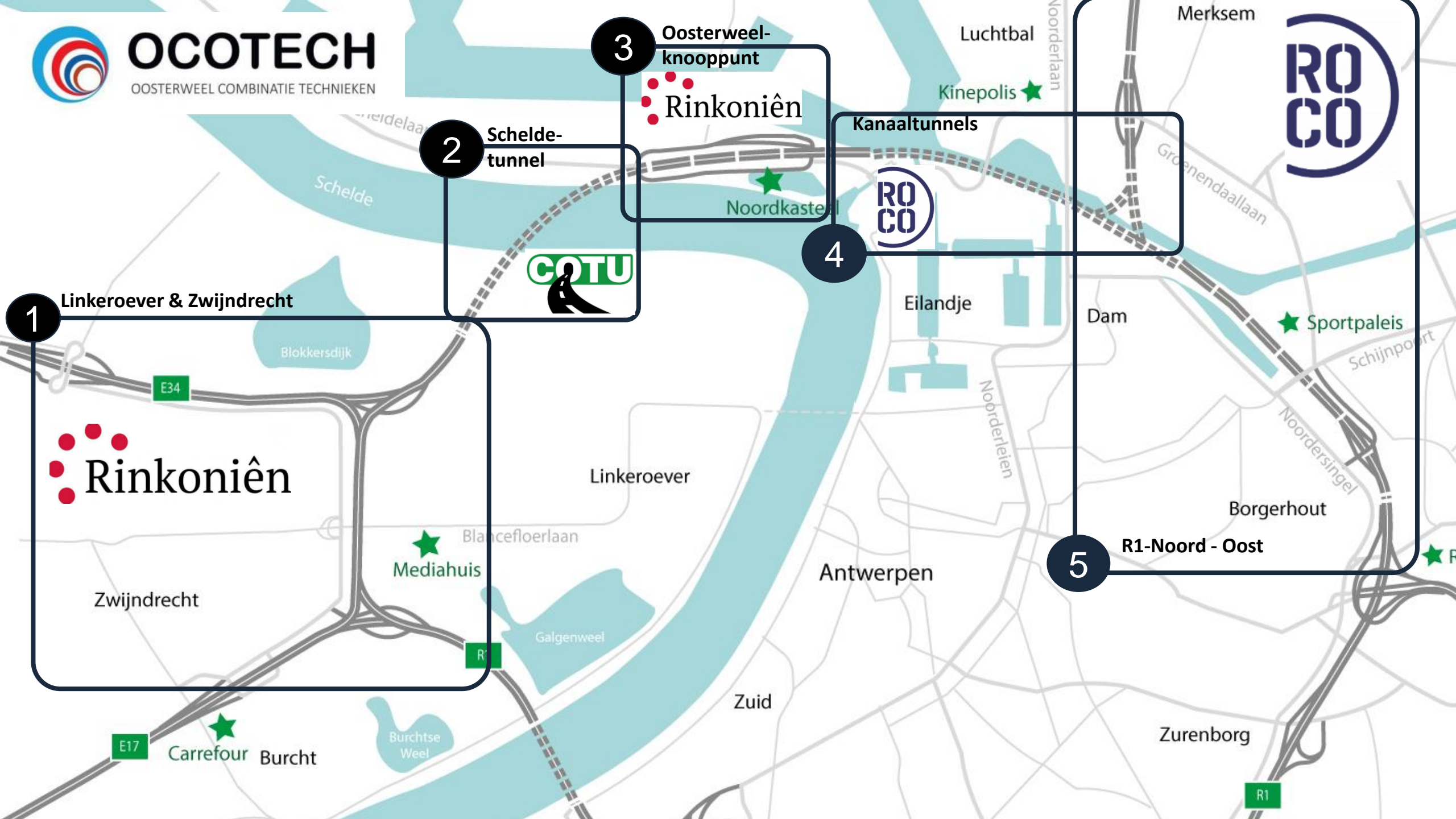
Opportunities of sustainable solutions in the underground structures of the Oosterweel connection



R. Keersmaekers



OCOTECH
OOSTERWEEL COMBINATIE TECHNIEKEN



1

Linkeroever & Zwijndrecht

Rinkoniën

2

Schelde-tunnel



3

Oosterweel-knooppunt

Rinkoniën

4

Kanaaltunnels



5

R1-Noord - Oost

BEFORE

**R1 - Groenendaallaan
Merksem/ Luchtbal**



AFTER

**R1 - Groenendaallaan
Merksem/ Luchtbal**





Sportpaleis BEFORE

RINGPARK LOBROEKDOK - SPORTPALEIS | CURRENT SITUATION



Sportpaleis AFTER

RINGPARK LOBROEKDOK - SPORTPALEIS | VISION OF THE FUTURE

**Our ambition:
Make Oosterweel the
reference of
a sustainable
infrastructure project**



I from Lant1s stands for I nnovation

- We offer our project site is a playground
- Oosterweel is an incubator/catalyst for innovation
- Relevance for the project is NOT a strict boundary condition, added value for society is!
- We implement a lot of ideas today, we have feasible ambitions tomorrow and we dream for the future

Capita selecta part 1: Today

- Reinforced soils as a new soil-retaining technique that replaces reinforced concrete (together with Arcadis, Buildwise, Rinkoniën, ...)



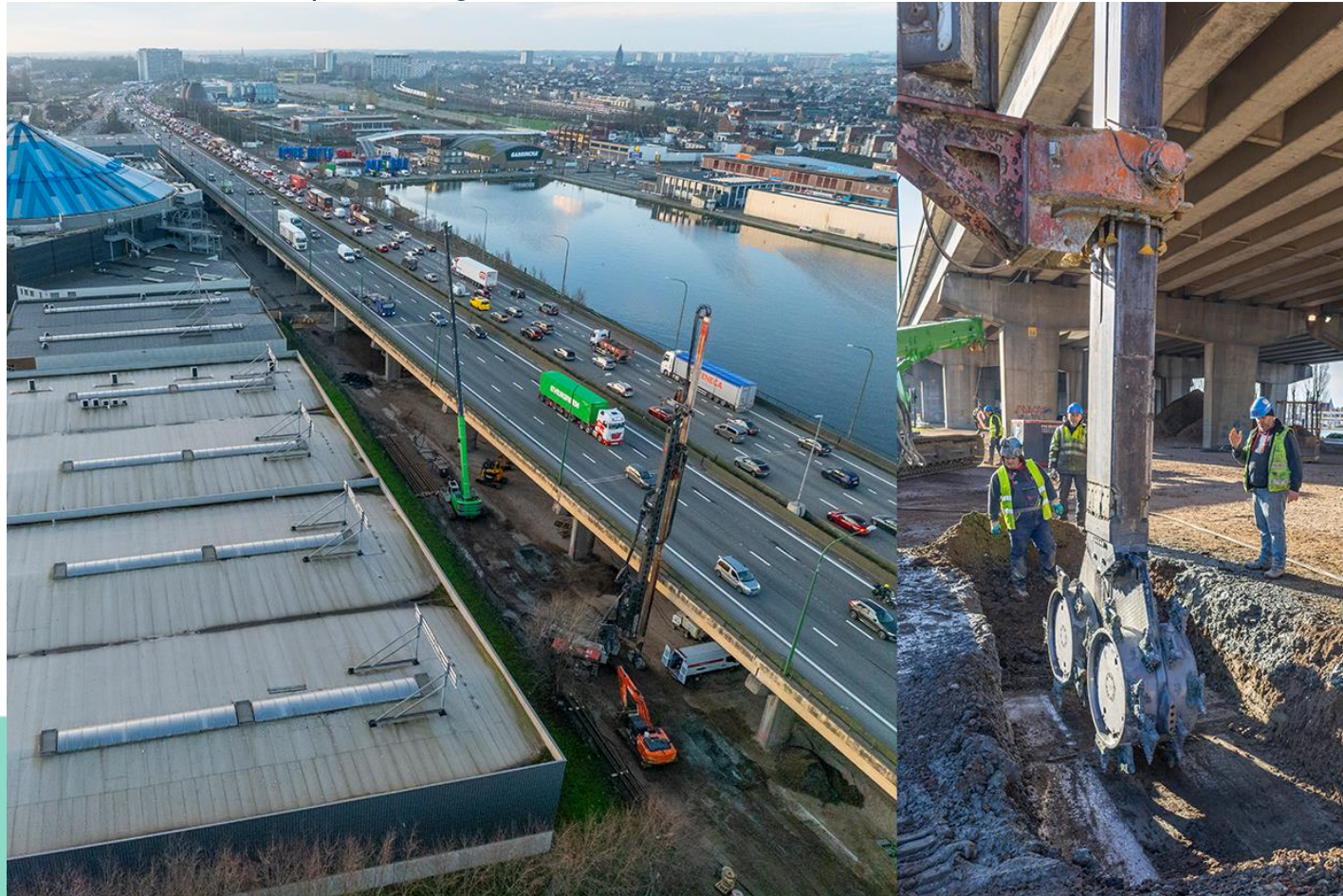
Capita selecta part 1: Today

- PFOS/PFAS:
 - Cleaning of contaminated soils
 - Facilitate research (hemp plants, Uhasselt,)
 - We purify our groundwater during construction and for the next 100 years
- Excavated soils: maximum reuse on site of excavated soils



Capita selecta part 1: Today

- Maximum use of soil mixing techniques:
 - mixing in situ soils with cement grout (CSM) as alternative for concrete deep foundations (temporary structures)



Capita selecta part 1: Today

- Noise control:
 - Investigate non- or low- vibration techniques:
 - CSM
 - Pré drilling with Avegaar
 - Construction with slopes
 - Electrification of machinery
 - Noise reducing measures
 - ...



CONCRETE part 1: Today

- Total need right bank: 2.300.000 m³ concrete / 5,52 *10E6 ton / 255.000 mixers

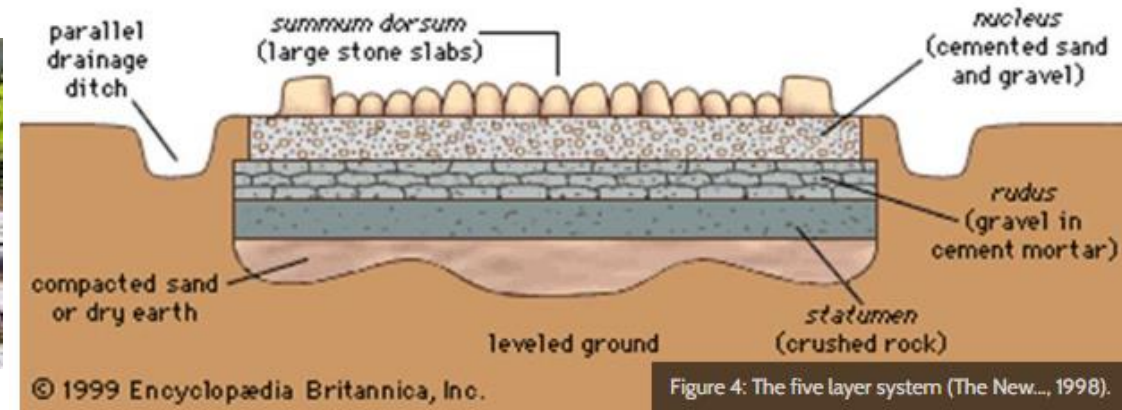
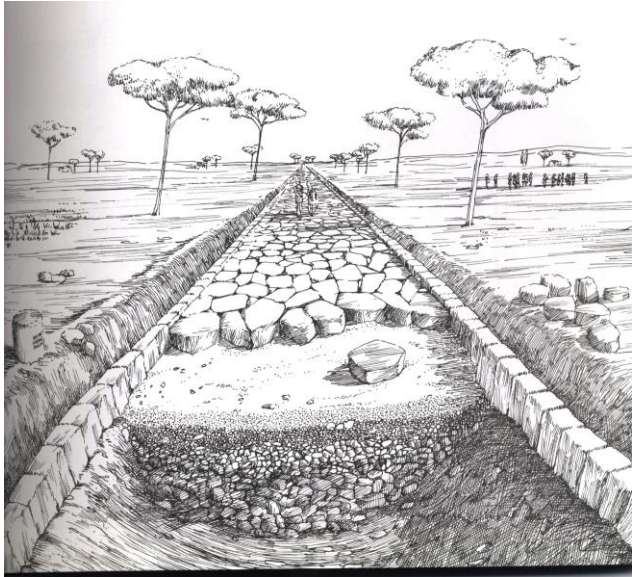


- Slurry walls (3A+3B): 875.000 m³ = 29 km wall 1 m thick, 30 m deep
- Concrete walls/columns: 540.000 m³
- Concrete slabs/beams: 775.000 m³
- Prefab concrete: 127.000 m³
- Roads: 200.000 m²
- Barriers: 80 km



CONCRETE part 1: Today

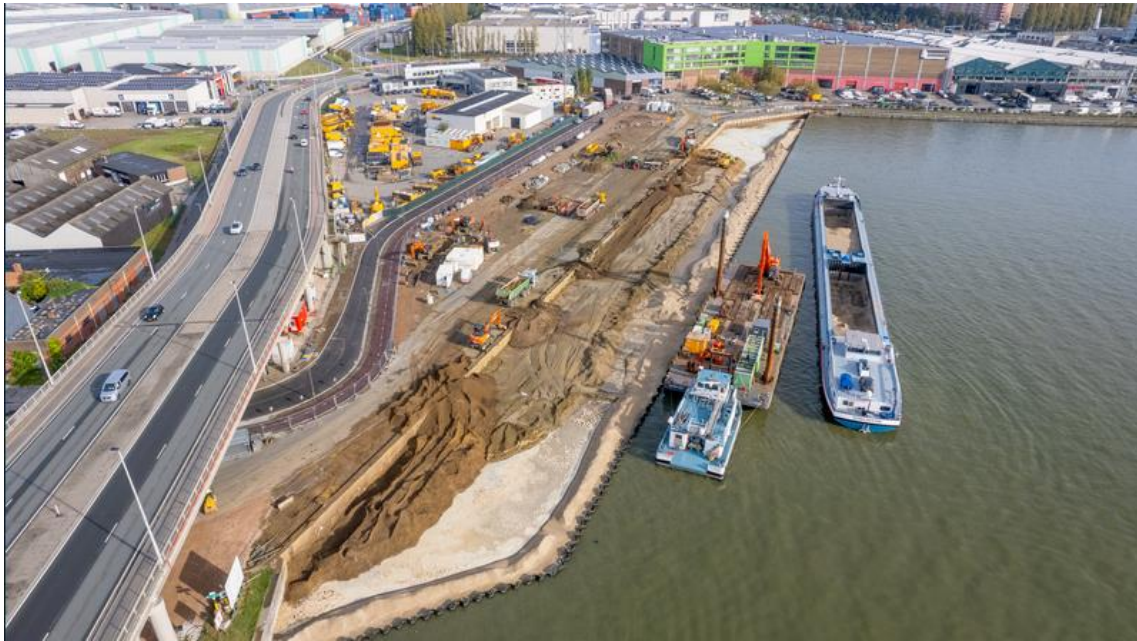
- What did our ancestors know? Via Appia: Roman highways



- What do we adopt in oosterweel?
 - Cement with pozzolana or volcanic ash (CEM V/a-P)
 - Self healing effect as an extra (limestone)

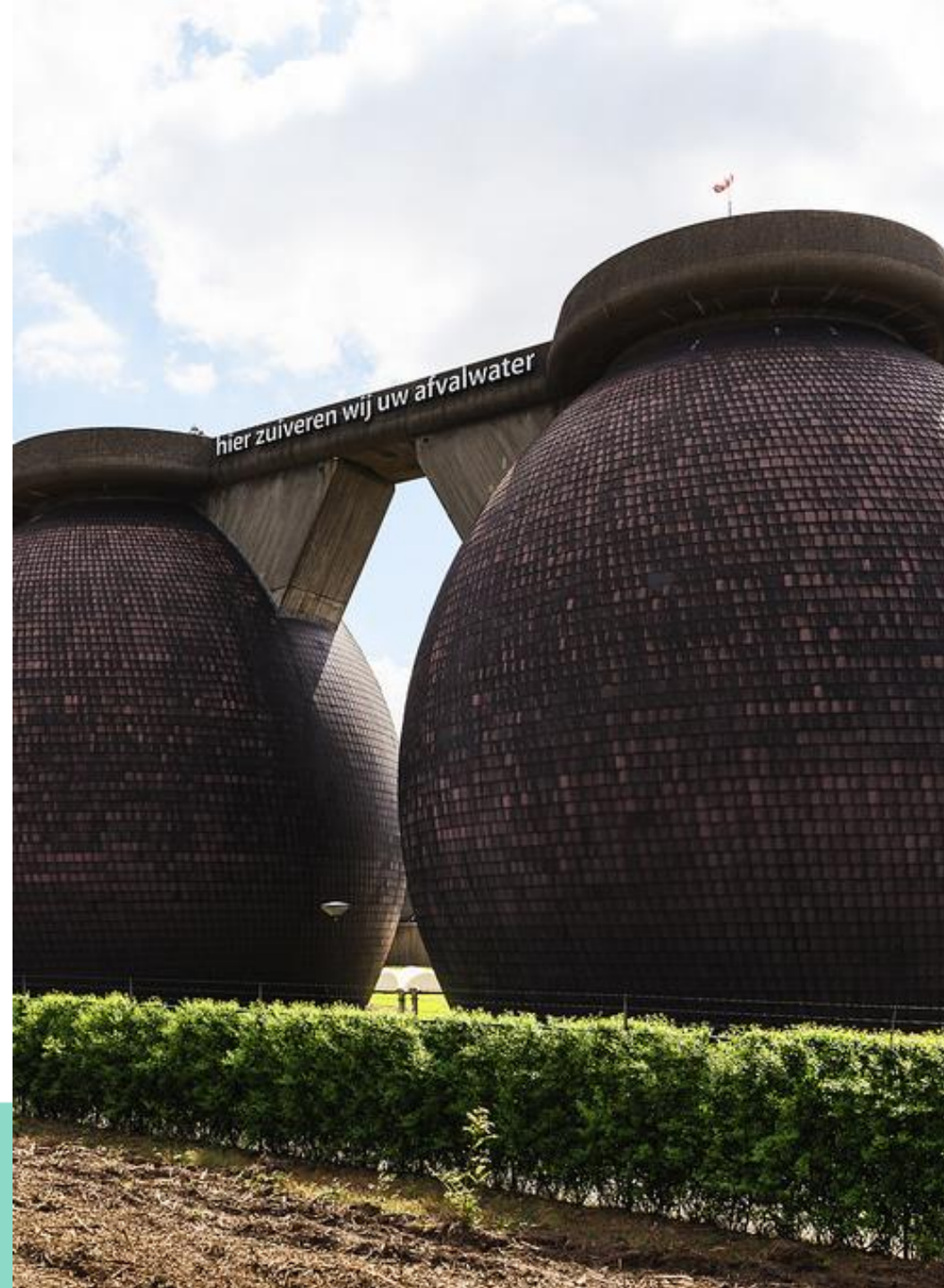
CONCRETE part 1: Today

- Raw materials via waterways
- Mixers drive on internal road system



CONCRETE part 1: Today

- Effluent water from purification facilities:
 - used for mixing concrete
 - for bentonite support fluids
 - as cleaning water
 - no tap water is used
 - no surface water from the docks is used

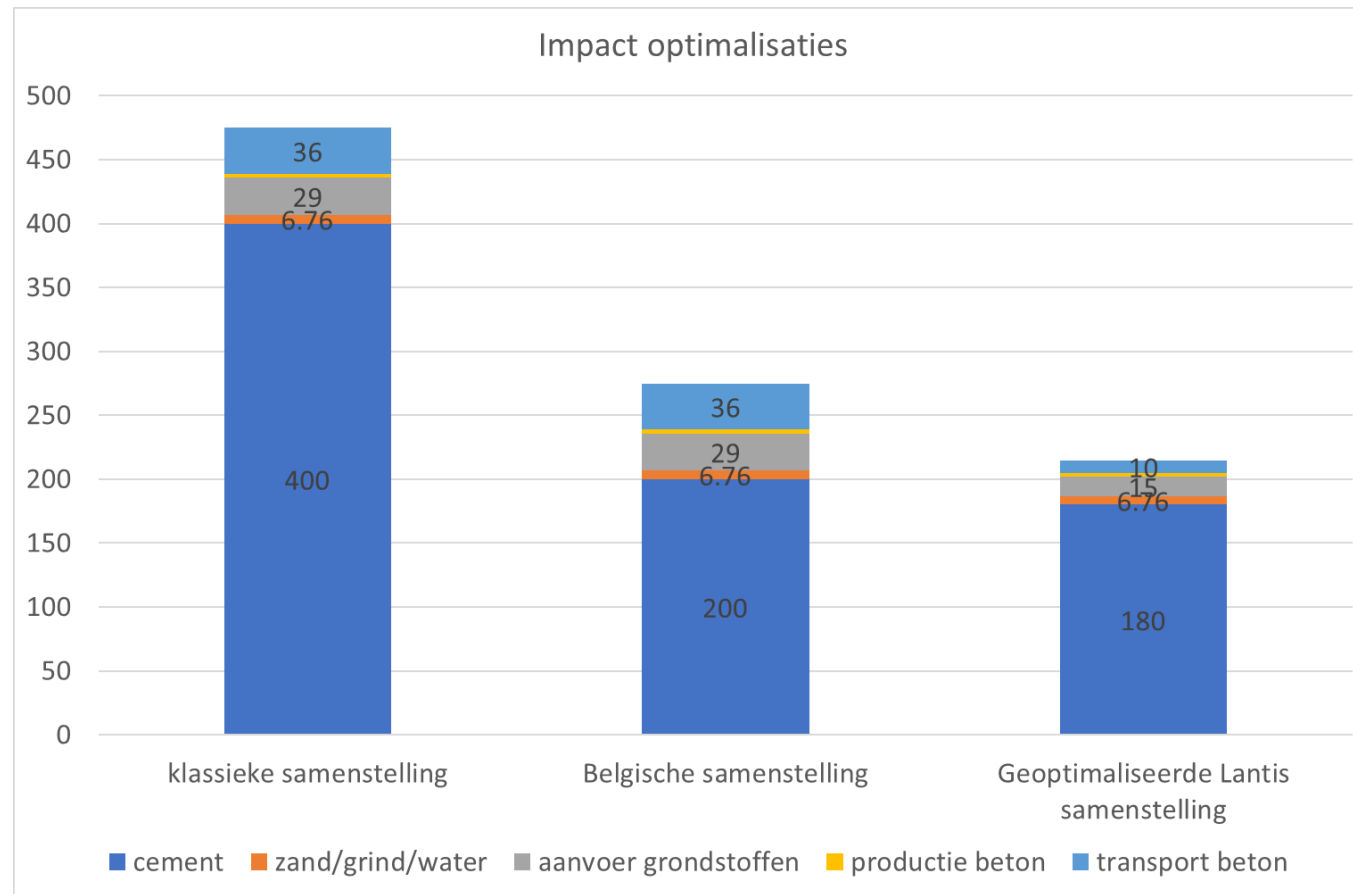


CONCRETE part 1: Today

- Concrete for slurry walls: ROCO/LANTIS
 - Initially needed:
 - Benor C35/45 EE4
 - W/C max 0,45
 - Min cement 400kg/m³
 - In execution:
 - Start from Benor C30/47 EE3 and add extra properties:
 - W/C max 0,5
 - Durability tests EE4
 - Strength after 56 days to demonstrate C35/45
 - **Result: 10% reduction in cement content!**

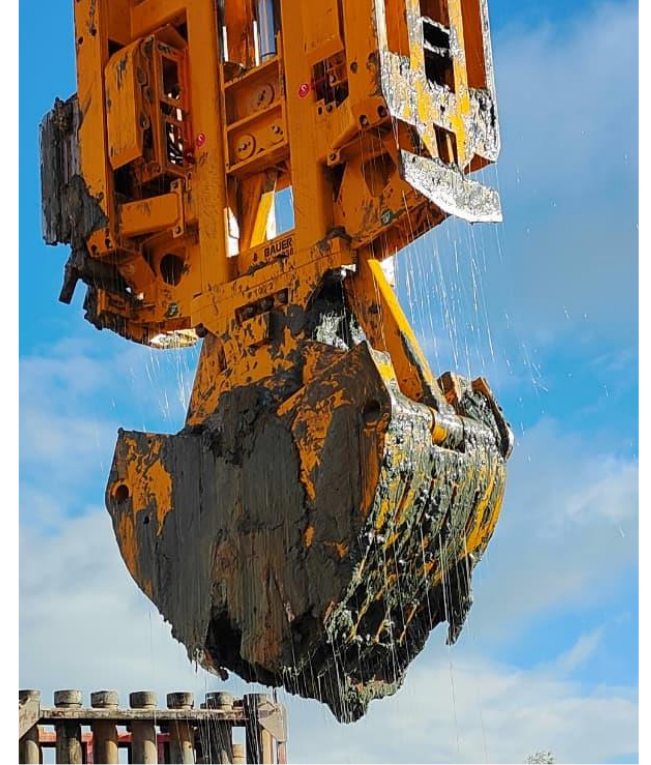
CONCRETE part 1: Today

- CO2-reduction / m³ concrete: current situation



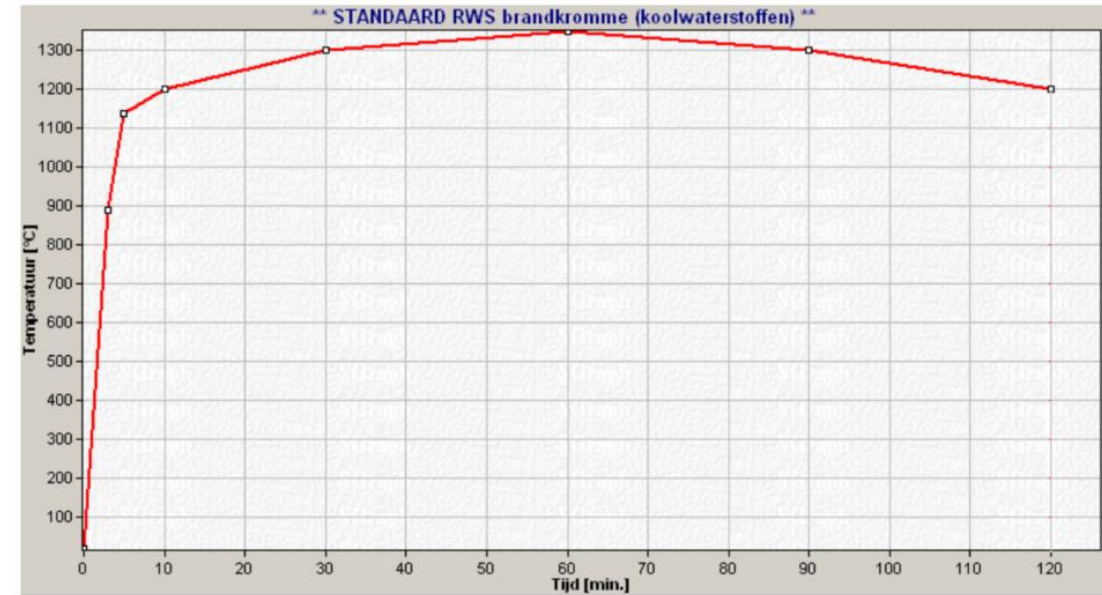
Capita selecta part 2: Tomorrow

- What will we hopefully do tomorrow (Buildwise/contractors):
- SDIP's: soil dispersion inhibiting polymers
 - Alternative for bentonite support fluid slurry wall
 - No desanding
 - Less workspace
 - Cleaner excavated soil



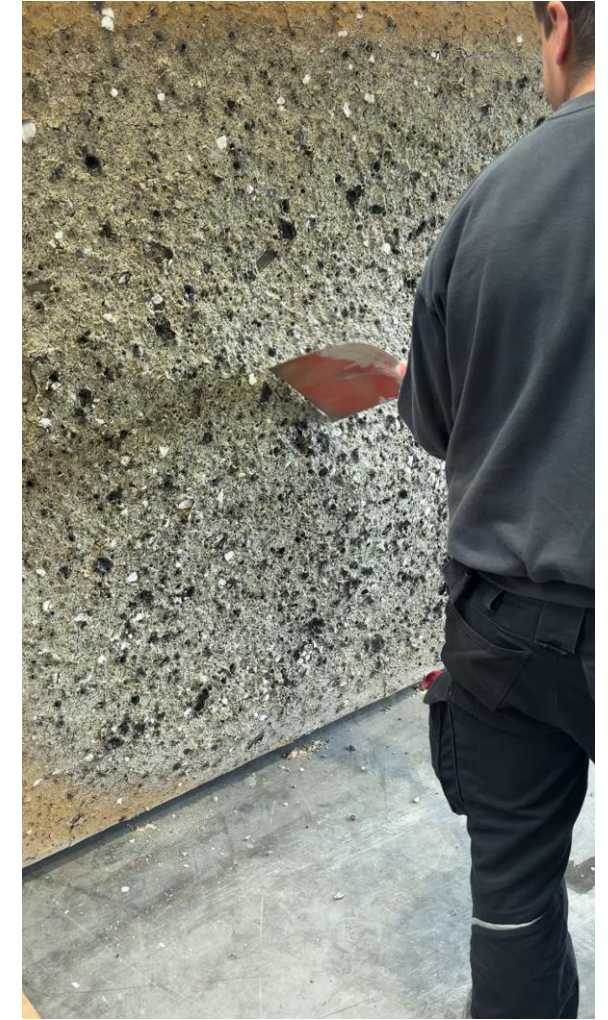
CONCRETE part 2: Tomorrow

- Polypropylene (PP)-fibres as alternative for fire resistant cladding (Rink/Roco/Lantis/Seco):
 - Reduce spalling
 - Reduce cost (enormous)
 - Planning robustness
 - Asset management



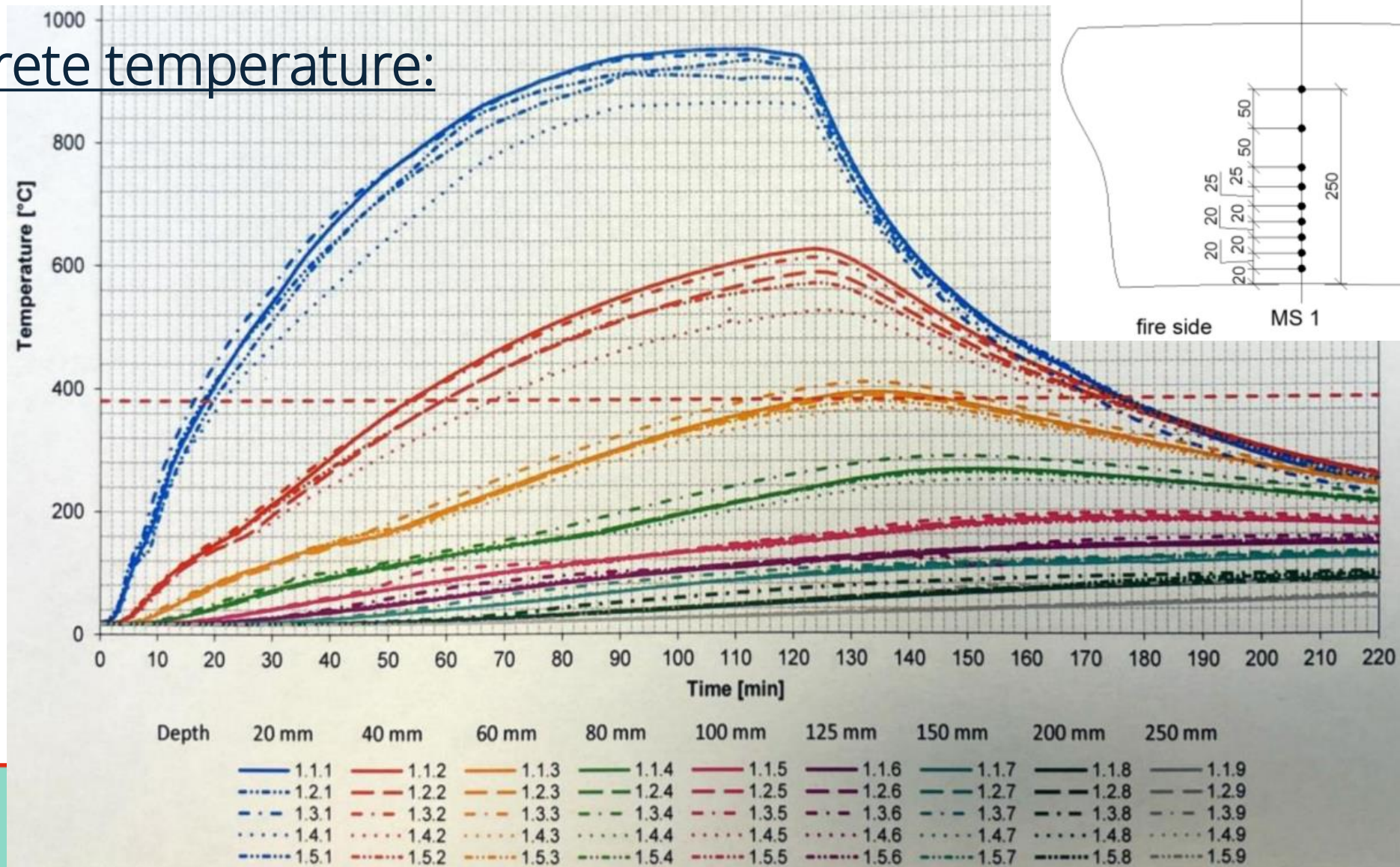
RWS fire curve (graphical)

Sneak preview: fire tests October MFPA Leipzig



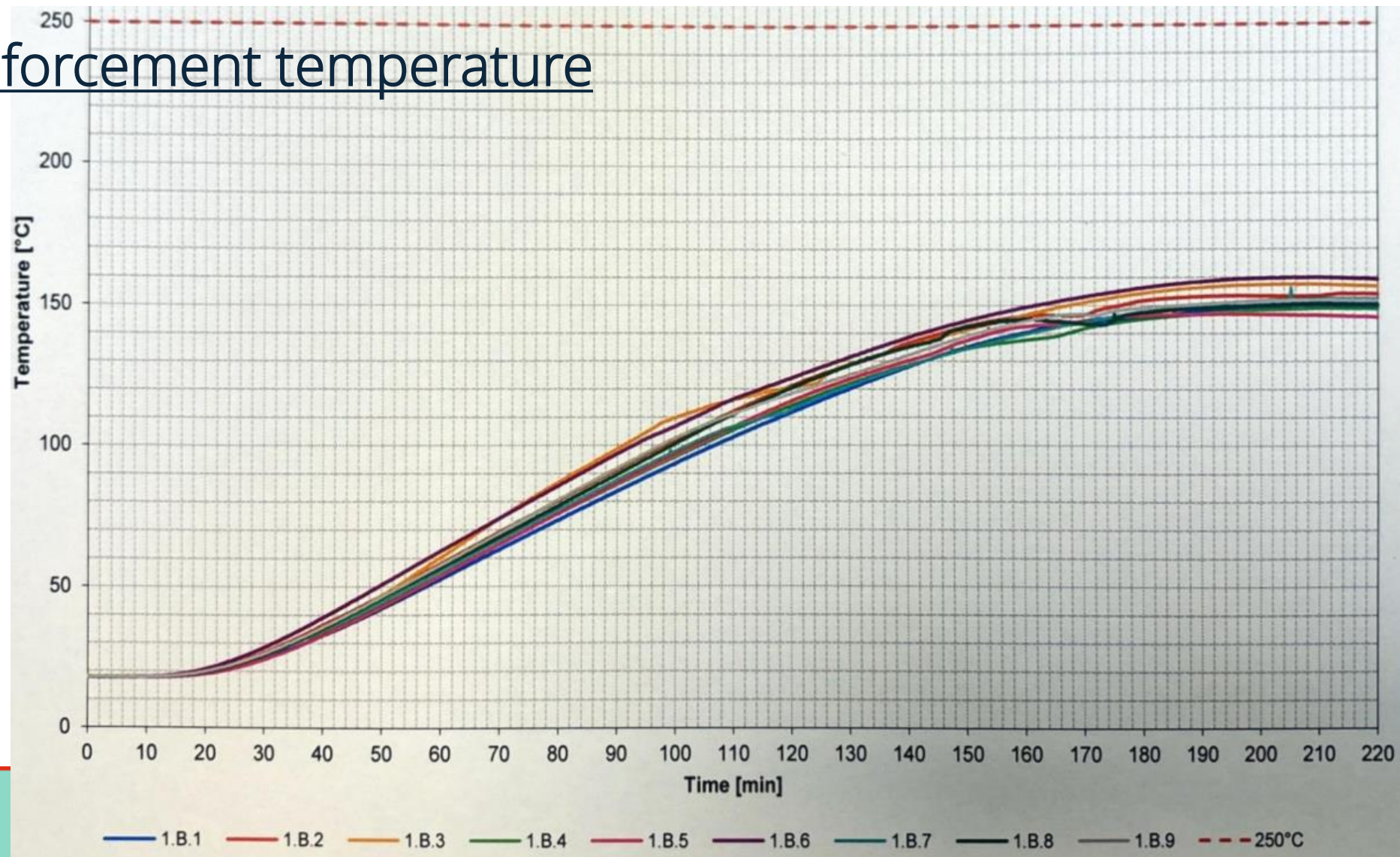
Sneak preview: fire tests October MFPA Leipzig

- Concrete temperature:



Sneak preview: fire tests October MFPA Leipzig

- Reinforcement temperature



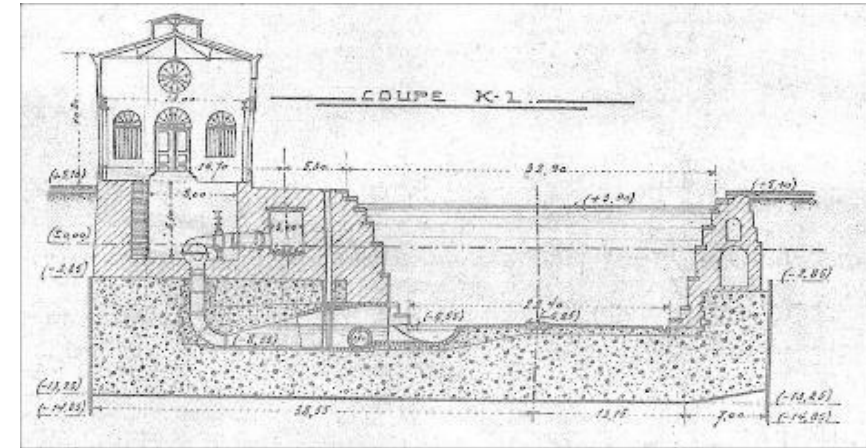
CONCRETE part 2: Tomorrow

- Steel fibres (hybrid) in foundation slabs (EBS/Bekaert/Seco...):



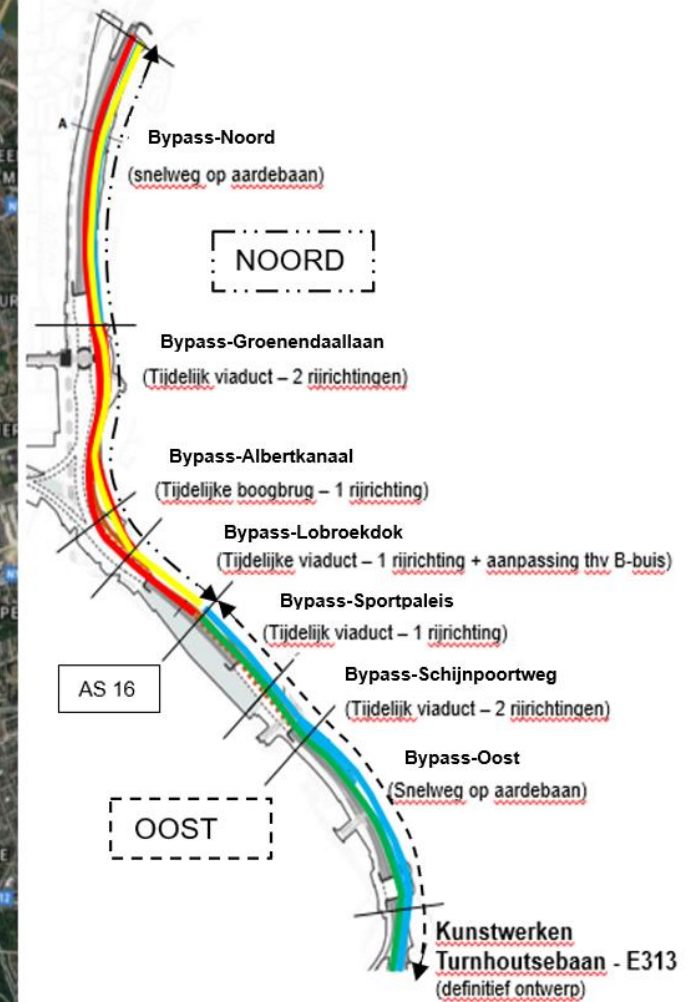
“URBAN MINING” part 1: Tomorrow

- High quality reuse of concrete aggregates:



“URBAN MINING” part 2: Where we dream about

- Reuse prefab beams bypass:



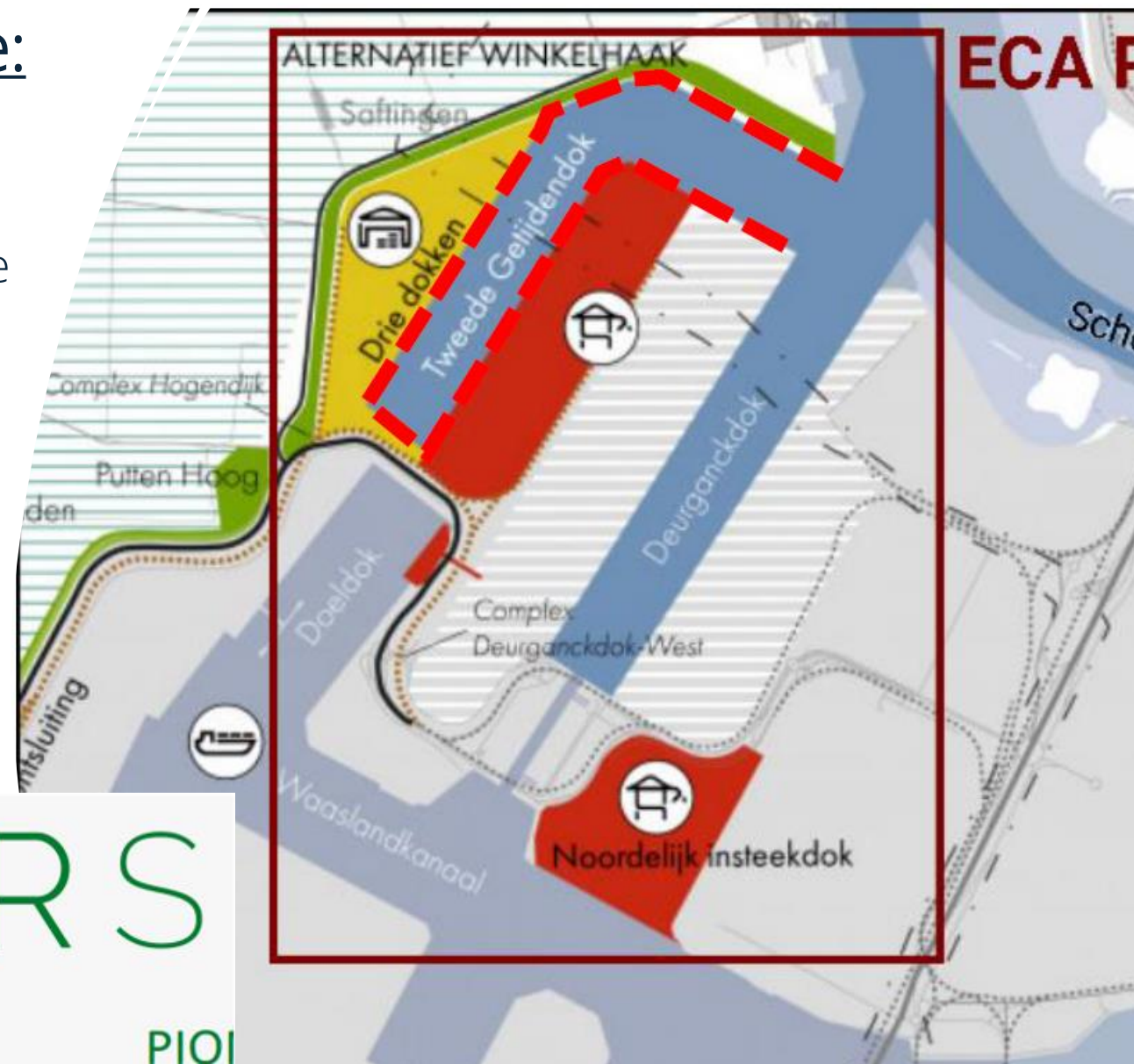
“URBAN MINING” part 2: Where we dream about

- Reuse prefab beams bypass: 1060 beams between 30m – 45m
 - KULeuven (De Nayer, Buildwise)



“URBAN MINING” part 2: Where we dream about

- Antwerp fine sands in concrete:
 - POAB/Buildwise/VITO/Lantis
 - Reuse in concrete
 - Potentially 300kg sand/m³ concrete
 - POAB 30 million m³
 - Oosterweel 8 million m³
 - Glauconite!
 - C35/45 EE4
 - Fine sand
 - Very ambitious



PI  **NEERS**

Portable Innovation Open Network for
Efficiency and Emissions Reduction Solutions

PIOI



CIRCULAIR
BETONAKKOORD
VLAANDEREN

Initiatieven

De **Europese Green Deal** stelt voorop om tegen 2030 broeikasemissies minimaal met 55% te verminderen en tegen 2050 met 95% t.o.v. het niveau van 1990.

Het **Vlaams Energie- & Klimaatplan** ambieert om tegen 2030 de broeikasgasemissies met 40% te verminderen t.o.v. het niveau van 2005.

Daarenboven voorzien de **Vlaamse beleidsambities** om tegen 2050 de Vlaamse materiaalvoetafdruk met 75% te reduceren t.o.v. 2016.

- **Respecting** the boundaries of the planet: life cycle, CO2 footprint, recycling
- Stimulating **innovation** and **collaboration** in all its forms: optimization of compositions, raw materials and testing
- An economy that collectively '**responsibilizes**' and rewards: added value, risk reduction, impact

A large concrete bridge is under construction. The bridge spans across the frame, supported by several concrete pillars. Below the bridge, a grid of steel reinforcement bars (rebar) is laid out on the ground, ready for a concrete pour. Several construction workers in blue safety vests and hard hats are visible in the distance, working on the site. The sky is overcast and grey. The overall scene is one of active construction.

Thanx for your attention!